  

PUBLIC UTILITY DISTRICT NO. 1 *of* CHELAN COUNTY
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April 10, 2015

VIA ELECTRONIC FILING

Honorable Kimberly D. Bose, Secretary, and
Nathaniel J. Davis, Sr., Deputy Secretary
FEDERAL ENERGY REGULATORY COMMISSION
888 First Street NE
Washington, DC 20426

Subject: Rocky Reach Hydroelectric Project, FERC No. 2145
Annual Report of Activities under the Anadromous Fish Agreement and Habitat Conservation Plan for Calendar Year 2014

Dear Secretary Bose and Deputy Secretary Davis:

Public Utility District No. 1 of Chelan County, Washington (Chelan PUD), licensee for Rocky Reach Hydroelectric Project No. 2145 (Rocky Reach Project) respectfully submits the attached annual progress report in accordance with Article 10 of Appendix B of the *Order on Offer of Settlement and Issuing New License* (License) issued on February 19, 2009.[1]

The 50-year Anadromous Fish Agreement and Habitat Conservation Plan (HCP) Agreement[2] for the Rocky Reach Project was filed with the Federal Energy Regulatory Commission (Commission) on November 24, 2003, and approved by the Commission at 107 FERC ¶ 61,280 (2004) and 107 FERC ¶ 61,281 (2004),[3] and prescribed by National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service pursuant to Section 18 of the Federal Power Act. Article 10 of Appendix B of the new License requires Chelan PUD to file with the Commission: (1) the final annual and comprehensive progress reports developed pursuant to the HCP; and (2) the final annual results of all studies and testing pursuant to the HCP.[4]

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[1] 126 FERC ¶ 61,138 (2009).
[2] 107 FERC ¶ 61,280 (2004).
[3] 107 FERC ¶ 61,281 (2004).
[4] Article 10 of Appendix B supersedes License Article 410 of *Order Amending License* issued June 21, 2004. Pursuant to License Article 404 of *Order Modifying and Approving Plan for Assessing Operation Effects of the Juvenile Bypass System* issued January 26, 2003 and *Order Amending License* issued April 12, 2002, the reporting requirements were incorporated as Section 1.1 of the progress report. This information will now be reported under new License Article 402. *Operations Plan.*

The progress report is intended to fulfill the License requirements and Section 4.8 of the HCP requiring an annual report of progress toward achieving the no net impact (NNI) goal described in Section 3 of the HCP, and includes a discussion of the agreements and other common understandings based upon completed studies and work in 2014. A copy of this report is being submitted to the National Marine Fisheries Service as specified in Section 9.8 of Appendix E of the License.

If you have any questions regarding this filing or requests for additional information, please contact Lance Keller at (509) 661-4299.

Sincerely,

Jeffrey G. Osborn
Compliance Program Supervisor
jeff.osborn@chelanpud.org

cc: Lance Keller, Chelan PUD
Erich Gaedeke, FERC
Scott Carlon, NMFS
HCP Coordinating Committee
HCP Hatchery Committee
HCP Tributary Committee

Attachments:
Annual Report, Calendar Year 2014, of Activities under the Anadromous Fish Agreement and Habitat Conservation Plan

Appendix A	Habitat Conservation Plan Coordinating Committees 2014 Meeting Minutes and Conference Call Minutes
Appendix B	Habitat Conservation Plan Hatchery Committees 2014 Meeting Minutes and Conference Call Minutes
Appendix C	Habitat Conservation Plan Tributary Committees 2014 Meeting Minutes
Appendix D	Habitat Conservation Plan Policy Committees 2014 Meeting Minutes
Appendix E	List of Rocky Reach HCP Committee Members
Appendix F	Statements of Agreement for Coordinating Committees
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Appendix J	Final 2014 Upper Columbia River Salmon And Steelhead Broodstock Objectives and Site-based Broodstock Collection Protocols
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Appendix N	Draft – Addendum to the Chelan County PUD Hatchery Monitoring and Evaluation Implementation Plan Wenatchee Sockeye Salmon
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Appendix P	Monitoring and Evaluation of the Chelan County PUD Hatchery Programs – 2013
Appendix Q	Chelan PUD Methow Spring Chinook Hatchery and Genetic Management Plan

Appendix R	Ecological Risk Assessment Of Upper-Columbia Hatchery Programs On Non-Target Taxa Of Concern
Appendix S	Extension of the Wenatchee Spring Chinook RRS Study
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ANNUAL REPORT CALENDAR YEAR 2014 ACTIVITIES UNDER THE ANADROMOUS FISH AGREEMENT AND HABITAT CONSERVATION PLAN

ROCKY REACH HYDROELECTRIC PROJECT FERC LICENSE NO. 2145

Prepared for

Federal Energy Regulatory Commission
888 First Street N.E.
Washington, D.C. 20426

Prepared by

Anchor QEA, LLC
720 Olive Way, Suite 1900
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April 2015

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1 INTRODUCTION

On June 21, 2004, the Federal Energy Regulatory Commission (FERC) approved an Anadromous Fish Agreement and Habitat Conservation Plan (HCP) for the Rocky Reach Hydroelectric Project (Rocky Reach – FERC License No. 2145) on the Columbia River in Washington State, operated by Public Utility District No. 1 of Chelan County (Chelan PUD). The HCP provides a comprehensive and long-term adaptive management plan for species addressed in the plan (Plan Species) and their habitat. This document fulfills Article 10 of Appendix B and Section 9.8 of Appendix E of the FERC License issued on February 19, 2009[1], and Section 4.8 of the HCP, which requires annual reporting of progress toward achieving the No Net Impact (NNI) goal, as described in Section 3 of the HCP, also in a 10-year Comprehensive Report assessing overall status of NNI, as well as successive 10-year intervals, and in common understandings based upon completed studies, including those conducted as research and development for NNI progress or those not considered valid due to extenuating circumstances (Section 5.2.3 of the HCP).

The signatories of the Mid-Columbia HCPs (HCPs for the Wells, Rocky Reach, and Rock Island hydroelectric projects) meet as combined Coordinating Committees, Hatchery Committees, and Tributary Committees to expedite the process of overseeing and guiding HCP implementation. Minutes from the 2014 monthly meetings are compiled in Appendices A (Coordinating Committees), B (Hatchery Committees), and C (Tributary Committees). Appendix E lists members of the Rocky Reach Committees. In addition, the Policy Committees provides a forum for resolution of disputes that are either elevated to or arise in the Coordinating Committees and remain unresolved. The Policy Committees did not meet in 2014 for the purpose of dispute resolution. However, the Policy Committees convened in 2014 to discuss the selection of new HCP Committees Chairpersons, as the current Chairman (serving since 2004) announced plans to retire in spring 2015, as further discussed in Section 3.4. The Coordinating Committee for the Rocky Reach HCP oversaw the preparation of this 11th Annual Report for calendar year 2014, which covers the period from January 1 to December 31, 2014. (The first ten Annual Reports covered January 1 to December 31, 2004 through 2013, respectively.)

[1] 126 FERC, paragraph 61,138 (2009)

2 PROGRESS TOWARD MEETING NO NET IMPACT

The Rocky Reach HCP requires preparation of an Annual Report that describes progress toward achieving the performance standard of NNI for each Plan Species. The NNI standard consists of three elements: 1) project passage survival; 2) hatchery production; and 3) funding a Plan Species Account for tributary restoration. Survival standards and measures established in the HCP include: 1) 91% combined adult and juvenile project survival, as achieved by project improvement measures implemented within the geographic area of the project; and 2) up to 9% compensation for unavoidable project mortality provided through hatchery and tributary programs, with up to 7% compensation provided through hatchery programs and 2% through tributary programs (Section 3.1 of the HCP).

In 2014, Chelan PUD has met or exceeded all requirements for NNI under the Rocky Reach HCP for spring migrant HCP Plan Species (spring Chinook salmon [*Oncorhynchus tshawytscha*], steelhead [*O. mykiss*], and sockeye salmon [*O. nerka*]). Project survival standards have been exceeded for steelhead, yearling Chinook salmon, and sockeye salmon. Yearling Chinook salmon, sockeye salmon, and steelhead are currently designated Phase III (Standards Achieved). For subyearling summer/fall Chinook salmon (a summer migrant and a non-Endangered Species Act [ESA]-listed Plan Species), considerable life history variability and limited technology constrain the ability to meaningfully estimate project survival (Section 2.1.1). As a result, subyearling summer Chinook salmon are designated as Phase III (Additional Juvenile Studies), and will continue to be compensated through the Tributary Conservation and Hatchery Compensation Plans at levels consistent with direction provided in the HCP. As established in Section 3.1 of the HCP, the inability to estimate survival due to limitations of technology shall not be construed as a success or a failure to achieve NNI. Coho salmon also are currently classified as Phase III (Additional Juvenile Studies[2]) and are compensated at levels indicated by the HCP to achieve NNI through Tributary Conservation and Hatchery Compensation Plans as the species is being reintroduced to the Upper Columbia River (UCR).

[2] The current phase designation will be re-evaluated in 2017.

Recalculated NNI production levels were agreed on in 2011, and implementation began with the 2014 release year and will continue for the next 10 years (release years 2014 through 2023). Chelan PUD has funded the Tributary Conservation Plan at the level agreed to in the HCP ($229,800 in 1998 dollars) and will continue to do so for the duration of the HCP (Section 2.3; Table 1).

Table 1
Rocky Reach HCP NNI Progress for Plan Species (2014)

HCP Plan Species (ESA Status)	Survival Standard Met	Hatchery Compensation Provided	Tributary Conservation Plan Funded	NNI
Spring Chinook Salmon Yearlings (ESA-listed)	Yes – Combined Adult and Juvenile	Yes	Yes	Yes
Steelhead (ESA-listed)	Yes – Combined Adult and Juvenile	Yes	Yes	Yes
Sockeye (Not Listed)	Yes – Combined Adult and Juvenile	Yes	Yes	Yes
Summer/Fall Chinook Salmon (Not Listed)	Phase III (Additional Studies)	Yes	Yes	Yes – NNI compensation provided, but additional studies required
Coho Salmon (Not Listed)	Phase III (Additional Studies)	Yes	Yes	Yes

Notes:
ESA = Endangered Species Act
NNI = no net impact

The remainder of this section of the report summarizes decisions and agreements reached by the Rocky Reach Coordinating, Hatchery, and Tributary committees in 2014 in support of achieving and maintaining NNI. This summary is followed by individual sections that summarize achievements, actions, and activities in 2014 that are specific to the areas of project survival and dam operations, hatchery compensation, and funding of tributary habitat protection and restoration projects.

Throughout 2014, the HCP Coordinating, Hatchery, and Tributary Committees reached agreement on numerous issues during meetings, all of which were documented in the meeting minutes, with many described in stand-alone statements of agreement (SOAs). These agreements, along with approvals for funding of habitat projects by the Rocky Reach Tributary Committee, are summarized in Table 2 and discussed in the remainder of this report.

Table 2
Summary of 2014 Decisions for Rocky Reach Habitat Conservation Plan

Date	Agreement	HCP Committee	Reference
January 15, 2014	Approved the extension request from the WDFW and the NMFS for a change in the scope of work for the BPA-funded Wenatchee Relative RSS, contingent on incorporation of edits discussed *(Note: the CCT approved the request via email on January 13, 2014)*	Hatchery	Appendix B
February 13, 2014	Approved the Rocky Reach and Rock Island 2014 HCP Action Plans	Tributary	Appendix C
February 19, 2014	Approved the *Chelan PUD 2014 Sockeye M&E Implementation Plan*, as revised	Hatchery	Appendix B
February 19, 2014	Approved the Rocky Reach and Rock Island 2014 HCP Action Plans	Hatchery	Appendix B
February 19, 2014	Agreed to consider approval of the *Chelan PUD Methow Spring Chinook HGMP* by email no later than February 28, 2014	Hatchery	Appendix B
February 25, 2014	Approved the Rocky Reach and Rock Island 2014 HCP Action Plans, as revised	Coordinating	Appendix A
February 25, 2014	Agreed to extend the 2013/2014 winter maintenance work period at Rocky Reach Dam by 13 days to allow more time to complete required work; rather than the typical March 1 start date, it was agreed the Rocky Reach Fish Ladder would be fully operational on March 14, 2014	Coordinating	Appendix A
March 12, 2014	Approved the *Chelan PUD Methow Spring Chinook HGMP* via email vote *(Note: NMFS abstained)*	Hatchery	Appendix B
March 19, 2014	Approved the *Rocky Reach 2013 HCP Annual Report*	Coordinating	Appendix A

Date	Agreement	HCP Committee	Reference
March 25, 2014	Approved the *Chelan PUD 2014 Rocky Reach Juvenile Fish BOP*	Coordinating	Appendix A
March 25, 2014	Approved the *Chelan PUD 2014 Rocky Reach Trap Pilot*	Coordinating	Appendix A
March 28, 2014	Approved the *Chelan PUD 2014 Fish Spill Plan* via email vote	Coordinating	Appendix A
March 28, 2014	Approved the *2014 Wenatchee Basin Steelhead Release Proposal*	Hatchery	Appendix B and Appendix M
April 10, 2014	Approved the 2014 Broodstock Collection Protocols	Hatchery	Appendix B
April 11, 2014	Approved the *Rocky Reach Trap/Methow Spring Chinook Broodstock Collection Proposal* for implementation in 2014 via email, as follows: NMFS approved on April 4, 2014; WDFW approved on April 7, 2014; the CCT and the YN approved on April 8, 2014; and USFWS approved on April 11, 2014	Hatchery	Appendix B
May 8, 2014	Agreed to contribute $600,000 to Trout Unlimited's Methow Valley Irrigation District Instream Flow Improvement Project ($300,000 from the Rock Island Plan Species Account and $300,000 from the Rocky Reach Plan Species Account)	Tributary	Appendix C
May 16, 2014	Approved the *2013 Chelan PUD and Grant PUD Hatchery M&E Report*	Hatchery	Appendix B
May 27, 2014	Agreed to provide Charlie Snow (WDFW) with read-only access to the final document library on the HCP Hatchery Committees Extranet site	Coordinating	Appendix A
May 27, 2014	Agreed to continue holding their monthly meetings at the Radisson Gateway Hotel, in SeaTac, Washington, along with the occasional conference call and meeting in eastern Washington	Coordinating	Appendix A
May 28, 2014	Approved the *Chiwawa Spring Chinook Broodstock Collection Protocol (Note: USFWS abstained, and the CCT approved the protocol via email following the call on May 28, 2014)*	Hatchery	Appendix B
June 12, 2014	Approved ONA's funding request for the Penticton Channel Monitoring Spawning Platforms	Tributary	Appendix C
June 16, 2014	Approved the *NTTOC Modeling Report*	Hatchery	Appendix B

Date	Agreement	HCP Committee	Reference
June 18, 2014	Agreed to extend the deadline for Chelan PUD to provide their draft *2015 Hatchery M&E Annual Implementation Plan* to the HCP Hatchery Committees for review from July 2014 to August 2014, 10 days prior to the HCP Hatchery Committees meeting on August 20, 2014	Hatchery	Appendix B
June 24, 2014	Agreed to provide Aaron Beavers (NMFS engineer) read-only access to the final document library on the HCP Coordinating Committees Extranet site	Coordinating	Appendix A
July 10, 2014	Approved Chelan-Douglas Land Trust's budget amendment request for the Entiat Stillwaters Gray Reach Acquisition	Tributary	Appendix C
July 16, 2014	Agreed to continue the modified Tumwater Dam operations through Monday, July 21, 2014, pending USFWS approval on Thursday, July 17, 2014 *(Note: due to several major wildfires in the area, all trapping operations were ceased on July 17, 2014)*	Hatchery	Appendix B
July 22, 2014	Agreed to provide Jayson Wahls (WDFW, Wells Complex Manager) read-only access to the final document library on the HCP Hatchery Committees Extranet site	Coordinating	Appendix A
August 26, 2014	Agreed to consider approval of the end of the Rocky Reach and Rock Island extended juvenile bypass operations in mid-September 2014 (via email)	Coordinating	Appendix A
September 15, 2014	Approved, via email, Chelan PUD's request to end juvenile bypass operations at the Rocky Reach and Rock Island juvenile bypasses on September 15, 2014 at midnight, as follows: USFWS, the YN, and WDFW approved the request on September 12, 2014; and the CCT, NMFS, and Chelan PUD approved the request on September 15, 2014	Coordinating	Appendix A
September 17, 2014	Approved the *Chelan PUD 2015 Hatchery M&E Implementation Plan*, as revised	Hatchery	Appendix B
September 17, 2014	Approved the SOA, finalizing the NTTOC Objective (*Hatchery M&E Plan Objective 12* [Formerly Objective 10]), as revised	Hatchery	Appendix B and Appendix G

Date	Agreement	HCP Committee	Reference
September 17, 2014	Approved the *Broodstock Collection Protocols SOA*, as revised	Hatchery	Appendix B and Appendix G
October 15, 2014	Agreed to defer to Hatchery Managers regarding any modification of fish release schedules that may be needed to avoid adverse impacts resulting from sediment load generated by the wild fires in the Methow basin this past summer, with the recommendation that WDFW conduct periodic fish health evaluations on fish held in potentially impacted holding ponds, and once available, review the Burned Area Emergency Response report on the effects of the Carlton Complex fire	Hatchery	Appendix B
October 28, 2014	Approved the *HCP Hatchery Committees Approved Broodstock Collection Protocols SOA*, as revised *(Note: the CCT's approved the SOA via email on October 24, 2014)*	Coordinating	Appendix A and Appendix F
October 28, 2014	Agreed to provide John Penny and Denise McCarver (Eastbank Hatchery Staff) read-only access to the final document library on the HCP Hatchery Committees Extranet site	Coordinating	Appendix A
October 28, 2014	Agreed that once the HCP Coordinating Committees approve Extranet site access for a particular position (e.g., Hatchery Complex Manager or Hatchery M&E Support Staff), succeeding staff filling those positions will be granted HCP Extranet site access without requiring an additional review and approval process	Coordinating	Appendix A
November 6, 2014	Identified the following HCP signatory representatives to select the HCP Chairpersons for the Hatchery and Coordinating Committees: Steve Parker for the YN, Kirk Truscott for the CCT, Jim Craig for USFWS, Ritchie Graves for NMFS, Jeff Korth for WDFW, Keith Truscott for Chelan PUD, and Shane Bickford for Douglas PUD	Policy and Coordinating	Appendix D

Date	Agreement	HCP Committee	Reference
November 6, 2014	Approved a ranking system for narrowing the HCP Chairperson candidate lists to a short list for interviews, where each Party ranks the candidates first to last for filling the Chairperson positions; reviews of the sum of those rankings, along with further discussion, will determine the interview lists	Policy and Coordinating	Appendix D
November 13, 2014	Approved Trout Unlimited's Small Projects Program application *Clear Creek Fish Passage and Instream Flow Enhancement Project*	Tributary	Appendix C
November 13, 2014	Approved Chelan-Douglas Land Trust's request for a time extension, scope change, and use of Mark Noble and Larry Rees as the appraiser and reviewer, respectively, for the Entiat Stillwaters Gray Reach Acquisitions Project	Tributary	Appendix C
November 18, 2014	Agreed that the HCP Chairperson selection interview list for each Committee would comprise the three top-ranked candidates, and those candidates were as follows (in alphabetical order): Hatchery Committees – Dr. John Ferguson, Ms. Elizabeth McManus, and Mr. Tom Schadt; and Coordinating Committees – Dr. John Ferguson, Dr. Tracy Hillman, and Mr. Tom Schadt	Policy and Coordinating	Appendix D
November 18, 2014	Agreed to hold the HCP Chairperson selection interviews on December 17, 2014, at Chelan PUD Headquarters in Wenatchee, Washington	Policy and Coordinating	Appendix D
November 18, 2014	Approved *the Rocky Reach and Rock Island 2014 Fish Spill Report (Note: USFWS and the CCT approved the report via email on November 12 and November 18, 2014, respectively)*	Coordinating	Appendix A
November 18, 2014	Approved the *Rocky Reach and Rock Island September 2014 Juvenile Bypass Operations Statement of Agreement (Note: USFWS and the CCT approved the report via email on November 12 and November 18, 2014, respectively)*	Coordinating	Appendix A and Appendix F
November 18, 2014	Agreed to provide Peter Graf (Grant PUD) read-only access to the final document library on the HCP Hatchery Committees Extranet site	Coordinating	Appendix A
November 19, 2014	Agreed to cancel the HCP Hatchery Committees meeting scheduled for December 17, 2014, due to conflicting schedules and lack of agenda items	Hatchery	Appendix B

Date	Agreement	HCP Committee	Reference
December 11, 2014	Approved the Okanagan Nation Alliance's budget amendment request for the Shingle Creek Dam Fish Passage Project	Tributary	Appendix C
December 11, 2014	Approved the CCFEG's budget amendment request for the Silver Side Channel Design Project	Tributary	Appendix C

Notes:
BPA = Bonneville Power Administration
CCFEG = Cascade Columbia Fisheries Enhancement Group
CCT = Colville Confederated Tribes
HGMP = Hatchery and Genetic Management Plan
M&E = monitoring and evaluation
NMFS = National Marine Fisheries Service
NTTOC = Non-Target Taxa of Concern
RSS = Reproductive Success Study
SOA = statement of agreement
USFWS = U.S. Fish and Wildlife Service
WDFW = Washington Department of Fish and Wildlife
YN = Yakama Nation

2.1 Project Survival and Dam Operations

2.1.1 Status of Phase Designations for Current Plan Species

A major feature of the Rocky Reach HCP is what is termed, "a phased implementation of measures to achieve the survival standards." Briefly, Phase I consists of a 3-year period in which studies are conducted to determine annual survival rates for each of the Plan Species. Following the completion of 3 years of valid studies, the Rocky Reach Coordinating Committee will determine whether the survival standard has been achieved. Depending on the results of this determination, Chelan PUD will proceed to either Phase II or Phase III. Under Phase II, the Rocky Reach Coordinating Committee may determine the standards are not met, and Chelan PUD is responsible for evaluating additional tools to improve survival. Under Phase III, the Rocky Reach Coordinating Committee may determine the survival standards are achieved, and Chelan PUD is required to re-evaluate survival every 10 years, or Phase III and NNI compensation is in place, but additional juvenile studies remain.

Current phase designations for all Rocky Reach HCP Plan Species are summarized in Table 3.

Table 3
Current Phase Designations for Rocky Reach Habitat Conservation Plan

Plan Species	Project Survival (percent)	Phase Designation	SOA Date
UCR Steelhead	95.79[1]	Phase III (Standards Achieved)	October 24, 2006
UCR Yearling Chinook Salmon	92.28[2]	Phase III (Standards Achieved)	August 30, 2011
UCR Subyearling Summer/Fall Chinook	TBD	Phase III (Additional Juvenile Studies)	June 25, 2013
Okanogan River Sockeye Salmon	93.59[1]	Phase III (Standards Achieved)	December 17, 2010
Coho Salmon	NA	Phase III (Standards Achieved – Interim Value)	June 20, 2007

Notes:
1 Juvenile project survival achieved (HCP standard is 93%)
2 Combined adult and juvenile survival achieved (HCP standard is 91%)
NA = Not applicable
SOA = statement of agreement
TBD = to be determined
UCR = Upper Columbia River

In 2010, the HCP Coordinating Committees approved a Chelan PUD request to restart passage survival testing of UCR yearling Chinook salmon at the Rocky Reach Project, starting with the year 2011. In 2011, the estimated juvenile yearling Chinook salmon project survival was 92.94%. In 2011, Chelan PUD also presented to the HCP Coordinating Committees passive integrated transponder (PIT) tag data in support of an empirically based estimate of adult spring Chinook salmon project passage survival for the Rocky Reach Project (dam and reservoir). As described in Section 2.1.2 of this report, Section 5.2 of the Rocky Reach HCP states that a combined adult and juvenile project survival of 91% shall be achieved and maintained. Due to an inability to differentiate hydro-related mortality from natural adult losses and straying rates when the HCP was developed, 93% juvenile project survival and 95% juvenile dam passage survival standards were used as alternative measures of initial compliance. Using PIT tag data, the 3-year (2009 to 2011) average adult spring Chinook salmon passage survival rate at Rocky Reach was estimated to be 99.90%. Combined with a 4-year average (2004, 2005, 2010, and 2011) Rocky Reach Project yearling spring Chinook salmon passage survival estimate of 92.37%, the combined adult and juvenile survival was estimated to be 92.28%, which exceeds the HCP combined survival standard of 91%. On August 30, 2011, a Phase III (Standards Achieved) designation for UCR spring Chinook salmon for the Rocky Reach Project was approved by the Rocky Reach Coordinating Committee.

No new or additional project survival studies were conducted in 2012 for the Rocky Reach Project.

In April 2013, information was reviewed on the status of tag technology and life-history attributes of subyearling summer Chinook salmon in the Mid-Columbia. Based on this information and review, the Rocky Reach Coordinating Committee agreed that empirical estimates of juvenile project survival are not currently feasible. As a result, on June 25, 2013, the Rocky Reach Coordinating Committee approved an SOA maintaining subyearling summer Chinook salmon in Phase III (Additional Juvenile Studies) for 3 years (May 2016). The SOA stipulated additional assessments of improvements in tag technology and study methods to evaluate survival study feasibility by 2016. The first assessment will take place in May 2016.

2.1.2 Assessment of Project Survival

The HCP requires that Chelan PUD shall work toward 91% combined adult and juvenile project survival at Rocky Reach Dam, achieved by project improvement measures implemented within the geographic area of the project. Progress toward this objective is described in Sections 2.1.2.1 through 2.1.2.4.

2.1.2.1 Adult Passage Monitoring

2.1.2.1.1 Rocky Reach Project

When the HCP was signed in 2002, it was acknowledged there was no scientifically rigorous method for the Rocky Reach Coordinating Committee to assess adult project passage survival for Plan Species. Existing methods did not differentiate between mortality caused by the project and other sources of mortality (such as mortality from natural causes, injuries and delayed mortality resulting from passage at downstream projects and marine mammal predation, harvest, or other types of non-project-specific mortality). Section 5.2 of the HCP states that given the inability to differentiate between the sources of adult mortality, initial compliance with the combined adult and juvenile survival standard would be based on the measurement of 93% juvenile project survival or 95% juvenile dam passage survival, and an adult survival estimate of 98 to 100%.

Beginning in December 2012, Chelan PUD was able to evaluate adult passage survival through the Rocky Reach Project (dam and reservoir) for steelhead and sockeye salmon, even though unknown harvest mortality remained in the survival estimates. PIT tag detections from the PIT Tag Information System database were used to evaluate adult fish migrating upstream in 2010, 2011, and 2012 to estimate project conversion rates. For steelhead, adult fish destined for the Methow and Okanogan River systems were used for the survival evaluation. For sockeye salmon, adults returning to the Okanogan River Basin were evaluated. The 3-year arithmetic mean survival rates at Rocky Reach Project for adult steelhead and sockeye salmon were 98.93% and 98.92%, respectively (Table 4). A year prior in 2011, Chelan PUD estimated the 3-year mean survival rates for adult spring Chinook salmon migrating through the Rocky Reach Project. This survival estimate was 99.90% for migration years 2009 through 2011. Chelan PUD will re-evaluate adult passage survival at Rocky Reach in 10-year intervals, as required.

Table 4 details HCP juvenile, adult, and combined survival rates at the Rock Island and Rocky Reach projects. Adult conversion rates were calculated from adult passage data for the years 2010 through 2012[3].

[3] Buchanan, R. A., and J. R. Skalski, 2012. *Estimation of the Adult Salmon and Steelhead Conversion Rates through Rock Island and Rocky Reach Projects, 2010-2012.* Prepared for Public Utility District No. 1 of Chelan County. December 2012.

Table 4
Habitat Conservation Plan Juvenile, Adult, and Combined Survival Rates at Rock Island and Rocky Reach

Project	Species	Juvenile Survival	Adult Survival	Combined[5]
Rock Island	Steelhead	96.75%	99.31%[2]	96.08%
	Spring Chinook Salmon	93.75%[1]	99.89%[3]	93.65%
	Sockeye Salmon	93.27%	98.37%[2]	91.75%
Rocky Reach	Steelhead	95.79%	98.93%[2]	94.77%
	Spring Chinook Salmon	92.37%[1]	99.90%[3]	92.28%
	Sockeye Salmon	93.59%	98.92%[4]	92.58%

Notes:
1 Includes spring-migrating yearling Chinook salmon.
2 Estimate does not account for fish losses due to recreational harvest in any years
3 No recreational harvest occurred.
4 Estimate adjusted for fish losses from recreational harvest in 2010 and 2011, but not for harvest losses in 2012.
5 Combined survival is the product of juvenile and adult survival estimates (e.g., 98% × 93% = 91%).

The HCP combined adult and juvenile project survival standard is 91%. The HCP combined adult and juvenile project survival estimates apply to fish actively migrating through the Rock Island and Rocky Reach projects in the mainstem Columbia River and do not include mortality occurring in other locations (i.e., they do not include ocean or tributary mortality).

2.1.2.1.2 Rocky Reach Trap Pilot Study

In May 2013, Chelan PUD conducted a 4-week pilot study to test the feasibility of using the Rocky Reach Trap for broodstock collection for Chelan PUD's Methow spring Chinook salmon program. The purpose of the study was to test the feasibility of visually identifying and selectively collecting adipose (ad)-clipped spring Chinook salmon. Based on results of the 2013 pilot study, several process and infrastructure recommendations were discussed to improve future trapping efforts. These recommendations were implemented during the 2013/2014 annual winter maintenance at Rocky Reach Dam. More specifically, a separation-by-code PIT-tag monitoring system was installed at the Rocky Reach Trap to test Chelan PUD's preferred option to meet their Methow spring Chinook salmon production obligation of 60,516 smolts in 2014. In May 2014, a second pilot study was conducted with the newly modified trap and separation-by-code monitoring system in place. Additional discussion of this pilot study can be found in Sections 2.2.2.1.2 and 2.2.2.9 of this report.

2.1.2.1.3 Trapping at Tumwater Dam

According to the Tumwater Operations Plan developed by Chelan PUD and the Washington Department of Fish and Wildlife (WDFW), once sockeye salmon arrive at Tumwater Dam, spring Chinook salmon trapping operations are reduced to 3 days per week, 16 hours per day, and not to exceed 48 hours per week. However, on July 11, 2014, because large numbers of spring Chinook salmon were still passing the dam, WDFW modified the trapping operations to 7 days per week, 10 hours per day, and not to exceed 48 hours per week. On July 16, 2014, WDFW requested Rocky Reach and Rock Island Hatchery Committees concurrence to run these modified operations until July 21, 2014, when operations would be re-revaluated based on how many spring Chinook salmon were still passing the dam (i.e., cost-benefit for continuing adult management). The Rocky Reach and Rock Island Hatchery Committees agreed to continue trapping operations at Tumwater Dam 7 days per week, 10 hours per day, and not exceeding 48 hours per week, through July 21, 2014, pending U.S. Fish and Wildlife Service (USFWS) approval requested on or before July 17, 2014. If USFWS approval was not obtained by that time, modified trapping operations would cease and default to operation schedules outlined in the Tumwater Operations Plan. However, due to several major wildfires in the area, including one in Tumwater Canyon, all trapping operations were ceased on July 17, 2014. Beginning on July 22, 2014, trapping at Tumwater Dam operated Monday through Friday, from 6:00 a.m. to 3:00 p.m. (9 hours per day, or 45 cumulative hours per week), not to exceed 48 hours per week, as outlined in the current approved plan.

2.1.2.2 Valid Study Flow Duration Curve Update

The Rocky Reach HCP, Section 13.24, requires that as part of the 2013 comprehensive review, and every 10 years thereafter the Rocky Reach Coordinating Committee shall update the spring and summer period Flow Duration Curves used to define valid survival studies. The updated Flow Duration Curves must reflect “Representative Flow Conditions,” meaning river flows between the 10th and 90th percentiles on the Flow Duration Curve, as calculated from the Grand Coulee Dam day average outflow. In 2013, efforts began to update the Flow Duration Curve, as required by the Rocky Reach HCP. The HCP Coordinating Committees agreed to develop the updated Flow Duration Curve with the historical 1929 to 1978 and 1983 to 2001 datasets used previously, to which the new 2002 to 2012 dataset is added. For comparison, Flow Duration Curves were also constructed using only the 1983 to 2012 dataset. The HCP Coordinating Committees also agreed to revise the definition and expand the dataset used for the summer period, to include data from June 1 through August 15, as opposed to the former definition of July 1 through August 15 for the summer period. Updated Flow Duration Curves were expected to become final in early 2014; however, in February 2014, a fracture discovered in Wanapum Dam postponed a number of efforts, including updating the curves, until time allows. The final updated Flow Duration Curves will now be completed in 2015.

2.1.2.3 2014 Survival Studies

2.1.2.3.1 Yearling Chinook Salmon

No yearling Chinook salmon survival studies were conducted in 2014 at the Rocky Reach Project.

2.1.2.3.2 Subyearling Chinook Salmon

Since 2010, Chelan PUD has been compiling information on PIT tag detections of subyearling Chinook salmon at Rocky Reach Dam to increase the understanding of subyearling life histories in the mainstem Columbia River upstream of Rocky Reach Dam. As discussed in Section 2.1.1 above, in April 2013, data were presented regarding the status of tag technology and life-history attributes for subyearling summer Chinook salmon in the Mid-Columbia. The Rocky Reach Coordinating Committee agreed that, based on this information, an empirical estimate of subyearling project passage survival is not currently feasible. In June 2013, the Rocky Reach Coordinating Committee approved an SOA maintaining subyearling summer Chinook salmon in Phase III (Additional Juvenile Studies) for up to 3 years (June 2016) and agreed to conduct annual assessments of improvements in tag technology and study design to evaluate survival study feasibility by 2016.

2.1.2.4 2015 Planned Survival Studies

There are no planned Rocky Reach juvenile salmonid project survival studies for 2015. Chelan PUD has achieved a Phase III (Standards Achieved) designation for yearling Chinook salmon, sockeye salmon, and steelhead at the Rocky Reach Project (Section 2.1.1). Subyearling Chinook salmon project survival status is pending development of suitable technology, and is currently designated Phase III (Additional Juvenile Studies). The Rocky Reach Coordinating Committee agreed to annually assess improvements in tag technology and study design to evaluate subyearling Chinook salmon survival study feasibility (Section 2.1.1). All designations will be re-evaluated at 10-year intervals, as required.

2.1.3 Project Operations and Improvements

This section summarizes project operations and progress toward maintaining the juvenile project survival standard at Rocky Reach Dam in 2014. Actions in 2014 were guided by the 2014 Chelan PUD HCP Action Plan, as approved by the Rocky Reach and Rock Island Coordinating Committees (Appendix A).

2.1.3.1 Operations

2.1.3.1.1 Juvenile Bypass and Fish Spill Operations[4]

In March 2014, the Rocky Reach and Rock Island Coordinating Committees approved the *2014 Rocky Reach Fish Bypass Operations Plan* (Appendix I) and the *2014 Rocky Reach and Rock Island Fish Spill Plan* (Appendix I). In 2014, the juvenile bypass system operated continuously from April 1 through September 15, 2014, which covered the normal bypass operating period for the outmigration of juvenile salmon and steelhead at Rocky Reach (April 1 through August 31), as well as an extended period (September 1 through September 15) in fulfillment of a Rocky Reach and Rock Island HCPs requirement to collect additional run-timing information and conduct species composition monitoring (Section 2.1.3.1.2). The target level for summer spill was 9% of the daily average river flow. Spill for summer-migrating subyearling Chinook salmon at Rocky Reach Dam began on May 24, 2014, at 0001 hours, and continued through midnight on August 24, 2014.

[4] 129 FERC ¶ 62,183 (issued December 8, 2009). Order Modifying and Approving Operations Plan Pursuant to License Article 402.

Following completion of the bypass operations on September 15, 2014, it was estimated that spill was provided for 98.27% of the subyearling Chinook salmon outmigration. Spill volume for the 93-day summer period averaged 12.72% of the total river flow, and was composed of 9.13% fish spill and an additional 3.59% unavoidable hydraulic spill. The Columbia River flows past Rocky Reach Dam during the spill period averaged 151,412 cubic feet per second (cfs) and the daily average spill rate was 19,253 cfs. Complete Rocky Reach Dam 2014 fish spill operations results are summarized in the *2014 Rocky Reach and Rock Island Fish Spill Report* (Appendix T).

2.1.3.1.2 September 2014 Juvenile Bypass Operations

The Rocky Reach and Rock Island HCPs include a requirement that additional run-timing information and species composition monitoring shall be conducted once every 10 years in order to verify that a significant component (greater than 5%) of the juvenile emigration is not present outside the normal bypass operating period (April 1 through August 31), and to verify that the operations established by the respective Coordinating Committee are adequately protecting 95% of the spring and summer migrations of juvenile Plan Species (Rocky Reach HCP Section 5.4.1b; Rock Island HCP Section 5.4.1a). In preparation for the extended bypass operations, a worst-case scenario with low head water was tested at Rocky Reach Dam to evaluate whether the sampling facility could be operated in September, and it was confirmed that it could be operated.

On September 11, 2014, Chelan PUD distributed an email to the Rocky Reach and Rock Island Coordinating Committees indicating that from September 1 through September 11, 2014, a total of 68 subyearling Chinook salmon (0.31% of the total index) had been collected at Rocky Reach and a total of 363 subyearling Chinook salmon (1.06% of the total index) had been collected at Rock Island, and that it was unlikely that a significant component (greater than 5%) of the juvenile migration will be present outside of the normal bypass operating periods (April 1 through August 31) at both dams. Based on these data, and because operations established by the respective Coordinating Committee appeared to be adequately protecting 95% of the subyearling Chinook salmon, Chelan PUD proposed ending juvenile bypass operations on September 15, 2014 at midnight. The Rocky Reach and Rock Island Coordinating Committees approved Chelan PUD's request via email, and bypass operations were ended at both dams on September 15, 2014, as proposed. Chelan PUD later summarized that from September 1 to 15, 2014, a total of 76 summer Chinook salmon were collected at Rocky Reach Dam, which compared to the overall cumulative index as of August 31, 2014, was equal to 0.36% of the total run. Complete index counts during the extended bypass operations are included in the *September 2014 Rocky Reach and Rock Island Bypass Operations Summary* (Appendix L). Because review of these data were requirements in the Rocky Reach and Rock Island HCPs, Chelan PUD also requested formal approval of fulfillment of these requirements in the form of a SOA. In November 2014, the Rocky Reach and Rock Island Coordinating Committees approved the *Rocky Reach and Rock Island September 2014 Juvenile Bypass Operations SOA* (Appendix A and Appendix F).

2.1.3.1.3 Pikeminnow Predator Control

In 2014, northern pikeminnow (*Ptychocheilus oregonensis*) predator-control work continued with Columbia Research long-line angling during the pre-migration period to target large pikeminnow that stage in deep reservoir areas and are difficult to capture with other gear types. The contract was extended to overlap with the 2014 U.S. Department of Agriculture (USDA) effort. The USDA hook-and-line angling program commenced during the peak of juvenile salmonid migration. The total combined harvest of pikeminnow in 2014 from Rocky Reach and Rock Island reservoirs was 74,857 fish. Harvest numbers from the various control efforts in 2014 were as follows: USDA hook-and-line angling – 44,826 fish; Columbia Research long-line angling – 27,090 fish; East Wenatchee Rotary Club pikeminnow derby – 2,563 fish; and angling by Chelan PUD Fish and Wildlife personnel – 378 fish. As in 2013, Chelan PUD once again provided contract funding for the annual East Wenatchee Rotary Club Pikeminnow Derby in 2014. A report summarizing results of the 2014 removal effort is expected sometime in early 2015.

2.1.3.1.4 Total Dissolved Gas Testing at Rocky Reach Dam

In November 2014, Chelan PUD distributed a draft *Rocky Reach TDG Year Five Report* for review. The report, as required by the Rocky Reach Hydroelectric Project 401 Water Quality Certification, covers years 2008 to 2013, and includes an evaluation of fish passage data and also alternative spillway operations to determine whether total dissolved gas levels can be reduced at Rocky Reach Dam. Chelan PUD has presented these findings to the

Washington State Department of Ecology (Ecology), the Rocky Reach Fish Forum (RRFF), and Rocky Reach Coordinating Committee. Going forward, Chelan PUD, through the consultation process with Ecology, the RRFF, and the Rocky Reach Coordinating Committee, will develop a schedule to make the necessary changes to perform the new spill configuration outlined in the report. This schedule may include computer automation of spill gates and/or changes to system operations and monitoring. Chelan PUD will operate the new spill configuration as a pilot or test spill and further evaluate the results for a designated period of time. Chelan PUD will develop a monitoring schedule to test operations under the new spill configuration. If upon operating under the new spill configuration the data show that optimal results are not occurring as previously evaluated, Chelan PUD will implement adaptive management in coordination with the RRFF and Rocky Reach Coordinating Committee.

2.1.3.2 Improvements and Maintenance

Facility improvements and maintenance at the Rocky Reach Project in 2014 that had the potential to affect Plan Species are described in this section.

Rocky Reach Attraction Water System

On January 2, 2014, the Rocky Reach Ladder was taken out of service for the annual maintenance and inspection. During the inspection, an issue was discovered with the Rocky Reach Attraction Water System. Rocky Reach Central Maintenance staff discovered that Pump A and Pump C were on the verge of failing. Pump A needed a new actuator rod, and Pump C needed a whole new shaft. Pump B also needed a new actuator rod. The Rocky Reach Coordinating Committee agreed to extend the 2013/2014 winter maintenance period at Rocky Reach Dam from February 28 to March 10, 2014, to allow more time to complete required work. On March 14, 2014, the Rocky Reach Fish Ladder was back online and fully operational (opposed to the typical March 1 in-service date). In response to this incident, Chelan PUD developed a contingency plan in the event that a similar situation occurs in-season in the future.

Rocky Reach Large Unit Repair

In October 2013, while repairing internal hydraulic issues in Turbine Unit 10 (C10), mechanic crews discovered a deep hairline crack in a stainless steel rod that delivers oil to the servo motor. Turbine Unit 8 (C8), Turbine Unit 9 (C9), and Turbine Unit 11 (C11) all have the same stainless steel rod design as part of the servo motors; therefore, Rocky Reach engineers made the decision to take C8, C9, and C11 out of service for repair, as well. During the 2013/2014 winter maintenance period, interim fixes were installed on C8, C9, and C11, and all units were back in commercial use by February 2014. The interim fix involved fixing the blades at selected steep angles that were determined to be the most efficient at full river flow (23,000 cfs [23 kcfs]) on the unit curve; these steep angles also represent the safest position, minimizing cavitation and the risk of turbine runaway. Permanent fixes are anticipated to require 6 months per unit and should be complete by fall 2018, pending any additional unforeseen delays. In April 2014, repairs were completed on C10 (offline since March 2013), and the unit was brought back online following the 13-month outage.

Rocky Reach Juvenile Fish Bypass Surface Collector Oil Spill

On July 19, 2014, the Rocky Reach Juvenile Fish Bypass (RRJFB) surface collector (SC) pump station was briefly shut down in the early morning and then again between 9:00 a.m. and 3:50 p.m. after a bypass attendant discovered that an oil hose had come loose inside the hydraulic power unit pump cabinet, and oil spilled over the containment area and into the pump station area of the bypass area. Cleaners performed a thorough cleanup of the oil spill, and at 3:50 p.m., the pump station was restarted and the system was back in full operation. In response to this incident, Chelan PUD developed a hose inspection protocol to help prevent a similar situation from occurring in the future.

Turbine Unit 2 Rotor Crack Repair

In November 2014, Turbine Unit 2 (C2) at Rocky Reach Dam was placed back online after being taken offline in June 2014 for mandatory rotor crack repair. While C2 was offline, the RRJFB SC used additional SC pumps to increase attraction flow, and Turbine Unit 1 (C1) flow was increased. No issues of fish de-scale or injury were observed in juvenile fish samples at the bypass with this adjusted configuration, which ran for a total of 78 days, from June 30, 2014, through September 15, 2014.

2.2 Hatchery Compensation

Section 8.1 of the Rocky Reach HCP describes a Hatchery Compensation Plan with two primary objectives: 1) to provide compensation for Plan Species; and 2) to implement specific elements of the hatchery program consistent with the overall objectives of rebuilding natural populations and achieving NNI. In 2014, Chelan PUD continued funding and provided capacity for hatchery production consistent with meeting NNI, and will continue to do so through 2015. Recalculated hatchery production values required to meet NNI through release year 2023 were approved by the Rocky Reach Hatchery Committee on December 14, 2011, and represent *Chelan PUD's No Net Impact and Inundation obligations for release years 2014-2023*. Hatchery compensation for Rocky Reach Project in 2014 included the release of 795,128 juvenile salmonids (combined Rocky Reach and Rock Island hatchery compensation; Table 5).

To improve coordination, a representative from Grant PUD is invited to the monthly HCP Hatchery Committees meetings. In addition, the Grant PUD representative and the Priest Rapids Coordinating Committees (PRCC) Hatchery Sub-committee facilitator receive meeting announcements, draft agendas, and meeting minutes. This practice benefits the HCP Hatchery Committees through increased coordination and sharing of expertise. The Grant PUD representative has no voting authority.

2.2.1 Hatchery Production Summary

Table 5 summarizes and compares HCP hatchery production objectives and actual 2014 smolt releases.

Table 5
2014 Production Level Objectives and Smolt Releases for Rocky Reach Habitat Conservation Plan Hatchery Programs*

Species	Program	Final Rearing Site	Rocky Reach Production Level Objectives (2014 to 2023)[a]	Total Smolt Releases for Rocky Reach in 2014 (Number of fish)
Spring Chinook Salmon	Methow	Methow Hatchery	60,516	0[b]

Species	Program	Final Rearing Site	Rocky Reach Production Level Objectives (2014 to 2023)[a]	Total Smolt Releases for Rocky Reach in 2014 (Number of fish)
Summer Chinook Salmon	Chelan Falls	Chelan Falls	576,000	566,188
Steelhead	Wenatchee	Chiwawa Hatchery[c]	247,300[d]	228,940
Sockeye Salmon	Okanogan	Shuswap Hatchery	291,040[e]	0[f]
Spring Chinook Salmon	Okanogan	CJH	115,000 (12.81% of CJH production)	0[g]
Summer Chinook Salmon	Sub-yearlings	CJH/ Omak Pond	94,570 (13.51% of CJH production	59,849[g,h]
Summer Chinook Salmon	Yearlings	Similkameen	166,569 (12.81% of CJH production)	0[g]

Notes:

a As specified in the Rocky Reach and Rock Island HCP Hatchery Committees Statement of Agreement Chelan PUD Hatchery Compensation, Release Years 2014-2023, approved December 14, 2011.

b In 2012, the Rock Island and Rocky Reach Hatchery Committees approved that Chelan PUD was meeting their 2014 spring Chinook salmon mitigation obligation through production of 204,542 smolts at the Chiwawa Acclimation Facility in lieu of production requirements in the Methow subbasin, contingent on the Methow subbasin production (60,516) being produced by another entity (i.e., backfilled).

c Includes releases from Blackbird Island Pond and truck planting to other locations in the basin.

d Steelhead production at Chiwawa includes Rock Island and Rocky Reach obligations.

e Combined with the Rocky Reach HCP, the Okanogan sockeye salmon production requirement totals 591,040 fish (production is allocated between the two HCPs); the table includes the number of fry released. By agreement of the HCP Hatchery Committees, this production requirement is satisfied for Okanogan sockeye salmon by funding of the Okanogan Skaha Lake sockeye salmon reintroduction program until otherwise determined by the HCP Hatchery Committees.

f Due to the inability of the Okanagan Nation Alliance to use the Shuswap Hatchery in 2013 (owned by the Department of Fisheries and Oceans in Canada), no broodstock were collected in 2013 and thus no fry released in 2014. Per the SOA approved by the RR Hatchery Committee on August 26, 2010, Chelan PUD still meets its obligations under NNI by continuing to fund the Okanagan Nation Alliance's Experimental Reintroduction of sockeye salmon into Skaha Lake, until at least 2021.

g The first year of spring Chinook salmon and yearling summer Chinook salmon broodstock collection occurred in 2013; first releases will occur in 2015.

h The first collection of broodstock for the sub-yearling program in 2013 was collected at a reduced level (60%), and thus Chelan's obligation was met by 13.51% of the total sub-yearlings released.

* Coho salmon mitigation met by the Funding Agreement with the Yakama Nation.

CJH = Chief Joseph Hatchery

2.2.2 Hatchery Planning and Implementation

Sections 2.2.2.1 through 2.2.2.13 detail 2014 actions that are relevant to planning for hatchery operations that support the HCP.

2.2.2.1 2014 Broodstock Collection Protocols

In March 2014, the HCP Hatchery Committees began their review of the draft *2014 Broodstock Collection Protocols* (for Chinook salmon and steelhead). The protocols were updated throughout the year, finalized in December 2014, and implemented at program hatcheries (Appendix J). In-season revisions were made as needed in coordination with the HCP Hatchery Committees. The *2014 Broodstock Collection Protocols* were intended to guide the collection of salmon and steelhead broodstock in the Methow River, Wenatchee River, and Columbia River basins. The protocols are consistent with previously defined program objectives such as program operational intent (i.e., conservation and/or harvest augmentation) and mitigation production levels (i.e., HCPs), and they comply with ESA permit provisions. In 2014, the HCP Hatchery Committees also discussed and agreed on a streamlined approval process for the annual protocols, including a revised document layout (Section 2.2.2.1.1).

2.2.2.1.1 Annual Broodstock Collection Protocols Approval

Historically, ESA permits for hatchery programs have stipulated that the annual Broodstock Collection Protocols will be developed by WDFW in coordination with the HCP Hatchery Committees and will be submitted to National Marine Fisheries Service (NMFS) by April 15 of each year. In March 2014, discussion began regarding requiring HCP Hatchery Committees approval of the annual protocols and streamlining the approval process in order to submit the annual protocols to NMFS by the April 15 deadline. In June 2014, NMFS indicated their support in requiring HCP Hatchery Committees approval of the annual protocols, and new requirement language was inserted into the new draft Section 10 permits. NMFS also agreed to delegate approval of the annual Broodstock Collection Protocols to their HCP Hatchery Committees and Coordinating Committees representatives in the interest of streamlining the approval process. Also in the interest of streamlining the approval process, a revised draft Broodstock Collection Protocols template was developed among WDFW, NMFS, and USFWS. The revised template removed unnecessary information and may undergo further revisions during the next few years.

In August 2014, a draft *Broodstock Collection Protocols SOA* was developed to memorialize the updated approval process for the annual protocols. Following several discussions and revisions, the revised draft SOA indicated that: 1) the HCP Hatchery Committees agree to develop and submit to NMFS annual Broodstock Collection Protocols each year by April 15; 2) Permit Holders will prepare the draft protocols for HCP Hatchery Committees and Coordinating Committees review no later than 10 days prior to their respective February meetings; 3) participation in the development, submission, and approval of the annual protocols within the Committees by the NMFS HCP Hatchery Committees and Coordinating Committees representatives will constitute NMFS acceptance and approval of the protocols; and 4) Coordinating Committees approval meets the Wells HCP requirement for approval of broodstock collection and M&E activities involving the Wells Project facilities. The final *Broodstock Collection Protocols SOA* was approved by the HCP Hatchery Committees and Coordinating Committees on September 17 and October 28, 2014, respectively (Appendix F).

2.2.2.1.2 Methow Spring Chinook Salmon Production

In 2012, the Chelan and Douglas PUDs agreed to terminate their Methow Hatchery Sharing Agreement. As a result, the last release of Chelan PUD spring Chinook salmon from the Methow Hatchery was in 2013. In 2012, the Rock Island and Rocky Reach Hatchery Committees approved that Chelan PUD was meeting their 2014 spring Chinook salmon mitigation obligation through production of 204,542 smolts at the Chiwawa Acclimation Facility in lieu of production requirements in the Methow subbasin, contingent on the Methow subbasin production (60,516) being produced by another entity (i.e., backfilled). The 204,542 smolts produced represented the NNI obligations for the Wenatchee (144,026) and Methow (60,516) subbasins, per the December 14, 2001, recalculation SOA. Ultimately, the 60,516 smolts were backfilled at the Methow Hatchery by Grant PUD, in order to maintain their own full suite of production requirements, which were not possible due to a delay in construction of their Nason Creek Acclimation Facility.

In 2013, the Rocky Reach and Rock Island Hatchery Committees agreed to meet the 2013 program requirement of 60,516 Methow spring Chinook salmon by: 1) broodstock collection, holding, and incubation at Winthrop National Fish Hatchery; 2) transfer of eyed eggs to Eastbank Hatchery for initial rearing; 3) overwinter acclimation at Grant PUD's Carlton Acclimation Facility, and 4) final rearing at the Chewuch Acclimation Pond via the Yakama Nation coho salmon multispecies acclimation plan. In 2014, spring Chinook salmon were transferred to Grant PUD's new acclimation facility located on property owned by Chelan PUD (adjacent to Chelan's existing Carlton Acclimation Pond).

To continue to meet the Methow spring Chinook salmon production obligation, Chelan PUD implemented a two-step approach of obtaining broodstock for the program in 2014 consisting of: 1) testing newly installed PIT-tag sorting technology at the Rocky Reach Trap to determine if appropriate broodstock could be collected to meet program needs (Section 2.2.2.9); and 2) a tributary-based approach utilizing tangle nets to collect broodstock in the Chewuch River (Appendix B). A total of 38 natural-origin Methow spring Chinook salmon were targeted; the total number of fish targeted via tangle netting in the Chewuch was dependent on the number of fish collected at the Rocky Reach Trap. In May and June 2014, during the 2014 Rocky Reach Trap pilot effort, three natural-origin recruits (NORs) and 22 hatchery-origin recruits (HORs; including one HOR Chiwawa stray) were captured. Two ad-present mortalities occurred (assumed NOR). Tangle netting in the Chewuch began July 14, 2014, and ended August 5, 2014, and occurred for 9 days; the target for the Chewuch broodstock collection via tangle netting was 33 NORs, and 21 NORs were captured. A total of 73 spring Chinook salmon broodstock (24 NORs, 48 HORs, and 1 unknown) were captured for broodstock, fulfilling Chelan PUD's Methow spring Chinook salmon production obligation for 2014.

2.2.2.2 Wenatchee Steelhead Acclimation and Release Plan

In March 2013, Chelan PUD and WDFW developed *a 2013 Wenatchee River Basin Steelhead Release Strategy* to begin evaluating possible explanations for low survival in 2012 and to improve survival in future years. This evaluation was based on analyses of post-release survival rates of Wenatchee steelhead which indicated unprecedentedly low post-release survival rates of steelhead smolts migrating from the Chiwawa River, Nason Creek, and Wenatchee River in 2012, based on PIT-tag detections at McNary Dam. The strategy was to compare the estimated survival to McNary Dam of force-released fish with those of volitionally released fish, sorted by PIT-tags, and raised in either circular tanks or raceways. The volitional group in 2013 was released earlier than in 2012 in order to evaluate whether survival improved with an earlier release date. Study results from 2013 indicated that there was no significant difference in the performance of the fish released volitionally versus forced; however, these results may be confounded by other variables (i.e., release date, release location, and brood origin). Based on these results, in 2014, WDFW proposed only volitional releases for two reasons: 1) volitional release may follow a more natural behavior pattern (opposed to pushing the fish out all at once); and 2) volitional release may minimize potential residualism. In March 2014, the Rocky Reach and Rock Island Hatchery Committees approved the *2014 Wenatchee Basin* Steelhead Release Proposal (Appendix M). Results from the 2014 releases will be used to inform and develop the 2015 release strategy. The 2015 release will attempt to assess the confounding variables present within the steelhead program and will evaluate the role of release strategy (forced versus volitional) for an additional year, rearing vessel (partial water reuse-circular versus traditional flow through), and brood origin on fish performance (e.g., juvenile survival and smolt to adult returns).

2.2.2.3 M&E Plan Implementation

Since 2013, Chelan PUD hatchery programs have been operated in accordance with the *Monitoring and Evaluation Plan for PUD Programs 2013 Update* and the Chelan PUD Hatchery M&E Implementation Plan, titled *Chelan County PUD Hatchery M&E Work Plan*, prepared annually to describe the M&E activities for the next calendar year. In November 2013, the Chelan PUD 2014 Hatchery M&E Implementation Plan was finalized (except for the sockeye salmon component, which was outstanding) following a 30-day Hatchery Committees review period, and was appended to the *2013 Rocky Reach HCP Annual Report.* In February 2014, a Sockeye Addendum to the final *Chelan PUD 2014 Hatchery M&E Implementation Plan* (Appendix N) was approved by the Rocky Reach and Rock Island Hatchery Committees.

In September 2014, the *Chelan PUD 2015 Hatchery M&E Implementation Plan* (Appendix O) was finalized following a HCP Hatchery Committees review period. In May 2014, the Chelan PUD 2013 Hatchery M&E Plan Report, *titled Monitoring and Evaluation of the Chelan County PUD Hatchery Programs,* that documented M&E activities in 2013 (Appendix P) was approved. A similar report will be completed in 2015 for 2014 M&E activities of natural production and hatchery operations.

2.2.2.4 Okanogan Sockeye Salmon Mitigation

In 2014, Chelan PUD provided a ninth year of funding for a portion of the Okanagan Nation Alliance's 12-year Skaha Lake Sockeye Salmon Reintroduction Program (the current hatchery production obligation for Okanogan sockeye salmon mitigation is a combined 591,040 smolts for Rocky Reach and Rock Island HCPs). Chelan PUD funding in 2014 also contributed to the construction of the new Kl cp'elk' stim sockeye salmon hatchery in Penticton, British Columbia, which was completed in September 2014. The hatchery was designed to support up to an 8-million egg program and was initially constructed to accommodate 5 million eggs. No sockeye salmon hatchery fry were released in 2014 because the Shuswap Hatchery located in Lumby, British Columbia, was unavailable for continued sockeye salmon rearing beginning with brood year 2013.

2.2.2.5 Hatchery and Genetic Management Plans

Wenatchee Steelhead

On June 30, 2014, after more than 4 years of consultation, the initial draft *Wenatchee Steelhead BiOp* was completed. The Biological Opinion (BiOp) was revised several times in 2014, and a final BiOp and new Section 10(a)(1)(A) permit are anticipated in 2015.

On November 28, 2012, NMFS requested formal consultation with USFWS under Section 7(a)(2) of the ESA on the proposed permitting of the Chiwawa spring Chinook salmon and Wenatchee steelhead programs. Several coordination meetings were held throughout 2014 among Chelan PUD, NMFS, USFWS, the Yakama Nation, WDFW, Colville Confederated Tribes, and Grant and Douglas PUDs. A partial draft BiOp was distributed by USFWS to the parties on December 23, 2014. Consultation is still ongoing, and a complete BiOp is anticipated to be issued by USFWS in 2015.

Methow Spring Chinook Salmon

In June 2013, NMFS requested that Chelan PUD prepare a full *Methow Spring Chinook HGMP*, despite formerly indicating that the HCP Hatchery Committees-approved addendum would be acceptable for the program. In December 2013, the draft *Chelan PUD Methow Spring Chinook HGMP* was distributed for review. After further discussion and multiple revisions to the draft HGMP, in March 2014, the Rock Island and Rocky Reach Hatchery

Committees approved the final *Chelan PUD Methow Spring Chinook HGMP*, as revised (Appendix Q). In October 2014, NMFS decided that the Chelan PUD Methow spring Chinook salmon consultation would be combined with the Methow Hatchery and Winthrop National Fish Hatchery consultations with a target completion date of March 31, 2015.

Wenatchee Summer Chinook Salmon

In May 2013, NMFS requested that Chelan PUD and other Permit No. 1347 permit holders submit letter applications for extension of permit 1347. NMFS indicated that a 10-year extension of the existing Permit No. 1347 was feasible. Chelan PUD submitted an extension request letter on August 27, 2013. Subsequently, on September 20, 2013, Chelan PUD received a letter from NMFS indicating that the existing ESA permits would be extended during consultation, until consultations were completed and a determination made on the new permits. In 2014, NMFS indicated that due to higher priority permitting of programs rearing ESA-listed species, permitting of summer and fall Chinook salmon programs would not be addressed until spring 2015.

2.2.2.6 Objective 10 of the Hatchery M&E Plan – Non-target Taxa of Concern

In 2012, the Hatchery Evaluation Technical Team (HETT) began preliminary runs of a risk assessment model using the recalculated hatchery production numbers. By November 2013, all viable model runs were completed and those data were entered in a database. While running the models, a coding issue was discovered and it was determined that fixing the program could not be done easily. In the interest of finalizing the Non-Target Taxa of Concern (NTTOC) study, the HCP Hatchery Committees agreed to move forward and develop a report that summarizes the results, while also acknowledging the limitations of the existing model. In April 2014, the HETT provided the draft NTTOC Report for review to the HCP Hatchery Committees, and following a 60-day review period the report was finalized in June 2014 (Appendix R). A total of 50 hatchery programs and 25 NTTOC populations were identified for the risk analysis, resulting in 526 interactions. There were insufficient data on cutthroat trout (*Oncorhynchus clarkia*) to run the Predation, Competition, and Disease (PCD) Risk model, and they were omitted from the modeling analysis. Lamprey (*Petromyzontiforme*) were also not modeled in PCD Risk, because there were insufficient data and information available regarding salmonid and lamprey ecological interactions, particularly pertaining to hatchery salmonids. The Chief Joseph Hatchery program was also not included in the modeling, and 134 interactions that were attempted failed to run due to the PCD Risk model either crashing or taking excessive time to run, yielding a total of 202 successful model runs. Of the 202 successful model runs, only three populations exceeded their respective containment levels (5%), which were all small summer steelhead sub-populations, including Twisp River summer steelhead interacting with Chelan Falls Hatchery summer Chinook salmon, Chiwawa summer steelhead interacting with Wells Hatchery summer steelhead, and Omak Creek summer steelhead interacting with Wells Hatchery summer steelhead. These exceedances were not considered a concern because they were so small (5.08%, 5.15%, and 5.14%, respectively) and had highly variability compared to the other interactions, which had exceptionally low variability. Additionally, there is limited understanding of the effects of interactions occurring in the mainstem Columbia River when compared to the tributaries. Overall, modeled mortality rates were very low. There were no in-basin containment level exceedances and only three exceedances overall. In general, the level of interaction of hatchery fish with target species was found to be low. Because the modeling results suggested very low risk to NTTOC, with few interactions exceeding the containment levels, the HCP Hatchery Committees determined no further analysis was warranted at this time. In September 2014, the HCP Hatchery Committees approved an SOA, finalizing the NTTOC Objective (Hatchery M&E Plan Objective 12 [Formerly Objective 10]; Appendices B and G). The SOA included a provision that if new information becomes available in the future, and the HCP Hatchery Committees agree, additional NTTOC evaluations may be conducted.

2.2.2.7 Wenatchee Steelhead Reproductive Success Study

The Rocky Reach HCP, Section 8.5.3, requires that Chelan PUD fund and implement a steelhead reproductive success study (RSS). The RSS began in 2008 and incorporated data from each subsequent brood year, to date. A final report documenting the study results is expected in 2015.

2.2.2.8 Dryden Overwintering Feasibility Study/Wenatchee River Total Maximum Daily Load

Activities continued in 2014 to assess the feasibility of converting Dryden Acclimation Facility to an overwinter facility in conjunction with determining how best to meet total maximum daily load requirements for phosphorous discharge by 2018. The last several years of data and analysis will be examined in 2015, and it will be determined whether or not it is feasible to convert Dryden to an overwinter facility.

2.2.2.9 Rocky Reach Trap Pilot Study

In May 2013, Chelan PUD conducted a pilot study to test the feasibility of using the Rocky Reach Trap for broodstock collection for Chelan PUD's Methow spring Chinook salmon program. Based on results of the 2013 pilot study, several recommendations were discussed to improve future trapping efforts, including modifications to the trap door, installations of additional lighting and cameras, and additional trap operator options.

In early 2014, Chelan PUD installed the following recommended trap improvements: 1) replaced the solid trap door with a grated or perforated trap door; 2) added underwater lighting; 3) installed an electrical control pendent to give the two operators the opportunity to operate the door depending on visibility; 4) painted the trap floor white; and 5) installed additional cameras. Chelan PUD also installed a separation-by-code PIT-tag monitoring system to test the viability of capturing the necessary broodstock numbers to meet full production obligations (Section 2.2.2.1.2). The system used a predetermined library of PIT-tag codes connected to unique auditory and visual signals that alerted the trap operator when target fish approached the trap. Once a fish was trapped, the origin was confirmed with a hand-held PIT-tag detector, and target fish were transferred to Eastbank Hatchery for holding. PIT-tag codes targeted included: Chewuch River smolt trap and mark/recapture evaluations (spring Chinook salmon NORs); mark/recapture evaluations above the mouth of the Twisp River (spring Chinook salmon NORs); Methow River smolt trap (spring Chinook salmon NORs); and Methow Hatchery MetComp smolts (spring Chinook salmon HORs; brood years 2009 and 2010).

Chiwawa Hatchery spring Chinook salmon were also targeted as part of stray management. Historical fish passage data at Rocky Reach Dam were reviewed to determine detection probability for the proposed trapping period, and trap operation was determined for optimal daily run coverage. Trapping occurred for 28 days between May 7 and June 5, 2014. A total of 106 target fish were detected at the Rocky Reach Trap, 25 of which were trapped, including: 21 Methow HORs; two Chewuch NORs; one Methow-Comp NOR; and one Chiwawa HOR. There were three trapping mortalities, including one ad-fin absent and two ad-present fish. The ad-absent mortality was discovered as an old carcass that was likely impinged at some point during trapping. The two ad-present mortalities included one that was impinged against the ladder wall when the trap door opened during a compressor test, and the other was a non-target fish that was impinged in the door closure area while trapping a target fish. Chelan PUD suggested possibly installing a camera on the backside of the trap, if trapping for broodstock occurred in the future, to monitor for fish injuries and determine whether non-target fish are holding in the area where the door could impinge them against the wall. Extensive records of fish passage were kept while trapping, and additional evaluations will be performed with those data.

2.2.2.10 Carlton Pump System

In August 2014, Chelan PUD conducted semi-annual maintenance at the Carlton Pond intake; divers cleared the screens of sediment build-up, large sticks, and other debris. To clean the screens, the screens were removed, and a blind was inserted to keep unscreened water out of the area while debris was removed. Once complete, the blind was pulled and the screens were replaced. When the screens were replaced, a vacuum occurred and debris may have been sucked into the pump. At the same time, a diver observed several small unidentified fish swimming behind the screens. Chelan PUD is monitoring the screens as required by their Permit 1347 and are developing a plan to prevent this situation in the future. The solution may require installing different equipment that does not require pulling the screens for cleaning.

2.2.2.11 Hatchery M&E Plan Objective 8.3, Fecundity at Size

In January 2014, WDFW requested input from the HCP Hatchery Committees on the protocol for measuring gonadal mass, and on options for when to take the measurements (taking the measurement at the eyed-egg stage or taking the measurement before the eggs are fertilized, at the green egg stage). The appropriate sample sizes required for listed versus unlisted programs were also discussed. The HCP Hatchery Committees came to conclusions regarding how to calculate and measure fecundity at size; however, additional discussion was needed to resolve the sample size question. In February 2014, WDFW distributed a memorandum describing standardized methods for Hatchery M&E Plan Objective 8.3, Fecundity at Size; and in December 2014, WDFW provided a revised memorandum on sample size for further discussion in 2015.

2.2.2.12 Incidental Take

In early 2014, the HCP Hatchery Committees questioned how NMFS and USFWS assigned incidental take under their ESA permits—to the owner of a facility or to the different operators at a facility. Following considerable discussion, in August 2014, USFWS clarified that if the entity conducting the action has the appropriate permits in place to perform that action, and the action is not linked to the facility owner's program, then incidental take is not assigned to the facility owner. USFWS also indicated that facility owners can contact USFWS to confirm that the proper coverage is in place. In the event that multiple parties are requesting take authorization, each of the proponents should have incidental take coverage (pre-project implementation), and take would be assigned to the individual proposed action.

2.2.2.13 Methow River Conditions and Implications for Populations and Hatchery Program Management

Following the wild fires that occurred throughout the summer of 2014, a large mudslide occurred near Carlton on the Methow River that had a major effect on the river. Some members of the HCP Hatchery Committees speculated that runoff would also result for a number of years with excessive levels of mud and ash, which could have a large impact on salmonid survival if it coincides with smolt migration. Douglas PUD suggested that it would be prudent to consider management strategies and actions for hatchery program releases that might be implemented to minimize impacts. After further research, the HCP Hatchery Committees agreed to defer to Hatchery Manager discretion regarding appropriate actions for releasing fish, with the recommendation to conduct periodic fish health evaluations on fish held in potentially impacted holding ponds, and once available, review available literature on the effects of the Carlton Complex Fire.

2.2.3 Maintenance and Improvements

During the 2013/2014 annual winter maintenance at Rocky Reach Dam, as part of Chelan PUD's strategy to obtain Methow spring Chinook salmon broodstock in 2014, a separation-by-code monitoring system was installed at the Rocky Reach Trap (Sections 2.2.2.1.2 and 2.2.2.9). Other trap improvements included: 1) replaced the solid trap door with a grated or perforated trap door; 2) added underwater lighting; 3) installed an electrical control pendent to give the two operators the opportunity to operate the door depending on visibility; 4) painted the trap floor white; and 5) installed additional cameras.

2.1 Tributary Committees and Plan Species Accounts

As outlined in the Rocky Reach HCP, the signatory parties designated one member each to serve on the HCP Tributary Committees. The Rock Island, Rocky Reach, and Wells Tributary committees meet on a regularly scheduled basis as a collective group to enhance coordination and minimize meeting dates and schedules. Subject items requiring decisions are voted on in accordance with the terms outlined in the specific HCPs. During 2014, the HCP Tributary Committees met on ten different occasions.

An initial task of the HCP Tributary Committees in 2014 was to review and update their operating procedures that provide a mechanism for decision making. These were initially developed in 2005 and included in that year's annual report (Anchor 2006)[5]. The Tributary Committees also developed Policies and Procedures for soliciting, reviewing, and approving project proposals. This document was last reviewed and updated in February and March 2014. The Policies and Procedures provide formal guidance to project sponsors on submission of proposals for projects to protect and restore habitat of Plan Species within the

[5] Anchor Environmental, L.L.C. 2006. *Annual Report, Calendar Year 2005, of Activities Under the Anadromous Fish Agreement and Habitat Conservation Plan*. Rocky Reach Hydroelectric Project, FERC License No. 2145. Prepared for FERC by Anchor Environmental, L.L.C., and Public Utility District No. 1 of Chelan County.

geographic scope of the HCP. The Committees established two complementary funding programs, the General Salmon Habitat Program (GSHP) and the Small Projects Program.

In 2014, the HCP Tributary Committees modified language in Sections 3.4 (GSHP), 5.1 (Draft Proposal Review), and 5.3 (Final Review) of the Policies and Procedures document to allow submission of GSHP proposals at any time during the year. Before this modification, the schedule for the GSHP was coordinated with the Salmon Recovery Funding Board (SRFB) process. That is, GSHP draft proposals were received in early May and final proposals were received in late June. The proposed change allows project sponsors to submit GSHP proposals at any time during the year. In addition, the HCP Tributary Committees approved language to Section 3.4 of the Policies and Procedures document indicating that the HCP Tributary Committees will accept SRFB applications for projects where Plan Species Account Funds are included as cost shares in SRFB proposals. The Committees approved the following language to Section 3.4 of the Policies and Procedures document:

> *Project Sponsors will use the General Salmon Habitat Program application. However, the Committees will accept the Salmon Recovery Funding Board application for projects where Plan Species Account Funds are included as cost shares in Salmon Recovery Funding Board proposals.*

Dr. Tracy Hillman continued as the Chairperson for the Rocky Reach Tributary Committee. Dr. Hillman is an Ecological Society of America board-certified senior ecologist and Chief Executive Officer of BioAnalysts, Inc. He has 28 years of experience as an ecologist and has chaired the Rocky Reach Tributary Committee since 2007.

2.1.1 Regional Coordination

Similar to the HCP Hatchery Committees and to improve coordination, a representative from Grant PUD and the facilitator of the PRCC Habitat Sub-committee were invited to the HCP Tributary Committees monthly meetings. In addition, they received meeting announcements, draft agendas, and meeting minutes. This benefits the HCP Tributary Committees through increased coordination and sharing of expertise. The Grant PUD representative and PRCC Habitat Sub-committee facilitator have no voting authority. The

HCP Tributary Committees, through the HCP Coordinating Committees, also invited American Rivers and the Confederated Tribes of the Umatilla Indian Reservation to participate in Committees meetings. Both parties contributed to the development of the HCP, yet elected not to sign the document. Neither of these parties participated in the deliberations of the HCP Tributary Committees in 2014.

The HCP Tributary Committees also coordinate with the Upper Columbia Salmon Recovery Board (UCSRB). Coordination is typically between the chairperson of the HCP Tributary Committees and the Executive Director or Associate Director of the UCSRB. The HCP Tributary Committees also invite representatives from the UCSRB to at least one meeting per year to update the Committees on activities proposed by the Board. In addition, some members of the Committees typically attend the UCSRB meetings to foster coordination in developing and selecting projects for funding. Some members of the Committees are also members of the UCSRB's Regional Technical Team, which increases coordination in selecting projects for funding. Many of the policies and procedures of the SRFB and HCP Tributary Committees are complementary, and annual funding rounds by these funding entities have been coordinated during the last several years.

In April 2014, the UCSRB invited the Rocky Reach Tributary Committee to an Upper Columbia Life History Workshop held on Wednesday, April 16, 2014, at the Confluence Technology Center in Wenatchee. The purpose of the workshop was to provide participants with current information about general life history patterns that have been observed across the region as well as specific information on habitat use in each of the four major subbasins (Wenatchee, Entiat, Methow, and Okanogan river basins). The workshop was primarily for project sponsors, monitoring program representatives and researchers, and the Regional Technical Team and Citizen's Advisory Committee members.

The Rocky Reach Tributary Committee coordinated funding of GSHP proposals with the BPA in July 2014. The purpose for inviting BPA to the July meeting, according to Section 2 of the Tributary Fund Policies and Procedures for Funding Projects, was to collaborate with regional, local, state, tribal, and national organizations that fund salmon habitat projects. The efforts resulted in identification of cost shares for suitable habitat restoration projects.

2.1.2 Fiscal Management of Plan Species Accounts

The HCP Tributary Committees set up methods for the long-term management of the Plan Species accounts for each HCP. The Rocky Reach Tributary Committee appointed the accounting firm Clifton Larson Allen to perform the necessary tasks for fiscal management of the Rocky Reach Plan Species Account. These tasks include the following: (1) develop a long-term approach to maintain the funds and to carry out tax calculations and reporting; (2) conduct the daily management of activities (such as processing of invoices); and (3) provide technical expertise on financial matters to the committees. The beginning balance of the Rocky Reach Plan Species Account on January 1, 2014, was $2,217,802.36; Chelan PUD's annual Rocky Reach contribution was $331,015.00; interest accrued during 2014 was $1,162.76; funds disbursed for projects in 2014 totaled $324,812.34; $4,633.54 was paid to Clifton Larson Allen and Chelan PUD for account administration during 2014; and $14,000.00 for appraisal fees for the Entiat Stillwaters Gray Reach Acquisition project. This resulted in an ending balance of $2,206,420.74 on December 31, 2014. The 2014 Annual Financial Report for this Plan Species Account is provided in Appendix K.

The Rocky Reach Tributary Committee delegated signatory authority to the chairperson for processing of payments for invoices approved by the Committee, with the Coordinating Committee Chairperson serving as the alternate. Chelan PUD recognizes the uniqueness of the Tributary Committee decision-making process and delegation of signatory authority to the Chairperson, and the Chelan PUD subsequently has provided funding necessary to assign reasonable liability insurance to the Tributary Chairperson.

2.1.3 General Salmon Habitat Program

The HCP Tributary Committees established the GSHP as the principle mechanism for funding projects. The goal of the program is to fund projects for the protection and restoration of Plan Species habitat. An important aspect of this program is to assist project sponsors in developing practical and effective applications for relatively large projects. Many habitat projects are increasingly complex in nature and require extensive design, permitting, and public participation to be feasible. Often, a reach-level project involves many authorities and addresses more than one habitat factor. Because of this trend, the GSHP was designed to fund relatively long-term projects. There is no maximum financial request in the GSHP; the minimum request is $100,000, although the HCP Tributary Committees may provide lesser amounts during a phased project.

In an effort to coordinate with ongoing funding and implementation programs within the region, the HCP Tributary Committees used the previously established technical framework and review process for this geographic area and worked with the other funding programs to identify cost-sharing procedures (Section 2.3.1).

2.1.3.1 2014 General Salmon Habitat Projects

In March 2014, the HCP Tributary Committees announced that they would accept GSHP applications at any time during the year. They also announced that they would continue to accept SRFB applications for projects where Plan Species Account Funds are included as cost shares in SRFB Proposals. The SRFB announced their 2014 funding cycle in March, with pre-proposal applications due on May 2, 2014, and full proposals due on June 24, 2014. The HCP Tributary Committees received and reviewed nine pre-proposal applications. The HCP Tributary Committees identified four projects that they believed warranted full proposals and dismissed five projects because they did not have strong technical merit.

In June, the HCP Tributary Committees received four full SRFB proposals to the GSHP. All were cost shares with the SRFB or other funding entities. The HCP Tributary Committees approved funding for two projects. In addition, the HCP Tributary Committees received three full proposals to the GSHP that were not SRFB proposals. The Tributary Committees approved funding for two of these projects. Table 6 identifies the projects, sponsors, total cost of each project, amount requested from Tributary Funds, and, if funded, which Plan Species Account supported the project.

Table 6
General Salmon Habitat Program Projects Reviewed by the Tributary Committees in 2014

Project Name	Sponsor[1]	Total Cost	Request from TC	Plan Species Account[2]
Salmon Recovery Funding Board Applications				
Upper Peshastin Migration Barrier Design	CCNRD	$74,500	$12,000	Not funded
Silver Side Channel Revival	CCFEG	$1,050,573	$525,287	Not funded[3]

Project Name	Sponsor[1]	Total Cost	Request from TC	Plan Species Account[2]
Methow Watershed Beaver Reintroduction	MSRF	$216,000	$33,500	W: $33,500
Barkley Irrigation Company – Under Pressure	TU-WWP	$3,293,180	$300,000	RI: $300,000
General Salmon Habitat Program Applications				
Icicle Irrigation District Flow Control Structure	CNRD	$140,633	$70,000	RI: $70,000
MVID Instream Flow Improvement	TU-WWP	$9,747,000	$600,000	RI&RR: $600,000[4]
Nason Upper White Pine Floodplain Reconnect	CCNRD	$3,037,136	$400,000	Not funded

Notes:

1 CCFEG = Cascade Columbia Fisheries Enhancement Group; CCNRD = Chelan County Natural Resources Department; MSRF = Methow Salmon Recovery Foundation; TU-WWP = Trout Unlimited – Washington Water Project

2 RI = Rock Island Plan Species Account; RR = Rocky Reach Plan Species Account; W = Wells Plan Species Account

3 The HCP Tributary Committees' portion of the Silver Side Channel Revival Project ($525,287) was funded by the Bonneville Power Administration.

4 In 2013, the Wells Tributary Committee approved $400,000 for the MVID Instream Flow Improvement Project. The sponsor was unable to secure all the funding needed for the project; therefore, in 2014 they asked the HCP Tributary Committees for an additional $600,000. The Rocky Reach and Rock Island Tributary Committees each agreed to contribute $300,000 to the project.

MVID = Methow Valley Irrigation District

TC = Tributary Committees

In 2014, the Rocky Reach Tributary Committee agreed to fund the following GSHP project:

- Methow Valley Irrigation District (MVID) Instream Flow Improvement Project for the amount of $300,000 (with cost share the total cost of the project was $9,747,000) – This project will: 1) improve instream flows in the lower 4.5 miles of the Twisp River by eliminating the MVID irrigation diversion and returning up to 11 cfs, which will be placed in permanent trust; 2) improve instream flow in the Methow River by piping a portion of the east canal and permanently trusting the saved water; 3) improve instream flow (2 cfs) and wetland and side channel habitat by restoring the natural flow in Alder Creek and permanently trusting the water; and 4) prevent fish injury and mortality associated with MVID's Twisp River pushup dam, fish screen operations, and the stranding of redds and juveniles in the MVID West Canal's intake canal and fish return channel.

2.1.3.2 Modifications to General Salmon Habitat Program Contracts

In 2014, the Rocky Reach Tributary Committee received the following requests from sponsors asking for modifications to GSHP projects funded by the Committee.

- In July, Chelan-Douglas Land Trust asked the Rocky Reach Tributary Committee for a budget amendment on the Entiat Stillwaters Gray Reach Acquisition Project. The sponsor asked if they could move $36,000 from Land Purchase to Sponsor Salaries and Benefits. The sponsor indicated that the additional funds were needed to develop Stewardship Plans. The landowners were unwilling to pay for the stewardship plans. The Rocky Reach Tributary Committee approved the budget amendment. The total budget amount did not change as a result of this amendment.
- In September, Chelan-Douglas Land Trust asked the Rocky Reach Tributary Committee for a time extension and scope change on the Entiat Stillwaters Gray Reach Acquisition Project. The sponsor asked if the Committee could: 1) grant a time extension on the project so the sponsor has time to complete all four acquisitions; 2) change the scope so the sponsor can acquire the entire Crone property (this will increase the acquired acreage from 10 acres to 16.47 acres); and 3) approve the use of Mark Noble as the appraiser and Larry Rees as the reviewer. The Rocky Reach Tributary Committee approved the time extension, scope change, and the use of Mark Noble and Larry Rees. The contract was extended from October 31, 2014, to December 31, 2015. Mark Noble and Larry Rees are approved Tributary Committee appraisers.
- In December, the Okanagan Nation Alliance asked the Rocky Reach Tributary Committee for a budget amendment on the Fish Passage at Shingle Creek Dam Project. The sponsor asked to move $5,688 from Contract Labor to Salaries/Benefits, Professional Services, and Overhead/Administration. Thus, the final amount allocated for Salaries/Benefits equaled $7,017, Contract Labor equaled $36,812, Professional Services equaled $7,779, and Overhead/Administration equaled $7,617. The Rocky Reach Tributary Committee approved the budget amendment. The total budget amount will not change as a result of this amendment.
- In December, the Cascade Columbia Fisheries Enhancement Group asked the Rocky Reach Tributary Committee for a budget amendment on the Silver Side Channel Design Project. The sponsor asked if they could move $5,000 from

Engineering to Salaries and Benefits. Thus, the final amount allocated for Professional Services equaled $16,000, Engineering equaled $93,000, and Salaries and Benefits equaled $23,000. The Rocky Reach Tributary Committee approved the budget amendment. The total budget amount will not change as a result of this amendment.

2.1.4 Small Projects Program

The Small Projects Program has an application and review process that increases the likelihood of participation by private stakeholders that typically do not have the resources or expertise to go through an extensive application process. The HCP Tributary Committees encourage small-scale projects by community groups, in cooperation with landowners, to support Plan Species recovery on private property. Project sponsors may apply for funding at any time, and in most cases, will receive a funding decision within 3 months. The maximum contract allowed under the Small Projects Program is $100,000.

2.1.4.1 2013 Small Projects

In 2014, the HCP Tributary Committees received six requests for funding under the Small Projects Program. The HCP Tributary Committees approved funding for four projects. Table 7 identifies the projects, sponsors, total cost of the projects, amount requested from Tributary Funds, and which Plan Species Accounts supported the projects.

Table 7
Projects Reviewed by the Tributary Committees Under the Small Projects Program in 2014

Project Name	Sponsor[1]	Total Cost	Request from TC	Plan Species Account[2]
Remove Collapsed Bridge from Shingle Creek	ONA	$10,579	$6,693	W: $6,693
Silver Reach Mining Impacts Evaluation/Feasibility	TU-WWP	$99,430	$96,355	Not funded[3]
Post-Fire Landowner Assistance/Habitat Protection	MSRF	$100,000	$57,328	RI: $57,328
Clear Creek Fish Passage & Instream Flow Enhancement	TU-WWP	$96,116	$69,500	RR: $69,500
Lehman Riparian Restoration	MC	$40,267	$9,053	RI: $9,053
Lower Wenatchee River Riparian Restoration	CCD	$44,000	$40,000	Not funded

Notes:

1 CCD = Cascadia Conservation District; MC = Methow Conservancy; MSRF = Methow Salmon Recovery Foundation; ONA = Okanagan Nation Alliance; TU-WWP = Trout Unlimited – Washington Water Project.
2 RI = Rock Island Plan Species Account; RR = Rocky Reach Plan Species Account; W = Wells Plan Species Account.
3 The Tributary Committees requested additional information. As of the end of 2014, the sponsor had not yet submitted a revised proposal.
TC = Tributary Committees

In 2014, the Rocky Reach Tributary Committee agreed to fund the following Small Project:

- Clear Creek Fish Passage and Instream Flow Enhancement Project for the amount of \$69,500 (with cost share the total cost of the project was \$96,116) – This project will improve flows within the lower 0.65 mile of Clear Creek (a tributary to the Chiwawa River) by removing two irrigation diversions (partial fish barriers) and replacing them with a well. This will increase flows in Clear Creek by 0.45 cfs during the irrigation season (May 15 through September 30) and 0.25 cfs throughout the year. These actions will improve spawning and rearing habitat for steelhead and rearing habitat for juvenile Chinook salmon.

2.1.4.2 Modifications to Small Project Contracts

The Rocky Reach Tributary Committee received no requests from sponsors in 2014 asking for modifications to Small Projects funded by the Committee.

2.1.5 Tributary Assessment Program

In 2014, at the request of the HCP Tributary Committees, the Okanagan Nation Alliance submitted proposals for the following monitoring projects:

1. Penticton Channel Monitoring Spawning Platforms – The objective of this study is to monitor the effects of the proposed spawning platforms as adaptive management for designing and construction of more platforms. This work will focus on quantifying spawners (redd surveys), egg retention (carcass surveys), egg-to-fry success, and habitat conditions (e.g., gravel stability, thalweg slope, fine sediment deposition, and gravel composition) within treated and untreated areas. Monitoring will occur during a 5-year period (2014 to 2018). The amount requested from the HCP Tributary Committees during the 5-year period was \$53,738 (with cost share, the total cost of

the monitoring project during the 5-year period was $168,863). The request from the HCP Tributary Committees for monitoring efforts in 2014 was $7,528.

2. Okanagan River Restoration Initiative (ORRI) Phase II Effectiveness Monitoring – The objective of this study is to monitor the effects (channel, hydraulic, and biological responses) of the ORRI-Phase II restoration work and to continue to monitor the long-term effects of Phase I and Vertical Drop Structure 13 restoration. Monitoring will include all activities associated with channel and hydraulic responses, and aquatic biological responses (save macrophytes and macroinvertebrates). Monitoring will occur during a 5-year period (2014 to 2018). The amount requested from the HCP Tributary Committees during the 5-year period was $69,578 (with cost share, the total cost of the monitoring project during the 5-year period was $175,600). The request from the HCP Tributary Committees for monitoring efforts in 2014 was $11,978.40.

The Rocky Reach Tributary Committee approved funding for the Penticton Channel Monitoring Spawning Platforms and the Wells Tributary Committee approved funding for the ORRI Phase II Effectiveness Monitoring Project. As required in the HCPs, Chelan and Douglas PUDs will provide funding for the monitoring projects through the Rocky Reach and Wells Tributary Assessment Programs rather than through the Rocky Reach and Wells Plan Species Accounts.

3 HABITAT CONSERVATION PLAN ADMINISTRATION

3.1 Mid-Columbia Habitat Conservation Plan Forums

In 2005 and 2006, Mid-Columbia Forums (Forums) were held as a means of communicating and coordinating with the non-signatories and other interested parties on the implementation of the HCPs. Non-signatory parties at the time of the 2006 meeting included the Confederated Tribes of the Umatilla Reservation and American Rivers. As in 2007 through 2013, these parties were invited by letter in 2014 to attend a Forum, in conformity with the 2005 FERC Order on Rehearing 109 FERC 61208 and in accordance with the offer to non-signatory parties of non-voting membership in HCP Tributary Committees and Hatchery Committees processes. The non-signatory parties again indicated no interest in attending a Forum in 2014; however, Michael Garrity of American Rivers indicated his organization was interested in a briefing on progress in implementing the HCP sometime during 2015.

3.2 Mid-Columbia Habitat Conservation Plan Extranet Sites

In 2013, the HCP Coordinating Committees discussed transitioning HCP file sharing from the historically used file transfer protocol (FTP) site to a more user-friendly platform. One of the primary purposes for transitioning to a new filing system was to facilitate a more efficient process for retrieving historical documents. In May 2013, Douglas PUD presented to the HCP Coordinating Committees an overview of their new SharePoint system (i.e., HCP Extranet site), as a potential option for Douglas and Chelan PUDs' new HCP document repository. The HCP Coordinating Committees raised no concerns with the proposed SharePoint repository, and Douglas PUD proceeded with the development of the repository. Douglas PUD unveiled the respective HCP Hatchery Committees Extranet site and HCP Coordinating Committees site with presentations to the HCP Hatchery Committees on January 15, 2014, and to the HCP Coordinating Committees on January 28, 2014. During 2014, the process of transferring all historical Douglas and Chelan PUDs' HCP files from the former FTP site to the new HCP Extranet sites was underway and is expected to be complete by early 2015. The HCP Tributary Committees Extranet site will also be available by early 2015.

3.3 Mid-Columbia Habitat Conservation Plan Coordinating Committees Meeting Location

In May 2014, a review was held of the HCP Coordinating Committees' meeting location. After researching other venue options and discussing financial and logistical considerations, the HCP Coordinating Committees agreed to continue holding their monthly meetings at the Radisson Gateway Hotel, in SeaTac, Washington, along with the occasional conference call and meeting in eastern Washington.

3.4 Mid-Columbia Habitat Conservation Plan Committees Chairperson

In September 2014, the HCP Chairman of the Coordinating and Hatchery Committees announced to the respective Committees plans to retire at the end of April 2015. The Chairperson of the Coordinating Committees also serves as the Chairperson of the Policy Committees; therefore, discussions began regarding selecting new Chairpersons for the HCP Policy, Coordinating, and Hatchery Committees—a process last visited 10 years ago when the HCPs were signed in 2004. A timeline was established to allow the new Chairperson(s) time to shadow the current Chairman prior to April 2015, which translated into interviews in December 2014, final decisions in January 2015, and contracting by February 2015. HCP Coordinating and Hatchery Committees representatives were asked to nominate qualified candidates to fill the respective Committees Chairperson positions, and the HCP Policy and Coordinating Committees agreed to convene to discuss details of the selection process. HCP signatory representatives were identified to select the Chairpersons for the HCP Hatchery and Coordinating Committees, which included the HCP Policy Committees representative for the Yakama Nation, NMFS, Chelan PUD, and Douglas PUD, and the HCP Coordinating Committees representative for the Colville Confederated Tribes, USFWS, and WDFW. A ranking system was also approved for narrowing the HCP Chairperson candidate lists to a short list for interviews, where each Party ranks the candidates first to last for filling the Chairperson positions. Reviews of the sum of those rankings, along with further discussion, determines the interview lists. The HCP Policy and Coordinating Committees compiled interview questions developed by each HCP signatory, and in December 2014, all candidates were interviewed for the HCP Coordinating and Hatchery Committees Chairperson positions. Final decisions will be announced in January 2015. *(Note: On January 14, 2015, the HCP Policy and Coordinating Committees* *unanimously approved Dr. John Ferguson as the HCP Policy and Coordinating Committees Chairperson and Dr. Tracy Hillman as the HCP Hatchery Committees Chairperson.)*

3.5 Habitat Conservation Plan Related Reports and Miscellaneous Documents Published in Calendar Year 2014

The following is a list of reports released in 2014 that are related to the implementation of the Rocky Reach HCP:

- Public Utility District No. 1 of Chelan County, 2014. Final 2014 Rocky Reach and Rock Island HCP Action Plan. February 2014.
- Anchor QEA, LLC, and Public Utility District No. 1 of Chelan County, 2014. *Annual Report Calendar Year 2013 of Activities Under the Anadromous Fish Agreement and Habitat Conservation Plan*. Rocky Reach Hydroelectric Project. FERC License No. 2145. April 2014.
- Hillman, T., M. Miller, C. Moran, M. Tonseth, M. Hughes, A. Murdoch, L. Keller, C. Willard, B. Ishida, C. Kamphaus, T. Pearsons, and P. Graf, 2014. *Monitoring and Evaluation of the Chelan and Grant County PUDs Hatchery Programs: 2013 Annual Report*. Prepared for HCP Hatchery Committee and the PRCC Hatchery Sub-Committee. June 2014.
- Mackey, G., T.N. Pearsons, M.R. Cooper, K.G. Murdoch, A.R. Murdoch, and T.W. Hillman, 2014. *Ecological Risk Assessment of Upper-Columbia Hatchery Programs on Non-Target Taxa of Concern*. Hatchery Evaluation Technical Team. Prepared for the HCP Wells Hatchery Committee, HCP Rocky Reach Hatchery Committee, HCP Rock Island Hatchery Committees, and the Priest Rapids Hatchery Sub-Committee, Wenatchee, WA. June 2014.
- Public Utility District No. 1 of Chelan County and Washington Department of Fish and Wildlife, 2014. *Hatchery and Genetic Management Plan (HGMP)*. Chelan PUD Methow Spring Chinook Program. December 2013. Updated February 2014.
- Public Utility District No. 1 of Chelan County, 2014. *Draft Proposal to Trap Spring-Run Chinook Salmon at Rocky Reach Trap and Tributary Based Broodstock Collection*. March 2014.

- Public Utility District No. 1 of Chelan County, 2014. *Rocky Reach and Rock Island HCPs Draft 2014 Fish Spill Report*. 2014 Chelan PUD Fish Spill Programs. October 2014.
- Public Utility District No. 1 of Chelan County, 2014. *2014 Rocky Reach Juvenile Fish Bypass System Operations Plan*. Final Plan. February 2014.
- Public Utility District No. 1 of Chelan County, 2014. *2014 Fish Spill Plan Rock Island and Rocky Reach Dams*. March 2014.
- Tonseth, M., 2014. *Draft 2014 Upper Columbia River Salmon and Steelhead Broodstock Objectives and Site-Based Broodstock Collection Protocols*. Washington Department of Fish and Wildlife Wenatchee Research Office. April 2014.
- Underwood, A., and C. Willard, 2014. *Draft Addendum to the Chelan County PUD Hatchery Monitoring and Evaluation Implementation Plan. Wenatchee Sockeye Salmon.* February 2014.
- Underwood, A., and C. Willard, 2014. *Chelan County PUD Hatchery Monitoring and Evaluation Implementation Plan 2015*. September 2014.
- Washington Department of Fish and Wildlife, 2014. *2014 Wenatchee Basin Steelhead Release Proposal*. WDFW Fish Program – Science Division Supplementation Research Team. March 17, 2014.

APPENDIX A
HABITAT CONSERVATION PLAN COORDINATING COMMITTEES 2014 MEETING MINUTES AND CONFERENCE CALL MINUTES

ANCHOR QEA

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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Coordinating Committees	**Date:**	February 25, 2014
From:	Michael Schiewe, Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the January 28, 2014 HCPs Coordinating Committees Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Radisson Gateway Hotel, in SeaTac, Washington, on Tuesday, January 28, 2014, from 9:30 am to 1:00 pm. Attendees are listed in Attachment A of these meeting minutes.

ACTION ITEM SUMMARY

- Anchor QEA will revisit the HCP email distribution lists and revise the lists consistent with Coordinating Committees' guidance (Item II-B).
- Anchor QEA will coordinate with Douglas PUD to ensure that Coordinating Committees representatives receive the access information needed to participate in the Wells Hatchery Modernization Workshop on February 12, 2014 (Item II-C).
- Tom Kahler will provide Bryan Nordlund with the Wells Hatchery Modernization 30% design drawings (Item II-C).
- Chelan PUD will provide: 1) their new Valid Flow Duration Curves; 2) a brief summary describing the underlying data and the calculation methods used; and 3) a draft Statement of Agreement (SOA) memorializing the new Valid Flow Duration Curves, prior to the Coordinating Committees' meeting on March 25, 2014 (Item IV-A).
- Chelan PUD will add to their draft Chelan PUD 2014 Wells Rocky Reach and Rock Island Action Plan "Juvenile Monitoring Activities at the Rock Island Bypass" from April 1, 2014 until August 31, 2014, as requested (Item IV-B).
- Coordinating Committees representatives will provide edits and comments on the draft Chelan PUD 2014 Rocky Reach and Rock Island Action Plan to Chelan PUD no later than Friday, January 31, 2014 (Item IV-B).

- Chelan PUD will request approval of the draft Chelan PUD 2014 Rocky Reach and Rock Island Action Plan at the Coordinating Committees' meeting on February 25, 2014 meeting (Item IV-B).
- Steve Hemstrom will determine what documentation is publically available regarding the City of Entiat's proposed development of a 65-slip public marina, and will provide those documents to the Coordinating Committees (Item IV-D).
- Bryan Nordlund will provide an official letter designating the current National Marine Fisheries Service (NMFS) HCP Committees representation (including alternative representation) to Kristi Geris for the administrative record (Item V-A).

DECISION SUMMARY

- The Coordinating Committees representatives present approved the Douglas PUD 2014 HCP Wells Action Plan, as revised (Item II-C).
- The Coordinating Committees representatives present approved the Wells Dam 2014 Juvenile Fish Bypass Operating Plan (BOP), as revised (Item II-D).

AGREEMENTS

- The Coordinating Committees representatives present supported Douglas PUD's request to NMFS to modify their existing Permit 1395 to allow trapping of hatchery-origin (HO) steelhead at Wells Dam from February through April 2014 in order to fulfill steelhead broodstock obligations required for several programs, with the stipulations that the Coordinating Committees are consulted during the trapping period, and updated on progress toward the collection goal and informed of any indications of passage delays; and that the ladder trapping will be terminated first before other collection actions are terminated (Item II-A).
- The Coordinating Committees representatives present supported the Yakama Nation's (YN's) proposal to extend coho trapping activities at Wells Dam from the traditional 3 days per week, 16 hours per day, to a modified 5 days per week, 9 hours per day, beginning September 27, 2014, and ending October 10, 2014, contingent upon: 1) ongoing monitoring of detection times of steelhead and fall Chinook at Rocky Reach Dam and Wells Dam; 2) an annual re-evaluation by the Coordinating Committees of the modified trapping operations during the initial years of implementation; and 3)

the YN providing a report to the Coordinating Committees summarizing trapping efforts with the modified operations (Item III-A).

REVIEW ITEMS

- Kristi Geris sent an email to the Coordinating Committees on January 10, 2014, notifying them that the draft Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan is available for review. Comments are due to Chelan PUD no later than Friday, January 31, 2014 (Item IV-B).

DOCUMENTS FINALIZED

- The Douglas PUD 2014 HCP Wells Action Plan that was approved by the Coordinating Committees on January 28, 2014, was finalized and distributed to the Coordinating Committees by Kristi Geris that same day (Item II-C).
- The Wells Dam 2014 Juvenile Fish BOP that was approved by the Coordinating Committees on January 28, 2014, was finalized and distributed to the Coordinating Committees by Kristi Geris that same day (Item II-D).

I. Welcome

Mike Schiewe welcomed the Coordinating Committees and asked for any additions or other changes to the agenda. The following revisions were requested:

- Tom Kahler added a Wells Hatchery Steelhead Broodstock update.
- Bryan Nordlund added a NMFS HCP Representation update.

A. Meeting Minutes Approval (Mike Schiewe)

The Coordinating Committees reviewed the revised draft December 17, 2013 conference call minutes. Kristi Geris said that all comments and revisions received from members of the Committees were incorporated in the revised minutes, and that there were no outstanding edits or questions to discuss. The Coordinating Committees members present approved the December 17, 2013 conference call minutes, as revised. Geris will finalize the meeting minutes and distribute them to the Committees.

II. Douglas PUD

A. Wells Hatchery Steelhead Broodstock Update (Tom Kahler)

Tom Kahler said that obtaining steelhead broodstock to compensate for the loss that was experienced last November has been challenging. He said that Wells Hatchery staff have been operating the Wells volunteer channel; however, the majority of fish observed have been natural origin. He said that given the current situation and after much discussion, Douglas PUD has decided to begin broodstock collection efforts by hook and line starting on January 29, 2014, in the Methow River. He said, in total, a little more than 180 steelhead are needed to fill required programs. He said, in addition to hook and line in the Methow, Douglas PUD also proposes to request from NMFS a modification of Permit 1395 that will allow trapping in the Wells fish ladders between February and April 2014 (with spring Chinook trapping already starting May 1, 2014). He said that approval from the Coordinating Committees will also be needed because the proposed activities relate to fish passage. He said that Douglas PUD would like to obtain Coordinating Committees approval prior to submitting the request to NMFS. He said the past 5 years of fish passage data at Wells Dam were reviewed, which indicated only steelhead passing during the proposed time period, with increasing steelhead detections during March. He added that broodstock collection efforts will also be ongoing at the Twisp Weir beginning in early March 2014, the surplus HO fish from which will be used for the Methow Safety-Net Program; however, it is not expected that trapping at the weir will collect enough steelhead for the full program. Additionally, trapping in the outfalls for the Methow and Winthrop National Fish Hatcheries will also occur.

Jim Craig asked what caused the loss of Wells steelhead broodstock. Kahler recalled that on November 17, 2013, Biomark was on site to passive integrated transponder (PIT)-tag fish, and treated water used to disinfect the tagging equipment was discharged to the parking lot where it ran into what hatchery staff believed to be a storm drain that was tied into the main drain of the hatchery; however, the drain led into the steelhead holding pond. Kahler said the drain was welded shut following the incident, and added that as part of the Wells Hatchery Modernization, HDR Engineering, Inc. (HDR), used ground-penetrating radar to locate all underground pipes, and they plan to reconstruct all hatchery plumbing.

Kahler summarized that Douglas PUD is requesting permission from the Coordinating Committees to trap outside their typical window, and then a formal request will be taken to NMFS for a permit modification. Kirk Truscott asked if, during Douglas PUD's review of passage data, they were able to distinguish between adipose fin (ad)-present and ad-clipped fish. Kahler said the proportion of the total run that passed during the proposed trapping period has not been calculated; however, he said in each year the number of ad-present fish was more than half the total passing in that period. He said, for example, that for 2012, approximately 508 fish passed Wells Dam between January 1 and April 30, 366 of which were ad-present, including some hatchery fish that were not ad-clipped.

Bryan Nordlund asked if Douglas PUD has consulted the HCP Hatchery Committees. Mike Schiewe said they have, and added that Mike Tonseth indicated that based on PIT-tag data, about 1,400 to 1,500 HO steelhead are between Rocky Reach Dam and Wells Dam; it is just a matter of determining how to obtain them. Truscott asked if Wells Hatchery Staff have considered running additional attraction flow in the volunteer channel, and Kahler said that he is not sure if they had tried it.

Kahler said the proposed trapping will be conducted using standard permit trapping protocols, which is 3 days per week, 16 hours per day, in both ladders at Wells Dam. He said that Douglas PUD would like for all broodstock collection options to be operating, including: 1) collection efforts in the Methow River (hook and line, Twisp Weir, hatchery outfalls); 2) the Colville Confederated Tribes' (CCT's) efforts at the Omak Weir and possibly at Wild Horse Springs; 3) Wells Hatchery outfall; and 4) trapping in the ladders at Wells Dam.

Schiewe asked the Coordinating Committees if they would be in support of Douglas PUD requesting the necessary permit modifications from NMFS in order to optimize chances of obtaining fish. Jeff Korth asked why Permit 1395 only covers trapping in the ladders at Wells Dam between July and November. Kahler explained that those dates were based on the historic WDFW trapping schedule at Wells Dam that focused on the peak of the run. He said that the new Permit 1395, which has yet to be issued, should include the late-winter/early-spring trapping at Wells and the Methow-specific and Okanogan-specific trapping locations to match the spawn-timing targets in the respective steelhead HGMPs, which he anticipated will result in a modification to those dates.

Truscott asked if there are data indicating about how many natural-origin (NO) steelhead pass Wells Dam during the period of proposed trapping. Kahler said that in 2011, a total of 377 steelhead passed Wells Dam, 277 of which were ad-present. Truscott recalled that data presented in the report "Assessment of Adult Steelhead Migration through the Mid-Columbia River using Radio-Telemetry Techniques, 1999-2000" (LGL Limited and BioAnalysts 2001), which Kahler distributed to the Coordinating Committees on January 27, 2014, indicated that trapping caused substantial delays in steelhead passage. He said considering those 2011 data, some NO steelhead could be impacted. Nordlund asked when broodstock collection at the different locations will commence. Kahler said trapping at the Twisp Weir will begin the first week of March. Truscott said broodstock collection will start at the Omak Weir once the ice melts, which he noted may be as early as mid-February this year. He added that the full broodstock target for the Okanogan Program is 58 steelhead including 42 HO fish and 16 NO fish. He said, as discussed by the HCP Hatchery Committees, due to highly variable collection efficiency in the Okanogan, the CCT plans to collect the full number of 58 broodstock from the Wells Hatchery volunteer channel to ensure the program is met.

Kahler acknowledged Truscott's concern of potentially impeding NO steelhead close to spawning; however, he also noted that there are five programs with basically no broodstock. He added that all of those programs will be at risk of being dramatically under-seeded. Truscott told Kahler he will further review the LGL Limited and BioAnalysts (2001) report, and will also review the percent of NO steelhead passing Wells Dam in late-winter/early-spring, in an effort to gain more insight into impacts on NO steelhead.

Schiewe said it seems that all efforts need to be started simultaneously, and the ladder traps should then be the first collection locations to stop when possible. Bob Rose questioned whether the impacts of delays are real or perceived impacts. He said that although he respects different opinions, he believes a slight delay may be less of an impact to steelhead than, for example, the stress a fish is put through with hook and line angling. He added that he believes the primary objective is to fill the programs, and a little bit of risk is worth doing that. Kahler said that the LGL Limited and BioAnalysts (2001) report evaluated passage on trapping days versus non-trapping days, and those data indicated definite delays. Rose acknowledged those data, but said the question is what the overall effect of those delays is. Nordlund said that from an Endangered Species Act (ESA) standpoint, delay is a form of take. He said that, as such, a conservative approach should be taken. He added that he also recognizes the importance of filling these programs, but delay in the main ladder should be a concern. Rose asked Nordlund how he would compare the effects of delay to the effects of hook and line angling. Nordlund said that angling is covered under a scientific collection permit. He also agreed with Rose that the hook and line method has adverse effects; however, he said he is unaware of any analyses that compare the two methods. He said that he is not implying he would not support trapping at Wells Dam, and added that he is more in support of the programs.

Truscott said the proposed trapping would operate about 43% of the time during the week, leaving the balance of the week for unimpeded passage. He said that the CCT supports this proposal. He added, however, that he would be interested in discussing a trapping schedule that would minimize the delays; for example, trapping consecutive days versus skipping a day in between trapping days. He said he recalls that between July and November, trapping success decreased with more consecutive days of trapping.

Korth asked if there is anything that can be done this year to help inform trapping in future years. Kahler said the step needed now is to get permission for these activities, and added that other considerations and details can be discussed later, as the actual trapping would not start until March 2014. Rose said that the YN supports Douglas PUD's request. Nordlund said that NMFS also supports the request, and added that he also likes Schiewe's suggestion to shut down the ladder traps first, when possible.

The Coordinating Committees representatives present supported Douglas PUD's request to NMFS to modify their existing Permit 1395 to allow trapping of HO steelhead at Wells Dam from February through April 2014 in order to fulfill steelhead broodstock obligations for various programs, with the stipulation that the Coordinating Committees are consulted regarding the trapping schedule during this extended time period.

B. PRESENTATION: HCP Coordinating Committees Extranet Site (Tom Kahler and Julene McGregor)

Tom Kahler said the Extranet platform was chosen as the new HCP document repository. He said the new repository is also in a location that can be accessed more directly by signatories to the HCPs. Mike Schiewe added that Chelan PUD has now agreed to house their HCP documents on the shared Extranet site, as well.

Julene McGregor, Douglas PUD Information Systems Staff, reviewed the HCP Coordinating Committee Extranet site help sheet (Attachment B) that Kahler handed out to the Coordinating Committees. She said that this help sheet provides instructions on how to access the HCP Coordinating Committee Extranet Site homepage. She emphasized the importance of the "s" following "http" in the URL that is needed to access the login page. She explained that from https://extranet.dcpud.net, non-Douglas PUD employees will need to select "Forms Authentication" from the drop down menu, which will bring up the username and password page. The username format is [<first name>.<last name>]. She said that following the meeting, each Coordinating Committees member will receive an email with a username and instructions for creating a password. She noted that this email is time-sensitive, but if the functions within the email expire before a password is set up, there is a "Forgot your password?" feature on the username and password page, as shown on Attachment B. She said that if at any time a password needs to be reset, selecting that hyperlink will cause another email to be distributed with instructions for resetting a password. After entering a username and password, a person should select "Sign In," which will bring up the Douglas PUD Extranet Site Homepage. *(Note: due to traveling schedules and the time-sensitivity of the password setup functions, it was later decided to postpone distributing emails with username and password instructions; the emails were distributed on February 3, 2014.)*

McGregor said that, from the Douglas PUD Extranet site homepage, a person should select "Natural Resources" from the left panel, and then from the Natural Resources homepage, select "HCP CC" from the left panel. This will bring up the HCP Coordinating Committee Extranet site homepage. The homepage includes a document block, which lists the most recently modified documents, and also a contacts list, which is located along the right margin of the homepage. A "Documents" menu is located along the left panel, which contains different views based on document type (i.e., action items, agendas, agreements, etc.). To view a document, a person should click on the document title and the file will open in a "read-only" format. McGregor noted that all views in the left panel are also located along the top of the columns above the document block. She said the column headers can be selected to sort files in ascending or descending order by name, and she also noted that the columns can be filtered (for example, by year). McGregor added that, in order to sort or filter a column, a person should hover the mouse over the column header and an arrow will appear; selecting this arrow will bring up the sort and filter options.

McGregor noted the "Find a file" search box located above the document block. She said by querying a keyword in this search box, all files within the current view will be searched. She also noted the "Search this site" box in the upper right corner of the site, which will search all documents in all views on the site. She said search results can be further filtered by document type, author, and modified date (located along the left panel of the "Search" page).

McGregor reviewed the "Document Drop," located along the left panel. She said this feature will now be used for submitting edits to meeting minutes in lieu of submitting revisions via email attachments. She said that, to edit meeting minutes, a person should first save the draft minutes to their hard drive. Once the draft minutes have been edited as needed, they will need to be uploaded back onto the Extranet site via the "Document Drop." This can be done via the "(+) new document" link or via the "Files" ribbon (i.e., "Upload Document"). She explained that documents uploaded to the "Document Drop" can only be viewed by her, Kristi Geris, and the person who uploaded the document. She said that Geris has an alert set up for the "Document Drop" that notifies her any time modifications are made to the "Document Drop," e.g., when a document is uploaded (these alerts can be set up for most folders, or views, on the site). Each document is linked to the user that uploads it, so Geris will know who uploaded each document. The "Document Drop" view also has an "Incorporated Edits" column. Once Geris incorporates edits from a particular document, she will change that column from "No" to "Yes" to indicate that those edits have been incorporated into the revised meeting minutes.

McGregor said that the Aquatic Settlement Work Group (SWG) and HCP Hatchery Committees Extranet sites are also up and running. She said that she will always be available to help, and also noted the "Help Documents" view located below the "Document Drop." She said that this view contains resources that help new users navigate the site, as well as instructions for creating personalized views.

Bryan Nordlund asked if all of the files saved on Anchor QEA's ftp site have been transferred to the HCP Extranet sites. Kahler said that they have except for Chelan PUD-specific documents. He explained that initially, Chelan PUD was unsure whether they wanted to use the Extranet site to house their HCP documents, so their documents were not uploaded to the site. He said now that Chelan PUD has decided to use the Extranet site as their HCP document repository, Geris is working with them to upload their documents, as needed.

Nordlund asked if anyone can upload documents to the Extranet site for others to view, and if the Coordinating Committees could agree to maintain the existing system of relaying documents through Geris for distribution (or rather, posting). McGregor said, for example, that Nordlund could upload a document to the Document Drop where Geris could retrieve it, modify the file title as needed, and upload the file in the appropriate view; and then notify the Coordinating Committees. She said that currently, the file size limit is set at 50 Mb, but that parameter can be adjusted, as needed.

Steve Hemstrom asked what the "Modified" column represents. McGregor explained that the "Modified" date indicates the last date a document was edited in any way, versus the "Created" date, which indicates when a document was uploaded to the Extranet site. She said that often these two dates are the same. She also noted that version history can be tracked on each document.

Hemstrom said that, in discussing the site with Keith Truscott, he had indicated that he would like for the site to be presented as a HCP site, rather than only a Douglas PUD site. Kahler said that Shane Bickford and Truscott have been discussing how to address this request.

Kahler said that when the HCP Hatchery Committees Extranet site was presented to the HCP Hatchery Committees, questions regarding access to the sites were raised. Specifically, the HCP Hatchery Committees requested access to final Coordinating Committees documents, as well. Kahler suggested allowing access to all final documents, as requested, but limiting access to draft documents to each respective HCP Committees. He further suggested housing all draft documents in the Document Drop and then securing the Document Drop to Committees members only. McGregor agreed that is a potential option, and also suggested creating a "Drafts Library" that only Committees members can access. Nordlund suggested handling draft documents in the traditional way (i.e., via email attachments), and added that this seems like an easier method for accessing documents than via the Extranet site. Bob Rose agreed with Nordlund, and suggested only posting final documents to the Extranet site. He added that if file size is the impetus for using the Extranet site as opposed to sending email attachments, then perhaps it makes sense to delineate a file size that determines whether a document is distributed via email or posted to the Extranet site.

Schiewe said that the real value of the Extranet site is to have the ability to search documents more efficiently. He said the other capabilities are just taking advantage of the SharePoint platform, but are not mandatory. Kahler noted that if email attachments continue to be implemented for draft documents, then he suggested revisiting the distribution lists. Rose said the lists should only include Committees representatives and alternates. Schiewe explained that the lists have grown due to requests from signatory parties to add additional staff members to the lists, and he agreed that the lists should be revisited. He also endorsed allowing all HCP Committees access to all final documents, and noted that if other staff members request to view a document or provide edits, they will need to coordinate with their respective HCP Committee representative to do so. He also noted that there will be certain exceptions to the distribution lists, for example, Bickford, Truscott, and other HCP Policy Representatives. Schiewe said that Anchor QEA will revisit the HCP email distribution lists and revise the lists consistent with Coordinating Committees' guidance.

Rose asked if HCP Hatchery Committees documents are also housed on the HCP Coordinating Committees Extranet site, and McGregor said that the HCP Hatchery Committees have their own Extranet site where their documents are housed. Kahler noted that the HCP Tributary Committee is the only HCP Committee that currently does not have a site. He noted that they are working on a site for the HCP Tributary Committee but chose to develop the Hatchery and Coordinating Committees' sites first since those Committees routinely use archived files and have requested easier access to those files, while no one on the Tributary Committee has shown similar interest in file archives.

C. DECISION: Douglas PUD 2014 HCP Wells Action Plan (Tom Kahler)

Tom Kahler said that the HCP Hatchery Committees and Tributary Committees approved their respective portions of the draft Douglas PUD 2014 HCP Wells Action Plan. He said that the HCP Hatchery Committee provided edits on the draft Action Plan, which were incorporated into the revised draft Douglas PUD 2014 HCP Wells Action Plan that was distributed to the Coordinating Committees by Kristi Geris on January 16, 2014.

Kahler reviewed the recent edits, including the addition of the installation of additional fish-counting work stations. He said that the action, "upgrades to the full-duplex and half-duplex PIT-tag detection system," was removed, and he added that those upgrades are now scheduled for the 2014/2015 maintenance period. He noted edits made to the HCP Hatchery Committees portion of the draft Action Plan, including the addition of a Hatchery and Genetic Management Plan (HGMP) section. He also noted the adjusted date for the Wells Hatchery Modernization Final Construction Drawings. He said that HDR is the firm that developed the designs, and they plan to discuss the 30% design drawings at a Wells Modernization Workshop being held following the HCP Hatchery Committees meeting on February 19, 2014, at Douglas PUD. He said that interested Coordinating Committees representatives could participate, and Mike Schiewe said that Anchor QEA will coordinate with Douglas PUD to ensure that Coordinating Committees representatives receive the access information needed to participate in the Wells Hatchery Modernization Workshop on February 19, 2014. Kahler said he will provide Nordlund with the Wells Hatchery Modernization 30% design drawings.

The Coordinating Committees representatives present approved the Douglas PUD 2014 HCP Wells Action Plan, as revised, and the Action Plan was finalized and distributed to the Coordinating Committees by Geris that same day (Attachment C).

D. DECISION: Douglas PUD 2014 Wells Dam Juvenile Fish BOP (Tom Kahler)

Tom Kahler said that the review period for the draft 2014 Wells Dam Juvenile Fish BOP and the draft 2014 Well Dam Gas Abatement Plan (GAP) ended on January 17, 2014, and no comments were received on either draft plan, and specifically, both Bryan Nordlund and Jim Craig noted via email (January 13, 2014, and January 16, 2014, respectively) that they had no comments on the 2014 GAP. He said that concurrent with the Coordinating Committees review of the draft 2014 BOP, the Aquatic SWG was also reviewing the draft 2014 GAP and Juvenile Fish BOP. He said that Pat Irle from the Washington State Department of Ecology provided comments to Andrew Gingerich on the draft 2014 GAP and BOP, which were forwarded to the Coordinating Committees by Kristi Geris on January 24, 2014. Kahler said that one revision to note is an update to the Wells Hydroelectric Project Spill Playbook that is appended to the draft 2014 Wells Dam GAP and BOP. He explained that during the past couple of years, concentrated spill was met using Spillbays 5 and 6 because unit 7 was being rebuilt. He said that when the 2014 Spill Playbook was initially developed, Douglas PUD planned to shift concentrated spill back to unit 7; however, now it does not appear that unit 7 will be ready. Therefore, a section in the Spill Playbook was edited to allow concentrated spill through Spillbays 5 and 6, or through unit 7 when it is ready.

The Coordinating Committees representatives present approved the Wells Dam 2014 Juvenile Fish BOP, as revised, and the plan was finalized and distributed to the Coordinating Committees by Geris that same day (Attachment D).

III. Douglas PUD and the Yakama Nation

A. *DECISION/DISCUSSION: Proposed Coho Trapping at Wells Dam (Tom Kahler, Tom Scribner, and Cory Kamphaus)*

Tom Scribner said the next phase of the YN Coho Program transitions from feasibility testing to a focus on natural production in the Methow, and a supplementation program that relies on obtaining returning adults. He said that up to this point, coho trapping has been accomplished in conjunction with other ongoing hatchery programs (Wells steelhead). However, with the new focus on supplementation, the YN can no longer obtain coho in conjunction with WDFW steelhead trapping in September and early-October, and will need to extend their (YN) trapping activities in the fall at some locations, and consider new trapping at additional locations. He said these are described in the Biological Assessment for the coho program.

Cory Kamphaus explained that the YN is proposing to modify trapping operations at Wells Dam from the traditional 3 days per week, 16 hours per day, to 5 days per week, 9 hours per day, for a certain period of time. He said that Tom Kahler raised the concern that this modified trapping schedule would cause delays in steelhead passage and indicated that the Coordinating Committee would need to approve of the proposed trapping because of the potential to affect passage of other Plan Species. Kamphaus said that their original request was to commence trapping on September 1, 2014, and to end trapping on October 10, 2014; this period was based on steelhead passage in 2004, and the estimated end of the coho run. He said that since that initial request, the YN has reviewed steelhead passage data from a 10-year period which indicate that, on average, coho do not pass Wells Dam until late-September. As a result, the YN has adjusted the modified trapping schedule to operate from September 27, 2014 through October 10, 2014, with the regular trapping schedule resuming after October 10, 2014. He said that according to the 10-year average, by September 27, about 70% of the steelhead run has passed Wells Dam, and 6% of the coho run has passed. By October 1, 80% of the steelhead run has passed Wells Dam, and 12% of the coho run has passed. He noted that the extended trapping is proposed after the majority of the steelhead run has passed the dam.

Kirk Truscott asked about summer and fall Chinook passage during this same period. Kamphaus replied that by September 27, 93% of the summer and fall Chinook run has passed Wells Dam, and by October 1, 93.5% of the run has passed; so almost the entire summer and fall Chinook run has passed Wells Dam by that time.

To evaluate potential effects of passage delays on steelhead, Kamphaus said he reviewed PIT-tag data for 2011 Priest Rapids returning adults, and filtered the results to steelhead detected at Wells Dam, as well as detected at the lower Methow instream array. He said a total of 175 steelhead were detected, 80% of which, after passing Wells Dam, remained in the Wells Reservoir and did not move into the Methow until the following spring; hence, the majority of those fish exhibited a mean overwintering residence time of 165 days. He said that for fall emigrants entering the Methow, the average travel time between Wells Dam and the Methow was only 19 days. Scribner asked about the origin of the PIT-tagged steelhead in this sample, and Kamphaus replied that those data appeared to be about two-to-one HO-to-

NO steelhead. He added that he is uncertain if that ratio is due to the Priest Rapids sampling protocol, or other reasons.

Bryan Nordlund asked if higher trapping efficiency is the reasoning behind the modified trapping schedule, and Kamphaus said that is correct. He added that there is uncertainty that enough adults will be collected with the current trapping schedule. He also noted that there are several unknowns with the shift in schedule, and that the modified trapping schedule will only be implemented as needed (i.e., the regular schedule will resume once enough coho are obtained). *(Note: Kamphaus later clarified that his use of the term "obtained" was in reference to bi-weekly quotas. He said, for example, if in a high escapement year, collection rates are good and goals are being met with fewer trapping days, then future collection days will continue to be minimized for the remainder of the season (i.e., broodstock collections will be managed to minimize impacts to listed fish.)* Nordlund noted that Kamphaus shared data for both September 27 and October 1, and asked if the YN is considering both dates as potential start dates for the modified schedule. Kamphaus said that the YN prefers to shift to the modified schedule on September 27, and that he only shared the October 1 data in case the Coordinating Committees had any major concerns with the earlier date. Jeff Korth suggested that while the modified trapping schedule is being implemented, the YN should track PIT-tags at Rocky Reach Dam and Wells Dam to monitor for significant changes in travel times between the dams. Nordlund agreed with this suggestion, particularly for fish destined for the upper river.

Kahler noted the larger than usual fall Chinook run that started passing Wells Dam in October 2013, peaked in late October, and tapered in November. He added that there were also higher numbers of NO steelhead than HO steelhead. He said he is unsure whether 2013 was an anomaly, but thought it was worthy to note. Kamphaus said he noticed this as well, and that 2013 was definitely a peak year for fall Chinook in the 10-year average.

Scribner noted that according to ESA standards, delay is a form of take. He asked if the Coordinating Committees have any concerns based on data that Kamphaus just presented. Jim Craig said data indicating that steelhead overwinter in the reservoir eases some of his concerns about possible delays and their effects. He asked if there should be concern for lamprey passage, and Kahler indicated that lamprey pass Wells Dam at night.

Bob Rose indicated support for the proposed modified trapping schedule. Nordlund said he also supports the proposed schedule, with a preference for starting the modified schedule at the more conservative start date of October 1. He added, however, that if passage at Rocky Reach Dam and Wells Dam is monitored, as Korth suggested, he would also support the earlier start date of September 27.

Kirk Truscott questioned the impacts of trapping longer versus shorter hours, and consecutive versus nonconsecutive days. He said he supports incorporating the modified trapping schedule in the Biological Opinion (BiOp), but with the provision that details of the trapping schedule (e.g., frequency) will be reviewed annually, and will be contingent upon Coordinating Committees approval. He added that the modified trapping schedule should be evaluated regularly to ensure the extended trapping is optimal for all resources. Mike Schiewe asked if Truscott is suggesting developing a "trigger," and he replied that regular Committees discussion should be adequate. Nordlund suggested holding a general trapping discussion each spring to lay out the plans for trapping that year.

Kamphaus said that with regards to monitoring, it will be important to know where each fish was tagged in order to understand their homing; otherwise, the daily counts could be misinterpreted because there is no guarantee that the fish was destined to pass Wells Dam. Nordlund asked how many fall Chinook were tagged above Wells Dam. Kahler and Lance Keller indicated that enough were tagged to support an analysis.

The Coordinating Committees representatives present supported the YN's proposal to extend coho trapping activities at Wells Dam from the traditional 3 days per week, 16 hours per day, to a modified 5 days per week, 9 hours per day, beginning September 27, 2014, and ending October 10, 2014, contingent upon: 1) ongoing monitoring of detection times of steelhead and fall Chinook at Rocky Reach Dam and Wells Dam; 2) an annual re-evaluation by the Coordinating Committees of the modified trapping operations during the initial years of implementation; and 3) the YN providing a report to the Coordinating Committees summarizing trapping efforts with the modified operations.

IV. Chelan PUD

A. Valid Study Flow Duration Curves (Steve Hemstrom)

Steve Hemstrom said that the numbers that were discussed at the last Coordinating Committees meeting were re-checked and verified. He said those data just need to be charted, which has not yet been completed. Bryan Nordlund asked if Chelan PUD planned to develop an SOA, and Hemstrom said that they can do so. He said that Chelan PUD will provide: 1) their new Valid Flow Duration Curves; 2) a brief summary describing the underlying data and the calculation methods used; and 3) a draft SOA memorializing the new Valid Flow Duration Curves, prior to the Coordinating Committees' meeting on March 25, 2014.

B. Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan (Lance Keller)

Lance Keller said that the draft Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan was distributed to the Coordinating Committees by Kristi Geris on January 10, 2014. He said no comments have been received on the draft Action Plan, and added that the Action Plan is similar to last year's. He noted that although pikeminnow ladder trapping has not been conducted in the past couple of years, like in the 2013 Action Plan, the activity will still be included in the 2014 Action Plan. He explained that in the past couple of years, the proposed activity has overlapped with the sockeye return; and a healthy return is again expected in 2014. He said, however, that if there is an opportunity to trap pikeminnow in the ladders, they will do so.

Bryan Nordlund asked what the difference is between the Bypass Operations Plan, the Passage Plan, and the Spill Plan. Keller said that the Bypass Operations Plan is specific to the Rocky Reach Juvenile Fish Bypass System, which also summarizes alternative operations implemented while Turbine Unit 2 (C2) goes down for maintenance (similar to last year when Turbine Unit 1 [C1] went down). He said that the Spill Plan outlines the spill level targets, durations, and analyses that will be completed, and the Passage Plan is a Federal Energy Regulatory Commission (FERC) license requirement and Clean Water Act Section 401 water quality certification requirement that is a summary of all three plans. He added that the Spill Plan is a part of the larger, all-encompassing Passage Plan. Keller said that these plans will be provided to the Coordinating Committees for review in the coming weeks.

Kirk Truscott asked where among the Coordinating Committees activities shown on the action plan the juvenile monitoring activity at the Rock Island Bypass is. Hemstrom said that activity is conducted from April 1, 2014, until August 31, 2014, and he said he will add that activity to the draft Action Plan, as requested. Truscott asked about the potential decrease in detection efficiency of the PIT-tag detection system at Rock Island. Both Hemstrom and Keller said they were unaware of this issue, and said that they will coordinate with Truscott to discuss it further.

Coordinating Committees representatives will provide edits and comments on the draft Chelan PUD 2014 Rocky Reach and Rock Island Action Plan to Chelan PUD no later than Friday, January 31, 2014. Chelan PUD will request approval of the draft Action Plan at the Coordinating Committees' meeting on February 25, 2014.

C. Rocky Reach Large Unit Repair Update (Lance Keller)

Lance Keller recalled Chelan PUD's action item from the Coordinating Committees' meeting on December 17, 2013, to check on the use of the Battelle Pacific Northwest National Laboratory (PNNL) turbine passage model to help inform the interim fix planned for the Rocky Reach Dam turbine units. He said that Steve Hemstrom followed up and concluded that a lot of additional modeling would be involved that would not fit the timeline needed to fix the turbines. He said that Chelan PUD held a conference call with Bryan Nordlund and the lead engineer developing the interim and long-term repairs, and there was a good discussion about why Chelan PUD chose the proposed operating angles with regards to unit integrity and fish concerns. Nordlund added that he understood that a lot of detail would need to be added to PNNL's models, and it seems the results would come out close to what Chelan PUD already determined in terms of cavitation; so he said that he supported what Chelan PUD proposed.

Keller said that the latest Rocky Reach Large Unit Repair Update (Attachment E) was distributed to the Coordinating Committees by Kristi Geris on January 24, 2014. He noted that Turbine Unit 9 (C9) returned to service in the temporary, fixed-blade mode. He said he received positive feedback from the lead engineer, saying that C9 was running quieter and more efficiently with the fixed-blade mode. He added that Turbine Unit 8 (C8) is currently dewatered and is scheduled to be back online by February 28, 2014.

D. Entiat Marina (Steve Hemstrom)

Steve Hemstrom said that he wanted the Coordinating Committees to be aware that the City of Entiat is proposing to construct a 65-slip public marina in the Rocky Reach Reservoir just upstream of the mouth of the Entiat River. He said that the proposed work involves dredging, pile driving, and excavation activities, among which is removal of about 101,700 cubic yards of material waterward of the 200-foot shoreline zone, including 24,400 cubic yards from below the high water mark. He added that a fuel dock is also proposed. The proposed work requires obtaining U.S. Army Corp of Engineers (USACE) permits, which also necessitates the development of a Biological Assessment (BA), which has already been completed. Hemstrom said that if permits are obtained, Chelan PUD will be required to apply for a FERC amendment because the marina is considered a non-Project-related modification and use, inside the project boundary. Hemstrom said that he wanted the Coordinating Committees to be aware of this work because of its potential impact on aquatic habitat.

Kirk Truscott asked where to locate information regarding this proposed work. Hemstrom said that he will determine what documentation is publically available regarding the City of Entiat's proposed development of the marina, and will provide those documents to the Coordinating Committees. Lance Keller added that the Joint Public Notice for the proposed marina is available online at http://www.ecy.wa.gov/programs/sea/fed-permit/pdf/201301049JPN.pdf. *(Note: Kristi Geris notified the Coordinating Committees on January 29, 2014, that the City of Entiat Marina BA is available for download from the ftp site.)*

V. NMFS

A. NMFS HCP Representation Update (Bryan Nordlund)

Bryan Nordlund said that he will provide an official letter designating the current NMFS HCP Committees representation (including alternates) to Kristi Geris for the administrative record. He said that following the consolidation and creation of the new NMFS West Coast

Region, Ritchie Graves has been designated the new NMFS Policy Representative for both the HCP and Priest Rapids Coordinating Committees. He said he will soon be transitioning Scott Carlon into the HCP Coordinating Committees to eventually take over as the new NMFS HCP Coordinating Committees Representative; and Justin Yeager will be Carlon's alternate. Nordlund said that Yeager will also be the new NMFS HCP Tributary Committees Representative. He said that Lynn Hatcher will continue to be the NMFS HCP Hatchery Committees Representative, with Craig Busack as his alternate. He said that he plans to bring Carlon and Yeager to a Coordinating Committees meeting in April or May 2014 to bring them up to speed regarding how the Committees work.

VI. Hatchery and Tributary Committees Update (Mike Schiewe)

Mike Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the last Tributary Committees meeting on January 9, 2014:

- *Review of Policies and Procedures Documents*: The Tributary Committees reviewed the Policies and Procedures for Funding Projects and the Tributary Committees Operating Procedures. There were no recommendations to modify the existing policies and procedures although they did discuss possible willingness to accept applications under the General Salmon Habitat Program at any time during the year, although they would also still participate an annual funding cycle in coordination with the Salmon Recovery Funding Board process.
- *Twisp River-Poorman Creek Wetland Acquisition Budget Amendment*: The Methow Salmon Recovery Foundation submitted a budget modification request. The Wells Tributary Committee concluded that they cannot approve the request because the project has changed significantly from its original scope. The approved funding was for an acquisition, and the project has now shifted to a conservation easement. The Wells Tributary Committee elected to terminate the Twisp River-Poorman Creek Wetland Habitat Acquisition Project. However, they indicated that they would review a new proposal seeking money to help fund habitat enhancements on the properties.
- *Douglas PUD 2014 HCP Wells Action Plan*: The Wells Tributary Committee reviewed and approved the Douglas PUD 2014 HCP Wells Action Plan for the Wells Tributary Committee.

Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the last HCP Hatchery Committees meeting on January 15, 2014:

- *Non-Target Taxa of Concern (NTTOC) Report Update*: Conducting a NTTOC study is an element under the Hatchery M&E Program to evaluate the potential effects of supplementation programs on non-target species. A risk model developed by Craig Busack and Todd Pearsons was used to evaluate potential interactions, and then it was suggested that an expert panel would review those data and develop a report. However, there were complications with the modeling that could not easily be fixed; so with as many model runs as possible, Greg Mackey agreed to take the lead on compiling the runs and coordinating with the Hatchery Evaluation Technical Team (HETT) to develop a report. Once drafted, the HETT will present the draft report to the Hatchery Committees for review, at which point it will be decided whether further actions are needed. Bill Gale raised the issue of whether this evaluation should include facilities used in the supplementation programs, particularly with regards to Tumwater Dam. He said that there appear to be potential effects of Tumwater Dam on the distribution of lamprey, and Gale was wondering how to pursue that topic. He plans to confer with RD Nelle about the appropriate venue at which to present the topic, as lamprey typically are addressed under the Rocky Reach Fish Forum, and not the HCP.
- *DECISION: Douglas PUD 2014 HCP Wells Action Plan*: The Hatchery Committees representatives present approved the hatchery portion of the Douglas PUD 2014 HCP Wells Action Plan, as revised.
- *Wells Hatchery Steelhead Broodstock Update*: The Hatchery Committees had a similar discussion as occurred in today's Coordinating Committees meeting. They support taking the measures necessary to acquire broodstock and get all programs back on track.
- *Methow Hatchery Spring Chinook Early Maturation Sampling*: The Hatchery Committees discussed Grant PUD's early maturation studies on spring Chinook salmon. The evaluation involves a visual test of the gonads to see if the fish are on track to mature early. The Hatchery Committees representatives present approved

Douglas PUD's request to sacrifice 300 Methow Hatchery spring Chinook juveniles to be used in the study.

- *DECISION: Extension Request for the Wenatchee Relative Reproductive Success (RRS) Study*: Washington Department of Fish and Wildlife (WDFW) requested an extension of the Wenatchee RRS Study, which has been ongoing for about a decade, to an end date of 2018. The study is funded by the Bonneville Power Administration, and is being conducted in coordination with NMFS. The Hatchery Committees representatives present approved the extension request, contingent on incorporation of edits that were agreed to by the HCP Hatchery Committees.
- *Section 8.3.2 of the Hatchery Monitoring and Evaluation (M&E) Plan*: The Hatchery Committees discussed a section of the Hatchery M&E Plan about measuring gonad somatic indices. Within WDFW, there are apparently different opinions regarding the protocol for measuring gonadal mass. Mike Tonseth will develop a draft protocol for measuring fecundity at size for Hatchery Committees review.
- *DECISION: Sockeye M&E Implementation Plan (Addendum)*: A decision was made 2 years ago to end the Lake Wenatchee Net Pen Sockeye Program based on disappointing sockeye return data. Those data indicated that the program was basically mining returning adults, and it was not achieving replacement. Following the recalculation of hatchery programs, Chelan PUD agreed to continue some M&E activities, and this addendum outlines what those activities will entail. Chelan PUD is coordinating with WDFW and the YN to refine the document for Hatchery Committees review.
- *Spring Chinook HGMP Discussion*: The final edits on Chelan PUD's draft Spring Chinook HGMP will be discussed during a conference call on February 6, 2014. A key component of this HGMP is defining how broodstock will be collected for the program.
- *2014 Rocky Reach Trap Pilot Study Proposal*: Chelan PUD is including in their spring Chinook HGMP the Rocky Reach Trap as a potential broodstock collection option. On January 29, 2014, Biomark will begin the process of installing a sort-by-code system at the trap to increase trap efficiency. There are also a number of improvements being installed, including: 1) replacing the solid trap door with a grated or perforated trap door; 2) adding underwater lighting; 3) installing an electrical control pendent to give the two operators the opportunity to operate the door

depending on visibility; 4) painting the trap floor white; and 5) installing additional cameras. The Hatchery Committees' role is to determine whether the correct brood is being collected, per the protocol. There is the question of whether there are enough PIT-tagged Chewuch spring Chinook; a total of 38 adults are needed for Chelan PUD's program. There is also the opportunity for adult management with adult strays impacting the Entiat.

- *HGMP Update*: Lynn Hatcher provided an update on permitting. Most new permits are expected to be completed by early-summer 2014. The second priority is to complete permitting for the non-listed species, which is expected to be addressed in fall 2014.
- *Coho Trapping under the YN HGMP and Future BiOp*: The Hatchery Committees had a similar discussion as occurred in today's Coordinating Committees meeting. They support helping the YN acquire the appropriate brood; however, the issues of fish passage and potential delays are the purview of the Coordinating Committees.

VII. HCP Committees Administration

A. Next Meetings (Mike Schiewe)

Mike Schiewe said that the next scheduled Coordinating Committees meeting is February 25, 2014, to be held by conference call. The March 25, 2014, and April 22, 2014 meetings will be held either by conference call or in person at the Radisson Hotel in SeaTac, Washington, as is yet to be determined.

List of Attachments

Attachment A	List of Attendees
Attachment B	HCP Coordinating Committee Extranet Site Help Sheet
Attachment C	Final Douglas PUD 2014 HCP Wells Action Plan
Attachment D	Final Wells Dam 2014 Juvenile Fish BOP
Attachment E	Rocky Reach Large Unit Repair Update

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris†	Anchor QEA, LLC
Steve Hemstrom*†	Chelan PUD
Lance Keller*	Chelan PUD
Tom Kahler*	Douglas PUD
Julene McGregor††	Douglas PUD
Jim Craig*	U.S. Fish and Wildlife Service
Bryan Nordlund*	National Marine Fisheries Service
Jeff Korth*	Washington Department of Fish and Wildlife
Kirk Truscott*†	Colville Confederated Tribes
Bob Rose*	Yakama Nation
Tom Scribner†††	Yakama Nation
Cory Kamphaus†††	Yakama Nation

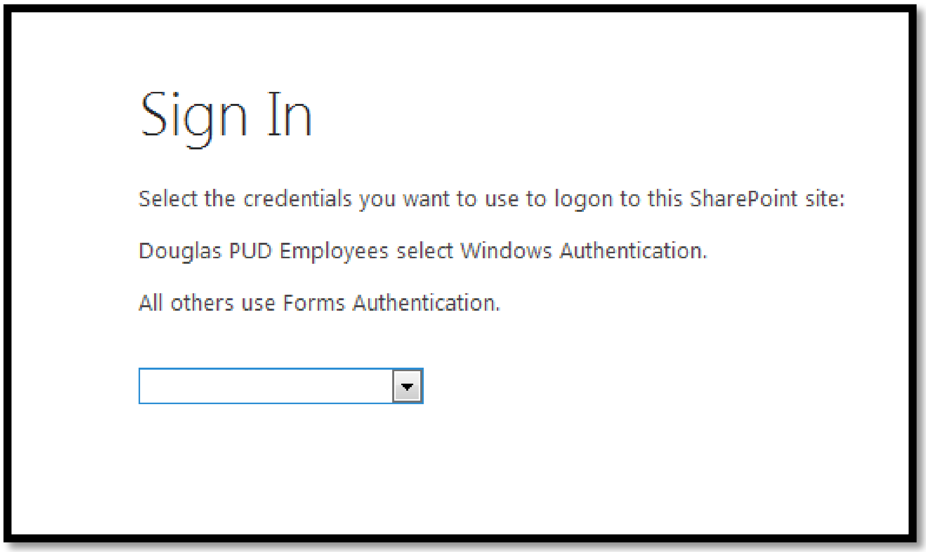
Notes:

* * Denotes Coordinating Committees member or alternate
* † Joined by phone
* †† Joined by phone for the HCP-CC Extranet Site discussion
* ††† Joined by phone for the Coho Trapping discussion

HCP Coordinating Committee Extranet site

Site URL: https://extranet.dcpud.net

Select Forms Authentication on the Initial Sign In page.



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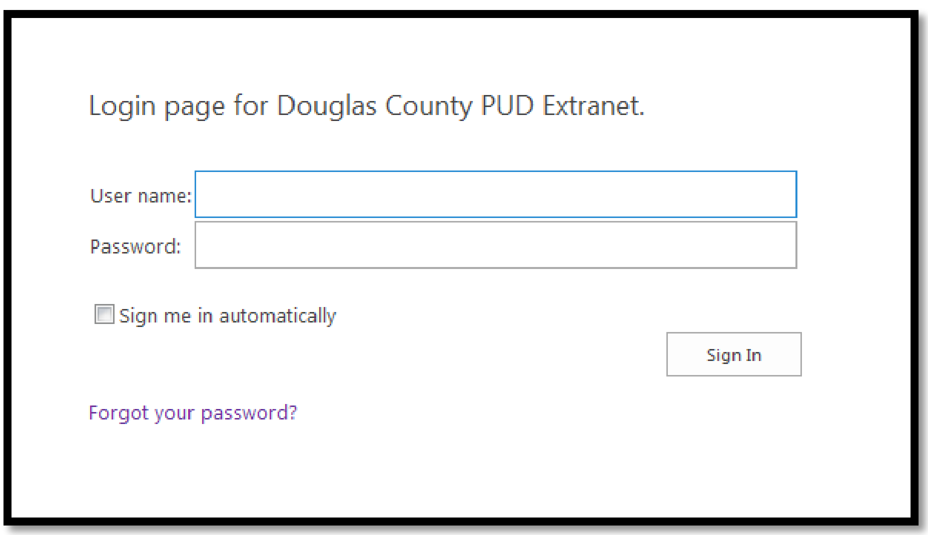

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FINAL 2014 ACTION PLAN
WELLS HCP

WELLS HCP COORDINATING COMMITTEE

1. **Juvenile Fish Bypass Plan**
   a. Draft to Coordinating Committee (CC) ....November 2013
   b. CC comments to DCPUD .... January 2014
   c. Submit to FERC for approval .... February 2014
   d. Draft report to CC .... October 2014

2. **Pikeminnow Control Program**
   a. Draft 2013 pikeminnow report to HCP CC .... January 2014
   b. Final 2013 pikeminnow report integrated into HCP Annual Report .... March 2014
   c. Pikeminnow removal – Wells Project.................... March – November 2014
   d. Draft 2014 pikeminnow report to DCPUD .... January 2015

3. **Sub-yearling Chinook Life-history Study**
   a. Monitor fish tagged in 2011-2013 study years .... through adult returns
   b. 2011-13 draft report and presentation to CC .... April 2014
   c. 2011-13 final report .... June 2014
   d. Weekly sampling for size and availability of run-at-large fish.................... May-July 2014

4. **Annual Monitoring of Juvenile Migration Run Timing**
   a. 2014 Skalski analysis of index data from RR .... September 2014
   b. 2014 draft of Skalski's report to DCPUD.................... September 2014
   c. 2014 final report presented to CC .... October 2014

5. **Fish Passage and Count-station Maintenance**
   a. Remove lamprey ramp from count station in the west ladder .... December 2013
   b. Remove lamprey ramp from count station in the east ladder .... January 2014
   c. Replace fish-count DVRs and cameras.................... January-April 2014
   d. Install additional fish-counting work stations.................... January-April 2014
   e. Improve count-window lighting and background.................... January-April 2014

6. **Fishway Outage Schedule for Fishway Inspection, Maintenance, and Fishway Projects**
   a. West Fishway....................December 10, 2013 – January 16, 2014
   b. East Fishway ....January 21 – February 27, 2014

7. **Lamprey Passage and Enumeration Study**
   a. Draft report.................... February 2014
   b. Final report.................... April 2014

8. **HCP Annual Report**
   a. Draft 2013 annual report to DCPUD for review..January 15, 2014
   b. Draft 2013 annual report to CC for 30-day review..................................February 10, 2014
   c. CC comments due to Anchor QEA...March 10, 2014
   d. Final 2013 annual report to DCPUD ....March 26, 2014
   e. Final 2013 annual report due to FERC ....March 31, 2014

9. **Fishway Operations for Lamprey Passage**
   a. Temporary modifications to collection-gallery head-differential.....................August 2014

WELLS HCP HATCHERY COMMITTEE

1. **Implement 5-year Hatchery Monitoring and Evaluation (M&E) Plan**
   a. Ongoing implementation ....January – December 2014
   b. Draft annual report for 2013 to Douglas PUD... June 2014
   c. Draft annual report to Hatchery Committee (HC) .... August 2014
   d. Final annual report to HC ....October 2014
   e. Draft 2015 implementation plan to HC ....July 2014
   f. HC approval of final 2015 implementation plan .... September 2014

2. **2014 Broodstock Collection Protocol**
   a. Draft to HC: .... March 2014
   b. Deadline for submission to NMFS: .... April 2014
   c. Implementation: ....May 2014 to April 2015

3. **Annual Implementation – Okanagan Sockeye Fish/Water Management Tools**
   a. Period covered: .... Water Year 2013-2014 (October – September)
   b. Water Year 2012-2013 Report and Presentation to HC: .... September 2014

4. **Methow Steelhead Relative Reproductive Success Study**
   a. Implementation: .... March 2010 - December 2021
   b. Annual report on genetic analysis:... September/October 2014
   c. Biological data in Annual M&E Report (above): ....October 2014
   d. Final report:... 2021/2022

5. **Hatchery Genetic Management Plans**
   a. Receive new Methow spring Chinook hatchery permit....................................... June 2014
   b. Receive new Wells steelhead hatchery permit...July 2014
   c. Receive new Wells summer Chinook hatchery permit.................................... August 2014

6. **Wells Hatchery Modernization**
   a. 30% Design to Douglas PUD .... December 2013-January 2014
   b. Workshop for HC input on 30% Design... February 2014
   c. Final Construction Drawings .... September 2014
   d. Provide updates to the HC ....Monthly
   e. Request for Bids.. *contingent upon FERC approval*

WELLS HCP TRIBUTARY COMMITTEE

1. **Plan Species Account Annual Contribution**
   a. $176,178 in 1998 dollars (estimated $252,427 2013 dollars).......................... January 2014

2. **Annual Report - Plan Species Account Status**
   a. Draft to Tributary Committee (TC): .... January 2014
   b. Approval deadline:... February 2014
   c. Period covered: ....January to December 2013

3. **2014 Funding-round – General Salmon Habitat Program**
   a. Request for project pre-proposals: .... *To be determined* (typically in March)
   b. Pre-proposals to TC: .... *To be determined* (typically in early May)
   c. Tours of proposed projects: ....*To be determined* (typically in late May)
   d. Project sponsor presentations to TC: .... *To be determined* (typically in early June)
   e. Final project proposals to TC:..............................*To be determined* (typically in late June)
   f. RTT project rating decisions:............................. *To be determined* (typically in early July)
   g. Supplemental sponsor presentations, as necessary ....*To be determined*
   h. TC final funding decisions:......................... *To be determined* (typically before December)

4. **Small Project Program**
   a. Project review and funding Decision..January – December 2014

Wells Hydroelectric Project
Final 2014 Juvenile Fish Bypass Operating Plan

Approved 28 January 2014

Operation of the bypass system throughout the 2014 season will follow the criteria contained within the Wells Dam Juvenile Dam Passage Survival Plan (Wells Juvenile Bypass Plan) found in Section 4.3 of the Wells HCP. The goal of the Wells Juvenile Bypass Plan is to provide bypass operations for at least 95 percent of both the spring and summer migration of juvenile plan species.

From 2004 through 2011, the timing of the implementation of bypass operations was based upon an analysis of 21 years of hydroacoustic and 14 years of species-composition data collected on juvenile run patterns at Wells Dam. From the data available to the Wells HCP Coordinating Committee in February 2004, they agreed that initiation of the Wells bypass system on April 12th and termination on August 26th would conservatively provide bypass operations for more than 95% of both the spring and summer migrations of juvenile Plan Species.

In 2011, Columbia Basin Research performed an analysis using seven years of passage data obtained from daily sampling at the Juvenile Sampling Facility of the Rocky Reach Juvenile Fish Bypass System to more accurately estimate the contemporary percentage of the migration of spring and summer migrants that passed during bypass operations at Wells Dam. From that analysis, the Wells HCP Coordinating Committee adjusted the starting and ending dates for bypass operations at Wells Dam, moving the starting date three days earlier to April 9 to cover early-migrating natural-origin spring Chinook, and moving the ending date seven days earlier to August 19 to more accurately reflect the contemporary passage timing of the sub-yearling Chinook outmigration. Thus, for 2012 and 2013, bypass operations at Wells Dam commenced at 00:00 on April 9 and ended at 24:00 hours on August 19. For accounting purposes, the end of the 2012 spring bypass season was June 13th at 24:00 hours and the beginning of the summer bypass season was June 14th at 00:00 hours.

Upon completion of the 2012 and 2013 bypass seasons, Columbia Basin Research updated the original analysis that supported the decision by the Wells Coordinating Committee to adjust the dates of bypass operations. The updated analysis determined that the dates of bypass operations at Wells Dam in 2012 and 2013 provided bypass passage during 98 to 100 percent of the migrations of all plan species. Based upon this high level of compliance with the HCP bypass operating criteria (exceeding the 95% bypass-passage criteria for the migrations of all plan species), Douglas PUD proposes to commence operation of the bypass system in 2014 starting at 00:00 on April 9 and to end operations at 24:00 hours on August 19.

Dam safety emergency action planning, as required by the Federal Energy Regulatory Commission (FERC), calls for Douglas PUD to operate Wells Dam with sufficient automatic-gate-opening capacity in the spillways to pass the flow from a plant load rejection of up to 200 thousand cubic feet per second (kcfs), in addition to any concurrent initial spillway discharge. Of the 11 spillways at Wells Dam, only spillways 3 through 9 have automated gate hoists. Thus, the seasonal installation of bypass barriers in spillways 2, 4, 6, 8 and 10, substantially reduces the automatic-gate-opening capacity of Wells Dam by reducing the capacity of each bypass spillway to 8.6 kcfs. Consequently, Douglas PUD must remove bypass barriers systematically when discharge-volume estimates exceed certain thresholds, as per Table 1, sufficient to provide the necessary automatic-gate-opening flow capacity as described in the FERC-required Emergency Action Plan for the Wells Project (EAP, Appendix I). Decisions to remove bypass barriers for dam safety considerations will be made each Monday (or at other times as necessary) during the bypass period and will be based on weekly forecasts of combined discharge from Chief Joseph Dam and side-flows from the Okanogan and Methow rivers (from the National Weather Service Northwest River Forecast Center [NWRFC]; http://www.nwrfc.noaa.gov/stp/stp.cgi).

Table 1. Schedule for removal of spillway flow-barriers (bypass barriers) to accommodate flood flows and load rejections.

Inflow Forecast (kcfs)	Bypass Barriers Removed
Up to 200	None
200 – 240	Spillway 6
240 – 275	Spillways 6, 8
275 – 310	Spillways 4, 6, 8
310 – 350	Spillways 4, 6, 8, 10, & preset gates 10, 11 to spill excess of 312 kcfs
350 – 400	Spillways 4, 6, 8,10, & preset gates 1, 10, 11 to spill excess of 312 kcfs
400 – 450	All spillways (2, 4, 6, 8, 10)

Juvenile Fish Bypass Operations and Clean Water Act TDG Compliance

Seasonal bypass operations generally coincide with the spring freshet, an event during which operators of hydroelectric projects must cope with flows that often exceed the hydraulic capacity of their powerhouses. When flows exceed the hydraulic capacity of the generating units, project operators must pass water via the spillway in what is termed “involuntary spill.” Involuntary spill increases the concentration of atmospheric gases in the water below hydroelectric projects, and can result in excessive levels of total dissolved gas (TDG) that may injure fish. To minimize the potential for fish injury, the Washington Department of Ecology (WDOE) imposes TDG standards on operators of hydroelectric projects.

Extensive study of spill operations at Wells Dam and modeling exercises at the University of Iowa provide the basis for the development of annual spill “playbooks” for operations at Wells Dam aimed at achieving the WDOE standards for TDG in the Wells tailrace. From modeling and physical-spill studies over the past several years, Douglas PUD has determined that concentrating spill through the middle of the spillway and supporting that concentrated spill with turbine discharge results in the most effective minimization of TDG in the Wells tailrace. Specifically, the best TDG performance is achieved when concentrating involuntary spill through Spillway 5, and allocating additional spill, beyond the capacity of Spillway 5, to Spillway 6 and then to Spillway 7, up to a maximum of 43 kcfs per spillway. If Turbine Unit 7 is not operational, additional spill would be allocated to Spillway 4 rather than Spillway 7.

To accomplish this TDG-minimizing pattern of concentrated spill requires the removal of the bypass barriers from at least one spillway during periods with excessive involuntary spill. The removal of the bypass barriers from one spillway takes approximately eight hours and requires the use of a four-man mechanical crew and the powerhouse gantry cranes. To comply with the

TDG standards below Wells, the bypass barriers must be removed from at least one spillway whenever involuntary spill exceeds 30 kcfs and one or both of the following conditions applies: 1) prolonged (> 8 hours) involuntary spill in excess of 40 kcfs is predicted (based on forecasted tributary inflows from the NWRFC and estimated discharge from Chief Joseph Dam provided by the US Army Corps of Engineers); or 2) total spill is predicted to exceed 53 kcfs, regardless of duration. Once involuntary spill of less than 40 kcfs, for a period of at least four days is predicted, the respective bypass barriers would be reinstalled. At river flows greater than 240 kcfs, bypass barriers would be removed from additional bypass bays as described above (see Table 1) and reinstalled sequentially as appropriate.

Juvenile Fish Bypass Contingency Plan

Following the failure of a gate-hoist cable in a bypass spillway at Wells Dam in late August 2010, Douglas PUD developed a contingency plan for bypass operations during a failure of a bypass gate or other such accident or unanticipated mechanical failure that rendered impossible normal bypass operations. High river discharge in 2011 and 2012 led to the incorporation of provisions for the management of TDG into the Bypass Contingency Plan in 2013. The 2014 Bypass Contingency Plan continues the provisions of the 2013 Bypass Contingency Plan, as described below.

Section 4.3 of the Wells HCP directs Douglas PUD to shut down the turbine units adjacent to the bypass spillway that is not operating due to either a lack of water or an inability to operate the bypass spillway. Under the 2014 Bypass Contingency Plan, if shutting down the turbines would not threaten compliance with TDG standards, Douglas PUD would shut down the associated turbine units. However, if doing so would threaten compliance with TDG standards, Douglas PUD would not shut down the associated turbines but would instead direct spill through spillways adjacent to the affected turbine units in a manner that provides bulk flow for fish passage while minimizing TDG (Figure 1, Option 1). Douglas PUD would consult the Spill Playbook (see above) to select such spill configurations, and would spill at least 10 kcfs through selected spillways to engage the submerged flip-lip as a TDG minimization measure and to provide bulk flow for fish attraction to the surface passage route. In circumstances where turbine shutdown would not jeopardize TDG compliance, Douglas PUD would shut down the associated turbine units to evaluate and repair the malfunction, but may then elect to move the bypass barriers from the inoperable bypass spillway to an adjacent, non-bypass spillway to obtain the use of an additional turbine unit (see Figure 1, options 2 and 3). The gate for that substitute bypass spillway would then be set at the standard 1-foot opening for bypass spillways and the adjacent turbine unit could be operated without constraints. This configuration would meet the intent of HCP Section 4.3 by providing bypass spill immediately adjacent to every operating turbine unit and would comply with the goal of the Total Dissolved Gas Abatement Plan.

During the repair of a bypass malfunction, Douglas PUD would daily reevaluate forecasts of Chief Joseph Dam discharge, tributary inflows, and TDG conditions, as well as repair progress, and determine which bypass option to implement as per Figure 1.

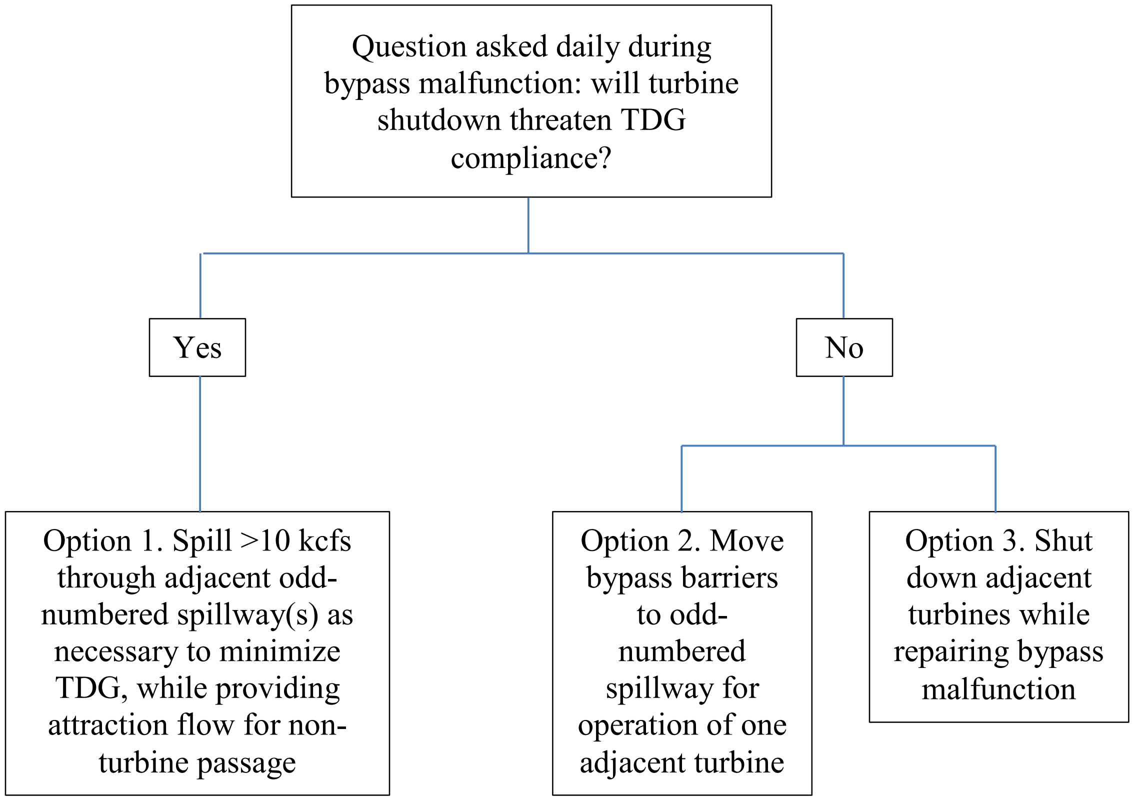
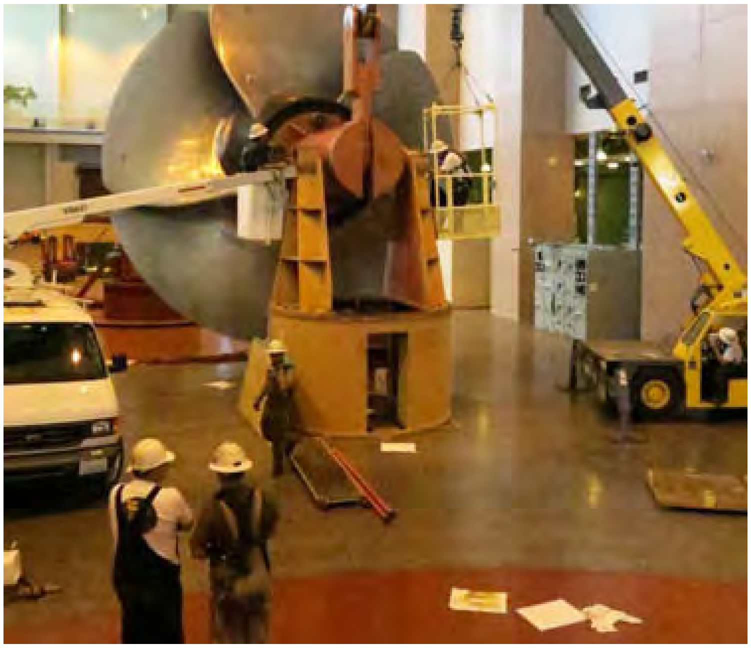


Figure 1. Evaluation flow chart for daily decisions regarding bypass, spill, and turbine operations during a bypass malfunction.

Fact sheet

Rocky Reach Large Unit Repair

Jan. 20, 2014



- March 2013 – Unit C-10 is taken out of service due to the appearance of oil around the generator shaft and metal shavings were found in a strainer;
- August 2013 – C-6, not one of the large generating units, was taken out of service for planned rotor maintenance;
- Sept. 23, 2013 – Units C-8, C-9, and C-11 were taken out of service when a crack was found in the rod on Unit C-10 that operates the servo motor. All four generating units have the same design; and the C-10 design issues are likely present in units C-8, C-9, and C-11;
- Dec. 5 - Unit C-6 was returned to service two weeks ahead of schedule. This allowed for additional generation during a high demand period with energy prices in the $80 - $90/MWh range;
- Dec. 27 – Unit C-11 was returned to service more than a month ahead of schedule.
- Jan. 20 - Unit C-9 returned to service in the temporary, fixed-blade mode;
- Unit C-8 is scheduled to have a temporary, fixed blade repair and be brought back online by Feb. 28, 2014;
- Unit C-10 is scheduled to return to service by April 30, 2014 with an interim fixed blade repair similar to the other large units;
- The operating angle for the fixed blades on units C8-11 is approximately 31 degrees or full steep position. The blade angle was selected to be the most efficient at full turbine flow (23 kcfs) on the unit curve, which is also the safest position. Performance and stability testing on C-11 helped in determining the proper angle for the remaining units;
- It is the District's desire to eventually restore all four units to Kaplan (variable pitch blade) service. The final repair schedule for returning C-8 - C-11 to the desired Kaplan condition is currently planned through the spring of 2019 and is variable dependent on fabrication and delivery of repair components.

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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Coordinating Committees	**Date:**	March 25, 2014
From:	Michael Schiewe, Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the February 25, 2014 HCPs Coordinating Committees Conference Call		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met by conference call on Tuesday, February 25, 2014, from 9:30 am to 11:30 am. Attendees are listed in Attachment A of these meeting minutes.

ACTION ITEM SUMMARY

- Chelan PUD will provide: 1) their new Valid Flow Duration Curves; 2) a brief summary describing underlying data and the calculation methods used; and 3) a draft Statement of Agreement memorializing the new Valid Flow Duration Curves, prior to the Coordinating Committees' meeting on March 25, 2014 (Item I-B).
- Bryan Nordlund will provide an official letter designating the current National Marine Fisheries Service (NMFS) HCP Committees representation (including alternative representation) to Kristi Geris for the administrative record (Item I-B).
- Chelan PUD will provide an official letter designating the current Chelan HCP Committees representation (including alternative representation) to Kristi Geris for the administrative record (Item II-B).
- Chelan PUD will investigate the feasibility of operating only two of the three Rocky Reach Attraction Water System Turbine Pumps (Pumps A, B, and C) in the event that one pump is inoperable, while still maintaining the 1.0-foot head differential, as well as determining how to execute the most efficient in-season repair, if needed (Item II-D).
- Chelan PUD will provide the 2013 Rocky Reach and Rock Island Bypass Reports to Kristi Geris for distribution to the Coordinating Committees by Friday, February 28, 2014 (Item II-E).

- Coordinating Committees representatives will consider developing criteria for terminating Rocky Reach Juvenile Fish Bypass (RRJFB) operations during tests of September extended operations *(Note: normal operation ends August 31)* (Item II-F).
- Chelan PUD will analyze the past 10 years of RRJFB fish passage data to determine whether there are any correlations between the final weeks of fish passage and water year flow conditions (Item II-F).
- Coordinating Committees representatives will submit edits and comments on the draft 2014 Chelan PUD RRJFB Operations Plan and the draft 2014 Chelan PUD Rock Island Bypass Monitoring Plan to Chelan PUD prior to the Coordinating Committees meeting on March 25, 2014, when Chelan PUD will be requesting approval of the draft plans (Item II-F).
- Coordinating Committees representatives will contact Jeff Korth if they, or someone in their respective agency, are interested in participating in the upcoming information meeting regarding New Zealand mud snails (Item IV-A).

DECISION SUMMARY

- The Coordinating Committees representatives present approved the Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan, as revised (Item II-A).

AGREEMENTS

- The Coordinating Committees representatives present agreed to extend the 2013/2014 winter maintenance work period at Rocky Reach Dam by 13 days to allow more time to complete required work; rather than the typical March 1 start date, the Rocky Reach Fish Ladder will be fully operational on March 14, 2014 (Item II-D).

REVIEW ITEMS

- Kristi Geris sent an email to the Coordinating Committees on February 14, 2014, notifying them that the draft 2013 Wells HCP Annual Report is available for a 30-day review with comments due to Anchor QEA no later than March 17, 2014.

- Kristi Geris sent an email to the Coordinating Committees on February 20, 2014, notifying them that the draft 2013 Rocky Reach and Rock Island HCP Annual Reports are available for a 30-day review with comments due to Anchor QEA no later than March 19, 2014.
- Kristi Geris sent an email to the Coordinating Committees on February 24, 2014, notifying them that the draft 2014 Chelan PUD RRJFB Operations Plan and the draft 2014 Chelan PUD Rock Island Bypass Monitoring Plan are available for review. Comments are due to Chelan PUD prior to the Coordinating Committees meeting on March 25, 2014, when Chelan PUD will be requesting approval of the draft plans (Item II-F).

DOCUMENTS FINALIZED

- The Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan was finalized and distributed to the Coordinating Committees by Kristi Geris on February 25, 2014 (Item II-A).

I. Welcome

Mike Schiewe welcomed the Coordinating Committees and asked for any additions or other changes to the agenda. The following revisions were requested:

- Lance Keller added an update on the Rocky Reach Large Unit Repair.
- Tom Kahler added an update on Wells Dam Ladder Maintenance.
- Jeff Korth added brief discussions regarding: 1) New Zealand mud snails; and 2) a Washington Department of Fish and Wildlife (WDFW) Public Disclosure Request.

A. Meeting Minutes Approval (Mike Schiewe)

The Coordinating Committees reviewed the revised draft January 28, 2014 meeting minutes. Kristi Geris said that there were two outstanding comments to discuss, including one comment regarding Douglas PUD's and the Yakama Nation's (YN's) joint discussion on proposed coho trapping at Wells Dam. Geris indicated that Tom Kahler requested clarification on a comment made by Cory Kamphaus about the duration of the trapping schedule. The Coordinating Committees recommended that Geris contact Kamphaus for clarification. Kamphaus clarified via email following the meeting that when he indicated that the regular trapping schedule would resume once enough coho are obtained, he said his use of the term "obtained" was in reference to bi-weekly quotas. He said, for example, if in a high escapement year, collection rates are good and goals are being met with fewer trapping days, then future collection days will continue to be minimized for the remainder of the season (i.e., broodstock collections will be managed to minimize impacts to listed fish). This clarification was incorporated into the January 28, 2014 meeting minutes.

The other comment was regarding the NMFS' HCP representation update. Kahler had requested confirmation of the committees to which Ritchie Graves was designated as the new NMFS Policy Representative. Bryan Nordlund clarified that Graves was designated the new NMFS Policy Representative for the HCP and Priest Rapids Coordinating Committees (not the HCP and Priest Rapids Fish Forum committees). This revision was also incorporated into the January 28, 2014 meeting minutes.

Geris said that all other comments and revisions received from members of the Committees were incorporated in the revised minutes. The Coordinating Committees members present approved the January 28, 2014 meeting minutes, as revised. Geris will finalize the meeting minutes and distribute them to the Committees.

B. Action Items (Mike Schiewe)

Action items from the last Coordinating Committees meeting on January 28, 2014, and follow-up discussions were as follows: *(Note: italicized item numbers below correspond to agenda items from the January 28, 2014 meeting.)*

- *Anchor QEA will revisit the HCP email distribution lists and revise the lists consistent with Coordinating Committees' guidance (Item II-B).*
  Mike Schiewe said that this process is still underway. He said most HCP Coordinating Committees and Hatchery Committees Representatives and Alternates, and HCP Policy Representatives, now have access to the Extranet sites. He added, however, that a few formal designations are still needed. He also noted that a process is now in place to control access to the Extranet sites. He explained that if access to

the sites is requested by someone who is not a HCP Representative or Alternate, access first needs to be approved by the HCP Coordinating Committees.

- *Anchor QEA will coordinate with Douglas PUD to ensure that Coordinating Committees representatives receive the access information needed to participate in the Wells Hatchery Modernization Workshop on February 12, 2014 (Item II-C).*
  Access information was provided to the Coordinating Committees.
- *Tom Kahler will provide Bryan Nordlund with the Wells Hatchery Modernization 30% design drawings (Item II-C).*
  The drawings were provided to Nordlund.
- *Chelan PUD will provide: 1) their new Valid Flow Duration Curves; 2) a brief summary describing the underlying data and the calculation methods used; and 3) a draft Statement of Agreement memorializing the new Valid Flow Duration Curves, prior to the Coordinating Committees' meeting on March 25, 2014 (Item IV-A).*
  Lance Keller indicated that this task is underway as planned.
- *Chelan PUD will add to their draft Chelan PUD 2014 Rocky Reach and Rock Island Action Plan "Juvenile Monitoring Activities at the Rock Island Bypass" from April 1, 2014 until August 31, 2014, as requested (Item IV-B).*
  The activity was added, as requested.
- *Coordinating Committees representatives will provide edits and comments on the draft Chelan PUD 2014 Rocky Reach and Rock Island Action Plan to Chelan PUD no later than Friday, January 31, 2014 (Item IV-B).*
  This will be discussed during today's conference call.
- *Chelan PUD will request approval of the draft Chelan PUD 2014 Rocky Reach and Rock Island Action Plan at the Coordinating Committees' meeting on February 25, 2014 meeting (Item IV-B).*
  This will be discussed during today's conference call.
- *Steve Hemstrom will determine what documentation is publically available regarding the City of Entiat's proposed development of a 65-slip public marina, and will provide those documents to the Coordinating Committees (Item IV-D).*
  Materials were provided.

- *Bryan Nordlund will provide an official letter designating the current NMFS HCP Committees representation (including alternative representation) to Kristi Geris for the administrative record (Item V-A).*
  Nordlund indicated that the letter is forthcoming, and explained that it is still undergoing internal review.

II. Chelan PUD

A. Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan (Lance Keller)

Lance Keller said that "Juvenile Monitoring Activities at the Rock Island Bypass" was added to the draft Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan, as requested, and a revised draft Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan was distributed to the Coordinating Committees by Kristi Geris prior to the conference call on February 25, 2014. He said that no other comments were received on the draft Action Plan. Mike Schiewe reminded the Coordinating Committees that the Action Plan is not a requirement; rather, it is a concise summary of activities planned for the upcoming year. He noted that the HCP Hatchery Committees approved the hatchery portion of the Action Plan at their meeting on February 19, 2014. The Coordinating Committees representatives present approved the Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan, as revised, and the final Action Plan (Attachment B) was distributed to the Coordinating Committees by Geris following the conference call on February 25, 2014.

B. Chelan PUD HCP Coordinating Committees Representation Update (Keith Truscott)

Keith Truscott said that Chelan PUD management recently re-evaluated the Natural Resources Group and its programs with the intent to manage internal staff and their responsibilities in an equal fashion, and balance workload based on maturity of implementation cycles. As a result, Lance Keller will now be the Chelan PUD HCP Coordinating Committees Representative, and Steve Hemstrom will continue to support the Coordinating Committees as the Chelan PUD HCP Coordinating Committees Alternate. Truscott thanked Hemstrom for his leadership and for his key role in assisting Chelan PUD in achieving No-Net-Impact for Plan Species over the past several years. Mike Schiewe and Coordinating Committees representatives also thanked Hemstrom for his contributions to the Coordinating Committees. Truscott said that Chelan PUD will provide an official letter designating the current Chelan HCP Committees representation (including alternative representation) to Kristi Geris for the administrative record.

C. Chelan PUD 2014 Spill Coordinator Update (Keith Truscott)

Keith Truscott said that, also as a result of the recent re-evaluation of the Chelan PUD Natural Resources Group, Thad Mosey, Chelan PUD Fisheries Biologist, will now provide Spill Management support to Lance Keller, Steve Hemstrom, and the Coordinating Committees.

D. Rocky Reach and Rock Island Adult Fishway Maintenance Update (Lance Keller)

Lance Keller provided the following updates on 2013/2014 Rocky Reach and Rock Island Adult Fishway maintenance efforts:

<u>Rock Island</u>

Right Ladder

Keller reminded the Coordinating Committees that each year at Rock Island Dam, a more extensive, comprehensive inspection and overhaul is performed on one of the three fish ladders, and that this year, it was the right ladder. He said the right ladder was taken out of service on December 2, 2013, and was back in service on February 1, 2014. He recalled last summer when sockeye salmon entered the dead-water space adjacent to the right bank fishway via a bowed vane in the auxiliary water system picket-barrier. He said that Rock Island Dam engineers inspected the system and reinforced the weaker areas as a temporary fix. He said Rock Island Dam engineers are now working on a long-term fix that is planned to be implemented during the 2014/2015 winter maintenance outage.

Left Ladder

Keller said that the left ladder was taken out of service on January 2, 2014, and was back in service on January 24, 2014. He recalled the structural issue that was discovered and repaired in the concrete floor associated with the attraction flow regulating gates during the 2012/2013 fishway maintenance period. He said those repairs were inspected and are still in good shape.

Middle Ladder

Keller said that the middle ladder was taken out of service on January 27, 2014, and was back in service on February 3, 2014. He said the inspection was positive, and noted that some debris was removed from the ladder.

Rocky Reach

Keller said that the Rocky Reach Ladder was taken out of service on January 2, 2014, for the annual maintenance and inspection. He said that during the inspection, an issue was discovered with the attraction water system turbine pumps, and now Rocky Reach Central Maintenance (CM) Staff are requesting an extension of the fishway outage to complete required work. He explained that the Rocky Reach Attraction Water System has three turbine pumps: Pump A, Pump B, and Pump C. He said that CM Staff discovered parts that are close to failing, and that may fail during the 2014 season. He said that both Pump A and Pump C are on the verge of failing, Pump A needs a new actuator rod, and Pump C needs a whole new shaft. He said that parts for Pump C arrived yesterday, and parts for Pump A should arrive within the next couple of days; Pump B will also need a new actuator rod. He said that CM Staff are requesting to extend the fishway outage from February 28, 2014, to March 10, 2014, which would put the ladder back in service by March 14, 2013 (opposed to the typical March 1 in-service date).

Bryan Nordlund asked if this will affect the water supply to all ladder entrances at Rocky Reach, and Keller replied that it would. He said that the CM Staff's inspection indicated that the repair work needs to be performed with the ladder completely dewatered. He added that Chelan PUD did consider other options, including placing the ladder back in service on March 1, as usual, and then taking it down for maintenance at another time. He added, however, that they would prefer not to do that. Nordlund agreed, and said that NMFS supports the requested extension. Jim Craig said the U.S. Fish and Wildlife Service (USFWS) also supports the requested extension. Jeff Korth and Kirk Truscott both agreed that fixing the issue now is preferable to fixing it later. Truscott asked what the contingency plan would be if Chelan PUD had to make a pump repair during critical times of fish passage. Keller said he believes that all three pumps do not need to be running to maintain the required 1.0-foot head differential; however, running only two pumps puts excessive wear and tear on those units. Steve Hemstrom added that the idea is to spread the duties among the three pumps so that none of them need to be working at their maximum potential. He said if one pump came out of service, the remaining two pumps would need to be running at a very high level. Nordlund said it was his understanding that there would be difficulties meeting the 1.0-foot head differential criteria if a pump failed. Keller said that Chelan PUD has never experienced this issue, so CM Staff are developing an annual inspection plan to help identify problems and hopefully reduce the likelihood of an in-season failure. He said that Chelan PUD will also investigate the feasibility of operating only two of the three Rocky Reach Attraction Water System Turbine Pumps (Pumps A, B, and C) in the event that one pump is inoperable, while still maintaining the 1.0-foot head differential, as well as determining how to execute the most efficient in-season repair, if needed. Nordlund asked how long an outage would be if a repair was needed in-season, and Keller said with parts in hand, it would take about 1 week.

The Coordinating Committees representatives present agreed to extend the 2013/2014 winter maintenance work period at Rocky Reach Dam by 13 days to allow more time to complete required work; rather than the typical March 1 start date, the Rocky Reach Fish Ladder will be fully operational on March 14, 2014.

E. 2013 Rocky Reach and Rock Island Bypass Reports (Lance Keller)

Lance Keller said that Chelan PUD will provide the 2013 Rocky Reach and Rock Island Bypass Reports to Kristi Geris by Friday, February 28, 2014, for distribution to the Coordinating Committees for their review.

F. 2014 Rocky Reach and Rock Island Bypass Operations Plans (Lance Keller)

Lance Keller said that Kristi Geris sent an email to the Coordinating Committees on February 24, 2014, notifying them that the draft 2014 Chelan PUD RRJFB Operations Plan and the draft 2014 Chelan PUD Rock Island Bypass Monitoring Plan are available for review. He noted that the 2014 RRJFB Plan is similar to last year's plan, including employing the same alternative RRJFB Surface Collector (SC) Operations during the Turbine Unit 2 (C2) outage as were approved for the Turbine Unit 1 (C1) outage in April 2013. Keller recalled that during the C1 outage last year, to increase attraction flow, three additional pumps were used in the RRJFB SC, and the soft limit on C2 was also increased from its normal set-point of 12,200 cfs (12.2 thousands of cubic feet per second [kcfs]) to 15.2 kcfs. He said these same alternative operations will be implemented in July 2014.

Keller said that both the Rocky Reach and Rock Island HCPs include a requirement that additional run-timing information and species composition monitoring shall be conducted once every 10 years in order to verify that a significant component (greater than 5%) of the juvenile emigration is not present outside the normal bypass operating period (April 1 through August 31), and to verify that the operations established by the Coordinating Committee are adequately protecting 95% of the spring and summer migrations of juvenile Plan Species (Rocky Reach HCP Section 5.4.1b, Rock Island HCP Section 5.4.1a). Keller said that, for now, 'to be determined' language is included in both draft plans. He said that during a typical season, annual maintenance begins immediately following the bypass season; he noted that running bypass operations for an additional month will impact that. He said that Chelan PUD is interested in developing criteria to address the HCP requirement, while also establishing when to terminate bypass operations within reason (e.g., if only one or two fish are passing the dam). Coordinating Committees representatives agreed to consider such criteria for terminating RRJFB operations during tests of September extended operations. Mike Schiewe asked if Chelan PUD is using the program RealTime (developed by John Skalski and the University of Washington), and Keller replied that they are. He added that the program projects few fish at the end of August, and extremely low probability that the run will continue into September.

Keller said that another factor to consider is what type of water year is expected for 2014 (i.e., what impacts a low water year would have on outmigration timing). Steve Hemstrom noted that during a low-flow year, a larger portion of water enters the bypass than during a normal-flow year. He added that, historically, this has artificially inflated the counts compared to a year with less flow going through the bypass. He suggested that any additional monitoring may be best implemented during a "valid" flow year, if the Coordinating Committees believe different water year flow conditions affect outmigration timing. Bob Rose asked if the inverse is true (would a high water year be undercounting?). He suggested evaluating available data to determine proportionality in terms of flow. Bryan

Nordlund noted that to conduct this analysis, high, medium, and low water year data would be needed, as well as proportion of collected fish under the different conditions, for multiple species; he asked if those data are available. Hemstrom said that fish guidance efficiency correlations at varying flows have not been calculated. Schiewe noted that the past 10 years of data include a variety of flow years, and Hemstrom said that Chelan PUD will analyze the past 10 years of RRJFB fish passage data to determine whether there are any correlations between the final weeks of fish passage and water year flow conditions. Nordlund asked if the 10-year interval stipulated in the HCPs is set for 2014, or if the Coordinating Committees can defer the monitoring to, for example, 2015, due to river conditions. Hemstrom said the HCPs do not include any such language, but Schiewe noted that the Coordinating Committees have the flexibility to defer actions based on consensus.

Keller clarified that the existing shutdown criteria is for spill, and the bypass typically shuts down each year on August 31 at midnight. Hemstrom further clarified that the criteria for spill shutdown are as follows: 1) the program RealTime estimates 95% of the total migration is complete; and 2) when subyearling index counts from the juvenile bypass sampling facility are 0.3% or less of the cumulative run for 3 out of any 5 consecutive days. He said if spill is shut down prior to August 31, the bypass continues to operate until August 31 at midnight. Nordlund said that another factor to consider is how spill shutting down may affect the bypass, and Hemstrom noted that some effects have been observed in the past.

Keller said that, ultimately, Chelan PUD is seeking a recommendation from the Coordinating Committees on when to shut down the bypass during the 2014 season during the extended September operation. Nordlund said that this year, he would prefer not to focus on when to shut down the bypass; rather, he suggested focusing on collecting data to inform how to address operation in future years. Hemstrom also noted that unlike previous years, this year, Chief Joseph Hatchery will be releasing subyearling Chinook salmon, which may affect bypass counts.

Keller said that bypass operations will begin April 1, 2014, so Chelan PUD will be requesting approval of the draft 2014 Chelan PUD RRJFB Operations Plan and the draft 2014 Chelan PUD Rock Island Bypass Monitoring Plan at the Coordinating Committees meeting on

March 25, 2014. Coordinating Committees representatives agreed to submit edits and comments on the draft plans to Chelan PUD prior to the March meeting.

G. Rocky Reach Large Unit Repair Update (Lance Keller)

Lance Keller said that Turbine Unit 8 (C8) is now back in commercial operation, which means that C8, Turbine Unit 9 (C9), and Turbine Unit 11 (C11) are all fully operational in the fixed blade configuration. He said that repair work continues on Turbine Unit 10 (C10), which is expected back by April 10, 2014.

III. Douglas PUD

A. 2014 Trapping at Wells (Tom Kahler)

Tom Kahler said that Douglas PUD's annual meeting with those who plan to trap at Wells Dam in 2014 is planned for April 2014. He said that prior to the annual meeting, Douglas PUD will meet with WDFW on March 20, 2014, to discuss the 2014 trapping season. He said that Douglas PUD would prefer to hold their meetings after the distribution of the draft 2014 Broodstock Protocols, and Mike Schiewe noted that Mike Tonseth is drafting them now and plans to distribute them 10 days prior to the next HCP Hatchery Committees meeting scheduled for March 19, 2014. Kahler said that 2014 Wells Dam trapping activities include collection of spring Chinook salmon and steelhead, among others. He said he recently received an email inquiry from Jeff Fryer regarding what information the Coordinating Committee needed to decide on the Columbia River Inter-Tribal Fish Commission's annual request for tagging sockeye at Wells Dam. Kahler recalled that the Coordinating Committees had requested that submittal of future requests for sockeye tagging be in time for inclusion in the March meeting agenda, so he said he is anticipating Fryer's request soon.

B. Wells Dam Ladder Maintenance Update (Tom Kahler)

Tom Kahler said that the Wells Dam west ladder was taken out of service on December 11, 2013, and was back in service on January 29, 2014. He said the Wells Dam east ladder was taken out of service on February 4, 2014, and is expected to be back in service by the end of February 2014. He said the lamprey ramp that was believed to be causing difficulties with fish counting (upstream down-ramp) was removed during the west ladder outage, and the same removal will be performed in the east ladder. Jim Craig asked if the ramps will be reinstalled in September, and Kahler replied that they will not due to the possible fish behavioral issues they were causing and the observation that they provided no benefit for lamprey.

IV. WDFW

A. New Zealand Mud Snails (Jeff Korth)

Jeff Korth said that WDFW Field Personnel have positively identified New Zealand mud snails in the Hanford Reach. He said the species was identified this year, from a core sample collected in September 2013; and added that two snails were found in the core sample. He said that WDFW is scheduling a meeting with stakeholders, including Grant PUD, the Colville Confederated Tribes (CCT), and the YN. He said the purpose of the meeting will be to discuss the detection of the species and the invasive risks associated with detection of the species, as well as response actions and recommendations for other entities. He said he wanted the Coordinating Committees to be aware of the meeting in case any members, or anyone they know, would be interested in attending the meeting. Coordinating Committees representatives agreed to contact Korth if they, or someone in their respective agency, are interested in participating in the upcoming information meeting regarding New Zealand mud snails.

Mike Schiewe asked what risks are associated with detection of this species, and asked if there is any expectation that the species may move upriver. Korth said that the last detection of New Zealand mud snails was in Lake Umatilla. He added that four or five were also detected in the lower river, and one was detected in the Snake River; therefore, the detections are slowly moving upriver. He said New Zealand mud snails are not like zebra mussels and quagga mussels, but they are still an ecosystem risk. He said they coat the entire bottom of a stream, and added that they have also been detected in the Puget Sound Basin in Capital Lake, near Olympia, and in other locations.

B. Public Disclosure Request (Jeff Korth)

Jeff Korth said that WDFW received a Public Disclosure Request (PDR) and Intent to Sue from the Wild Fish Conservancy. He said both involve providing the past few years' of internal and external communications regarding steelhead, including emails, plans, notes, and other related documents. He said the schedule for an initial response to the PDR is mid-April 2014, and added that Committees members should contact him with questions. Kirk Truscott asked what the Intent to Sue was about, and Korth said he believes it is centered on Puget Sound steelhead hatchery operations permitting, but they are requesting information from all over the state. Mike Schiewe asked if NMFS is also subject to this request, and Bryan Nordlund said he is unaware of any such request.

V. Hatchery and Tributary Committees Update (Mike Schiewe)

Mike Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the last HCP Tributary Committees meeting on February 18, 2014:

- *Review of Policies and Procedures Documents*: The HCP Tributary Committees agreed to allow project sponsors to submit General Salmon Habitat Program (GSHP) proposals at any time during the year (previously, acceptance of submittals was limited to a certain part of the year).
- *Salmon Recovery Funding Board and Tributary Committees Funding Schedule*: Although the new policy allows project sponsors to submit GSHP proposals at any time, the Tributary Committees will continue to coordinate with the Salmon Recovery Funding Board proposal process.
- *Annual Deposits to the Plan Species Accounts*: The amount deposited into each account at the end of January 2014 is as follows: Rock Island $698,905; Rocky Reach $331,015; and Wells $253,775. The unallocated amount within each account at the end of January 2014 is as follows: Rock Island $4,074,020; Rocky Reach $1,745,241; and Wells $1,228,313.
- *Rocky Reach and Rock Island 2014 Draft Action Plans*: The Tributary Committees approved the Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan.
- *Appraisal Process*: The Tributary Committees cover the cost of the appraiser, but it was not clear if they also cover the cost of the review; a project sponsor asked if the Tributary Committees cover the cost of appraisal reviews, and the Tributary

Committees confirmed that they cover both the cost of the appraisal and the cost of the review (using the Tributary Committees' appraisers for both).

- *Next Steps*: The next Tributary Committees meeting will be on Thursday, March 13, 2014.

Schiewe said that the HCP Hatchery Committees met on the morning of February 19, 2014, for their monthly meeting, and the Wells Hatchery Modernization Workshop was held in the afternoon to review the 30% design drawings for the Wells Hatchery Modernization. He said that a number of small items were discussed at the workshop, and added that at the 30% design stage, there is still the opportunity to make changes. He also added that changes can be incorporated up until the 60% design stage. Bryan Nordlund said that he had no major concerns based on his understanding of the plan, but did have a few questions. Schiewe suggested contacting Greg Mackey with questions. He then updated the HCP Coordinating Committees on the following actions and discussions that occurred at the last HCP Hatchery Committees meeting on February 19, 2014:

- *Chelan PUD 2014 Sockeye Monitoring & Evaluation (M&E) Implementation Plan*: Following the termination of the Lake Wenatchee Net Pen Sockeye Program, Chelan PUD committed to continued M&E for Wenatchee sockeye salmon; this plan outlines these plans. The HCP Hatchery Committees approved the Chelan PUD 2014 Sockeye M&E Implementation Plan.
- *Chelan PUD Methow Spring Chinook Hatchery and Genetic Management Plan (HGMP)*: The Chelan PUD Methow Spring Chinook HGMP addresses Chelan PUD's plan for meeting their 61,000 spring Chinook smolt obligation. The draft HGMP had been under development for a couple of years, and now the final draft HGMP is almost ready for Hatchery Committees review. The Hatchery Committees agreed to consider approval of the draft HGMP via email by February 28, 2014. Much of the discussion has been about the collection of broodstock, as collection no longer takes place at Methow Hatchery. Chelan PUD is investigating the option to collect broodstock at the Rocky Reach Trap. Additional Passive Integrated Transponder-tag arrays and a separation-by-code system are being installed to better anticipate and trap a target fish. The separation-by-code system will contain a library of codes for target fish. Although this year will be an additional pilot year, target fish that are

collected will be retained for broodstock. The second tier of broodstock collection will be tributary-based collection, similar to what Grant PUD conducted in Nason Creek. This collection method is only temporary. Chelan PUD is still evaluating how to collect the needed 38 fish for their program in future years. They have also reopened discussions with Douglas PUD for possible options. Chelan PUD is also considering the potential uses of the Rocky Reach Trap beyond obtaining broodstock, including for adult management of strays from the Chiwawa Program. The trap does not appear to pose run-timing or passage blockage because it is manually operated when target fish are detected. Chelan PUD is also determining how many fish would need to be marked to obtain ample broodstock at the trap.

- *Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan*: The Hatchery Committees representatives present approved the Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan.
- *Wells Hatchery Steelhead Broodstock Update*: In November 2013, 178 of the 200 Wells steelhead broodstock were lost when disinfectant was accidently dumped into the steelhead holding pond at Wells Hatchery. The Hatchery Committees and Coordinating Committees have investigated options to trap in the Wells Dam fish ladder beginning in March 2014, as well as intensify trapping in the Wells Dam volunteer channel, angling in the Methow, and the CCT's collection efforts in the Okanogan. Collection efforts have only produced about eight fish to date, but Wells Hatchery and WDFW staff are anticipating more beginning in March 2014.
- *Broodstock Protocols*: WDFW is working on these; a draft will be available for review prior to the Hatchery Committees meeting on March 19, 2014.
- *Non-target Taxa of Concern Update*: Greg Mackey indicated that the draft report is complete and being reviewed by the Hatchery Evaluation Technical Team, a subgroup of the Hatchery Committees. The draft report will then go to the Hatchery Committees for final review and a decision on a path forward. Mackey indicted that, for the most part, no interaction exceeded the established containment levels.
- *HGMP Update*: NMFS provided an update on the HGMP process. A number of tasks will be finished by spring 2014. At this point, summer and fall Chinook salmon are the lowest priority, and are anticipated to be addressed in fall 2014. NMFS and

USFWS are holding a Biological Opinion Coordination Meeting on March 10, 2014, to further discuss finalizing the HGMPs.

- *Incidental Take*: Questions regarding the assignment of Incidental Take are also planned to be discussed at the Biological Opinion Coordination Meeting on March 10, 2014. The question of who is responsible for accounting for take—the operators of a facility or owners of the facility—has been a topic of concern. This is an important issue, particularly for the PUDs, because if take is attached to the operation of their hydroelectric project, then someone else's activities that exceed the authorized take could trigger re-initiation of consultation and affect dam operation.

VI. HCP Committees Administration

A. Next Meetings (Mike Schiewe)

Mike Schiewe said that the next scheduled Coordinating Committees meeting is March 25, 2014, to be held in person at the Radisson Hotel in SeaTac, Washington. The April 22, 2014 and May 27, 2014 meetings will be held either by conference call or in person at the Radisson Hotel in SeaTac, Washington, as is yet to be determined. Schiewe added that the Coordinating Committees may want to consider holding the May or June meeting in eastern Washington, as is traditionally done.

List of Attachments

Attachment A	List of Attendees
Attachment B	Final Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Keith Truscott†	Chelan PUD
Steve Hemstrom*	Chelan PUD
Lance Keller*	Chelan PUD
Tom Kahler*	Douglas PUD
Jim Craig*	U.S. Fish and Wildlife Service
Bryan Nordlund*	National Marine Fisheries Service
Jeff Korth*	Washington Department of Fish and Wildlife
Kirk Truscott*	Colville Confederated Tribes
Bob Rose*	Yakama Nation

Notes:
* Denotes Coordinating Committees member or alternate
† Joined for the Chelan PUD HCP Coordinating Committees Representation Update and Chelan PUD 2014 Spill Coordinator Update

Attachment B

2014 Rocky Reach and Rock Island
HCP Action Plan ***Final***

COORDINATING COMMITTEE

Timeline columns: Jan 2014, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec (days 1, 15, 31 / 1, 15, 29 / 1, 15, 31 / 1, 15, 30 / 1, 15, 31 / 1, 15, 30 / 1, 15, 31 / 1, 15, 31 / 1, 15, 30 / 1, 15, 31 / 1, 15, 30 / 1, 15, 31)

Activity	Start	End
Deliver 2013 RR Bypass Evaluation Report	D (Feb 1)	F (Mar 15)
Deliver 2014 RR Bypass Operations Plan	D (Feb 1)	F (Mar 31)
Deliver 2013 RI Bypass Evaluation Report	D (Feb 1)	F (Mar 31)
Deliver 2014 RIS Bypass Operations Plan	D (Feb 1)	F (Mar 15)
Pikeminnow long-line control programs	S (Feb 1)	C (Nov 30)
Pikeminnow angling control programs	S (May 1)	C (Oct 15)
Avian Predation programs	S (Apr 1)	C (Aug 31)
Piscivorous Bird Monitoring and Report	S (Apr 1)	C (Dec 31)
Northern Pikeminnow Ladder Trapping RI/RR	S (Jun 1)	C (Aug 31)
Deliver 2014 RI/RR Fish Passage Plan	D (Feb 15)	F (Mar 15)
Deliver 2014 RR/RI Spill Plan	D (Mar 1)	F (Apr 1)
Deliver 2014 RR/RI Spill Report	D (Sep 15)	F (Oct 15)
RR 9% Summer Spill	S (Jun 1)	C (Aug 15)
RI 10% Spring Spill	S (Apr 15)	C (Aug 15)
RI 20% Summer Spill	S (Jun 1)	C (Aug 15)
RR Juvenile Fish Bypass Operations	S (Apr 1)	C (Sep 15)
RI Juvenile Bypass Trap Operations	S (Apr 1)	C (Sep 15)
2013 HCP Annual Report	D (Mar 1)	F (Apr 1)

HATCHERY COMMITTEE

Timeline columns: Jan 2014, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec (days 1, 15, 31 / 1, 15, 29 / 1, 15, 31 / 1, 15, 30 / 1, 15, 31 / 1, 15, 30 / 1, 15, 31 / 1, 15, 31 / 1, 15, 30 / 1, 15, 31 / 1, 15, 30 / 1, 15, 31)

Activity	Start	End
2013 Hatchery M & E Report	D (Mar 15)	F (Jun 1)
2015 Hatchery M & E work plans	D (Jul 1)	F (Sep 1)
Steelhead Reproductive Success Study (Analysis and Fir	→ Ongoing	F (Dec 31)
Dryden Water Quality Monitoring (Year 3)	S (Mar 1)	C (May 1)
Summer Chinook Size Target Study (Year 2)	→ Ongoing	
Chelan Hatchery Raceway Rehab - Part 2	S (Jun 15)	C (Aug 15)
Chiwawa Acclimation Facility Office Rehab	→ Ongoing	
Eastbank Hatchery Office Rehab	→ Ongoing	
Chelan Hatchery Rehab	S (Feb 1)	
Eastbank Well Pump Motor VFD	→ Ongoing	C (Jul 1)
Rocky Reach Trap Pilot	S (Jun 15)	C (Jul 15)
Hatchery Program Broodstock Collection	S (May 1)	C (Dec 15)
Hatchery Releases	S (Apr 15)	C (May 1)

TRIBUTARY COMMITTEE		**Jan 2014**			**Feb**			**Mar**			**Apr**			**May**			**Jun**			**Jul**			**Aug**			**Sep**			**Oct**			**Nov**			**Dec**	
Activity	**1**	**15**	**31**	**1**	**15**	**29**	**1**	**15**	**31**	**1**	**15**	**30**	**1**	**15**	**31**	**1**	**15**	**30**	**1**	**15**	**31**	**1**	**15**	**31**	**1**	**15**	**30**	**1**	**15**	**31**	**1**	**15**	**30**	**1**	**15**	**31**
RR and RI Plan Species Account Annual Deposit			**C**																																	
General Salmon Fund Project Solication Process	**→ Ongoing**																																			
General Salmon Fund Project Approval	**→ Ongoing**																																			
General Salmon Fund Project Implementation	**→ Ongoing**																																			
Small Project Review and Approval	**→ Ongoing**																																			
Small Project Implementation	**→ Ongoing**																																			

D = Draft Document
F = Final Document

S = Start Project
C = Complete Project

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FINAL MEMORANDUM

To:	Rock Island and Rocky Reach HCPs Committees	**Date:**	March 25, 2014
From:	Michael Schiewe, HCP Coordinating Committees Chair		
Cc:	Kristi Geris, Tom Kahler		
Re:	Final Meeting Summary of the March 17, 2014 HCP-CC Wanapum-Rock Island Fish Passage Plan Conference Call		

The Rock Island (RI) and Rocky Reach (RR) Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met by conference call on Monday, March 17, 2014, from 9:00 to 9:45 am. Attendees are listed in Attachment A of this meeting summary.

ACTION ITEM SUMMARY

- Chelan Public Utility District (PUD) will continue considering options in the Rocky Reach Fish Forum as a contingency plan for lamprey passage, if necessary (Item II-D).
- Chelan PUD will continue considering the frequency of inspections of the proposed denil structures (Item II-D).
- Chelan PUD will continue discussion of the proposed Rock Island 2014 spill gate pattern and hourly flow shaping during the HCP Coordinating Committees meeting on March 25, 2014 (Item II-E).

DECISION SUMMARY

- The RI and RR HCP Coordinating Committees representatives present approved Chelan PUD's Interim Fish Passage Plan (Item II-D).

I. Welcome and Introductions

Mike Schiewe said that the purpose of this conference call is to further review and request HCP Coordinating Committee's concurrence on Chelan PUD's Interim Fish Passage Plan.

II. Chelan PUD Interim Fish Passage Plan

Lance Keller said that, in response to Wanapum Dam's emergency spillway repair and reservoir drawdown, Chelan PUD has developed an Interim Adult Fish Passage Plan for the three fishways at Rock Island Dam (right bank, center, and left bank) to address fluctuating tailwater elevations that can cause fishway entrances to be intermittently non-operational. Review of adult fish passage data (timing, ladder, and entrance preferences), coupled with historical daily and monthly average river flows and back water tailwater effect, allowed the design team to propose a strategy that will modify three identified ladder entrances for low tailwater situations, and leave the remaining three high-efficiency entrances untreated to allow for normal ladder entrance function during periods when tailwater elevations provide adequate access to the ladder (typically during the months of April through July). Engineered adult fishway extensions will be installed to provide adult passage when tailwater elevations drop below the level of the untreated entrances. This strategy provides the most flexible operation scenario across the widest range of tailwater elevations expected at Rock Island Dam.

A. Right Bank and Left Bank Ladders

Chelan PUD outlined a plan for denil structures to be installed at both the right bank (tailrace entrance [TRE] and left powerhouse entrance [LPE]) and left bank adult fishways. The denils will be comprised of two 30-foot-long sections with a rest box in the middle. The right bank extensions will have two denils (6 feet wide total) at each entrance designed for an attraction flow of 90 cubic feet per second (cfs); the left bank extension will be a single denil (3-feet-wide) designed for 55 cfs. Each ladder extension will also have a lamprey passage way (18 inches wide by 8 inches high, with 4 inches of water flow) installed on the side of the denil, which will follow the same slope and contour as the denil. These extensions provide passage down to a tailwater elevation of 547 feet.

B. Middle Ladder

The center fishway will be fully operational during periods when tailwater elevations exceed entrance elevation (April through July). Reliability of function, inability to securely install modifications, and low incidence of fish use at the center ladder precludes any attempt to make modifications at this entrance to address a low tailwater situation.

C. Mobilization

Chelan PUD will mobilize contractors to begin fabrication immediately. The first denil will be installed on the tailrace entrance of the right ladder by April 11, 2014, the second one at the left powerhouse entrance of the right ladder by April 18, 2014, and the third one at the left bank ladder by June 21, 2014.

Chelan PUD explained that the Endangered Species Act Emergency Consultation process has been initiated, and to administer the consultation, regularly scheduled coordination meetings are taking place with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the Federal Energy Regulatory Commission (FERC).

It is necessary for Chelan PUD to file its Interim Fish Passage Plan with FERC by March 31, 2014, to allow sufficient time for FERC to review and issue an order authorizing the work to take place.

D. Discussion

Bob Rose noted that, based on past observations, lamprey tend to avoid new infrastructure, possibly because of residues of industrial and of human hand oils and lack of a strong river scent. He suggested considering a second strategy in the future, like trap and haul, as a backup. Lance Keller agreed that having a backup plan would be a good idea; however, he noted that Chelan PUD's main objective was to develop a specialized structure to provide passage and avoid handling effects resulting from trap-and-haul methods.

Kirk Truscott asked if the majority of all fish species prefer passing Rock Island Dam at the right bank ladder system. Keller said that, based on historical passage data, spring and summer Chinook salmon, sockeye salmon, and coho all seem to prefer the right bank. Kirk Truscott said that he is concerned that the 1.6 million Columbia River fall chinook salmon that are projected to return in 2014 may not be able to move effectively through the two denil structures that are intended to replace the right powerhouse entrance (RPE) during low flows. Keller said that Chelan PUD is aware of this year's forecasts, which is why they plan to shape the flows during daytime passage to increase the flows to a point where the RPE will be open for passage during peak passage times. He said that, when the RPE is perched, a Rock Island Fish Attendant will increase the attraction flow towards the TRE and LPE.

Kirk Truscott asked, when the RPE is functional, what the projected discharge at the modified entrances would be. Steve Wiest (Chelan PUD engineer) said that the attraction water is dialed down from the headwater source, and 90 cfs is maintained through the RPE and TRE. He noted that this flow is the same for the lower tailwater conditions. He said that, when the tailwater comes up, the tailwater flow is adjusted to maintain proper head differentials, and if the denil gets completely flooded, attraction water is added until normal entrances can be operated. Keller said that Rock Island Fish Attendants will remain on-call to maintain these operating procedures, as necessary.

Keller noted that about 5 to 7 percent of lamprey pass Rock Island Dam using the left bank ladder, and the remainder use the right bank ladder. He said velocities for lamprey are a factor of flow and slope, and will be based on criteria outlined by the Bonneville Power Administration. He said that, if the proposed lamprey passage system appears to be working, trap and haul of lamprey would be unnecessary. He also said that, in part, the system will be evaluated based on counts at other dams. Bryan Nordlund cautioned that, in case trap and haul is implemented, the Grant PUD traps have historically been inefficient for trapping. Bob Rose suggested modeling trapping efforts after efforts conducted at Federal Columbia River Power System dams. He said that they deploy traps that are several feet long, which are pulled every day. Keith Truscott said that Chelan PUD can present the trap and haul option to FERC as a contingency plan; however, at this point, he does not want to delay fabrication with those details. He said that Chelan PUD will continue considering using trap and haul as a contingency plan for lamprey, if necessary.

Bryan Nordlund suggested frequent inspections of the proposed denil structures, noting that a small amount of debris can impact the efficiency of the structures. Keller said that Chelan PUD's engineering team is working on a protocol that will include frequent inspections and cleaning, if necessary.

Patrick Verhey asked if there is risk of fish jumping out of the denil structures. Steve Wiest said that the design of the structures is based on designs used by the National Marine Fisheries Service, which include adequate freeboard to prevent fish from jumping out. He added that the denil structures are 5 feet, 6 inches tall, with 4 feet of water in them.

Bryan Nordlund asked if there have been discussions about obtaining interim coverage for irrigation diversions, and Keith Truscott indicated that those discussions are underway.

The Coordinating Committees representatives present approved Chelan PUD's Interim Fish Passage Plan.

E. 2014 Proposed Rock Island Spill Gate Pattern and Hourly Flow Shaping

Lance Keller said that the document summarizing the proposed Rock Island 2014 spill gate pattern and hourly flow shaping that had been distributed for discussion at the HCP Coordinating Committees meeting on March 25, 2014, was undergoing slight modifications. He said the modifications will be discussed at the March 25 meeting.

F. Next Steps

Keith Truscott said that Chelan PUD will be in touch with the Rocky Reach Fish Forum to discuss Chelan PUD's Interim Fish Passage Plan.

List of Attachments

Attachment A List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA
Kristi Geris	Anchor QEA
Keith Truscott	Chelan PUD
Lance Keller*	Chelan PUD
Steve Hemstrom*	Chelan PUD
Steve Wiest	Chelan PUD
Jeff Osborn	Chelan PUD
Kirk Truscott*	Colville Confederated Tribes
Bryan Nordlund*	National Marine Fisheries Service
Scott Carlon*	National Marine Fisheries Service
Jim Craig*	U.S. Fish and Wildlife Service
Steve Lewis	U.S. Fish and Wildlife Service
Patrick Verhey*	Washington Department of Fish and Wildlife
Bob Rose*	Yakama Nation

Notes:
* Denotes RR and RI HCP Coordinating Committees member or alternate

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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Coordinating Committees	**Date:**	April 22, 2014
From:	Michael Schiewe, Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the March 25, 2014 HCPs Coordinating Committees Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Radisson Gateway Hotel, in SeaTac, Washington, on Tuesday, March 25, 2014, from 9:30 am to 12:30 pm. Attendees are listed in Attachment A of these meeting minutes.

ACTION ITEM SUMMARY

- Tom Kahler and Kristi Geris will coordinate with Douglas PUD Information Systems (IS) Staff to troubleshoot HCP Extranet Site issues expressed by the Coordinating Committees (Item I-C).
- Tom Kahler will convey to the Columbia River Inter-Tribal Fish Commission (CRITFC) the Coordinating Committees' conditional approval of CRITFC's annual request to tag sockeye salmon at Wells Dam in 2014, with the requirements that: 1) fish subjected to MS-222 prior to release must be Floy-tagged; 2) sockeye trapping will only occur on the west ladder; 3) to the extent practical, trapping will occur in coordination with the Washington Department of Fish and Wildlife's (WDFW's) summer Chinook trapping for the Carlton program (Jeff Korth will coordinate internally to discuss the feasibility of collecting broodstock and tagging in tandem) and would in no case exceed 3 days per week, 16 hours per day; and 4) tagged sockeye must be released upstream from Wells Dam rather than returned to the ladder (Item II-A).
- Chelan PUD will provide: 1) their new Valid Flow Duration Curves; 2) a brief summary describing the underlying data and the calculation methods used; and 3) a draft Statement of Agreement (SOA) memorializing the new Valid Flow Duration Curves (Item III-A).

- Chelan PUD will provide the 2013 Rocky Reach and Rock Island Bypass Reports to Kristi Geris for distribution to the Coordinating Committees (Item III-C).
- Chelan PUD will verify the conditions being tested during the preseason tests at the Rocky Reach Juvenile Fish Bypass (RRJFB), including how many pumps will be operated during testing (Item III-C).
- The Coordinating Committees meeting on April 22, 2014, will be held by conference call (Item V-A).
- The Coordinating Committees meeting on May 27, 2014, will be held at the Radisson Hotel in SeaTac, Washington (Item V-A).
- The Coordinating Committees meeting on June 24, 2014, will be held in eastern Washington, at a location that is yet to be determined (Item V-A).

DECISION SUMMARY

- The Coordinating Committees representatives present conditionally approved CRITFC's annual request to tag sockeye salmon at Wells Dam in 2014, with the requirements that: 1) fish subjected to MS-222 prior to release must be Floy-tagged; 2) sockeye trapping will only occur on the west ladder and to the extent practical, concurrent to and in coordination with WDFW's summer Chinook trapping for the Carlton program (Jeff Korth will coordinate internally to discuss the feasibility of collecting broodstock and tagging in tandem); 3) in no case would trapping exceed 3 days per week, 16 hours per day; and 4) tagged sockeye must be released upstream from Wells Dam rather than returned to the ladder (Item II-A).
- The Coordinating Committees representatives approved the Chelan PUD 2014 Fish Spill Plan via email on March 28, 2014 (Item III-B).
- The Coordinating Committees representatives present approved the Chelan PUD 2014 Rocky Reach Juvenile Fish Bypass Operation Plan (Item III-C).
- The Coordinating Committees representatives present approved the Chelan PUD 2014 Rock Island Bypass Monitoring Plan (Item III-C).
- The Coordinating Committees representatives present approved the Chelan PUD 2014 Rocky Reach Trap Pilot (Item III-E).

AGREEMENTS

- The Coordinating Committees representatives present agreed to the following review and approval process for the summaries of the weekly Wanapum briefings: 1) Anchor QEA will distribute to the Coordinating Committees a draft summary for review on the Wednesday following the Monday briefing; 2) Coordinating Committees representatives will provide comments on the draft summary no later than the Friday following the Monday briefing; and 3) Anchor QEA will distribute the final summary at the close of the review period (Item I-B).

REVIEW ITEMS

- There are no items that are currently out for review.

DOCUMENTS FINALIZED

- The Chelan PUD 2014 Fish Spill Plan that was approved by the Coordinating Committees via email on March 28, 2014, was finalized and was distributed to the Coordinating Committees by Kristi Geris on March 31, 2014 (Item III-B).
- The Chelan PUD 2014 Rocky Reach Juvenile Fish Bypass Operation Plan was finalized and was distributed to the Coordinating Committees by Kristi Geris on March 26, 2014 (Item III-C).
- The Chelan PUD 2014 Rock Island Bypass Monitoring Plan was finalized and was distributed to the Coordinating Committees by Kristi Geris on March 26, 2014 (Item III-C).
- The Final Wells 2013 HCP Annual Report was distributed to the Coordinating Committees by Kristi Geris on March 31, 2014.

I. Welcome

Mike Schiewe welcomed the Coordinating Committees and asked for any additions or other changes to the agenda. Bryan Nordlund added a brief discussion regarding complications encountered with the HCP Extranet Site, and Schiewe added a brief discussion regarding the review and approval process for the weekly Wanapum briefing summaries.

A. Meeting Minutes Approval (Mike Schiewe)

The Coordinating Committees reviewed the revised draft February 25, 2014 conference call minutes. Kristi Geris said that all comments and revisions received from members of the Committees were incorporated in the revised minutes, and that there were no outstanding edits or questions to discuss. The Coordinating Committees members present approved the February 25, 2014 conference call minutes, as revised. Geris will finalize the minutes and distribute them to the Committees.

The Coordinating Committees reviewed the revised draft March 17, 2014 conference call minutes. Kristi Geris said that all comments and revisions received from members of the Committees were incorporated in the revised minutes, and that there were no outstanding edits or questions to discuss. Jeff Korth indicated that WDFW did not attend this conference call, and therefore abstained from voting. The Coordinating Committees members present approved the March 17, 2014 conference call minutes, as revised, with WDFW abstaining. Geris will finalize the minutes and distribute them to the Committees.

B. Review and Approval Process for the Weekly Wanapum Briefing Summaries (Mike Schiewe)

Mike Schiewe said that the purpose of these weekly briefings is for Grant PUD and Chelan PUD to provide a brief summary on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans that were developed in response to the discovery of a 65-foot-by-2-inch crack near the base of spillway monolith 4 at Wanapum Dam, and to create a consultation record as required by the Federal Energy Regulatory Commission (FERC), the National Marine Fisheries Service (NMFS), and the U.S. Fish and Wildlife Service (USFWS). Schiewe said that the summaries documenting the briefings are purposely kept at a high level and are not expected to require an extensive review; and due to the frequency of the briefings, the initial thought was to forego the typical review and approval process that is implemented for HCP meeting minutes. Schiewe recommended, however, in recognition of the fact that some level of review is beneficial, that the Coordinating Committees agree on a shortened review period because of the quick turnaround that will be needed to distribute the final briefing summaries prior to the next briefing. He suggested providing the draft summaries for review by the Wednesday following the Monday briefing, with any comments returned to Kristi Geris within 24 to 48 hours. He said that comments should focus on correcting factual errors.

The Coordinating Committees representatives present agreed to the following review and approval process for the summaries of the weekly Wanapum briefings: 1) Anchor QEA will distribute to the Coordinating Committees a draft summary for review on the Wednesday following the Monday briefing; 2) Coordinating Committees representatives will provide comments on the draft summary no later than the Friday following the Monday briefing; and 3) Anchor QEA will distribute the summary as final at the close of the review period.

C. HCP Extranet Site (All)

Bryan Nordlund said that he has encountered complications with the HCP Extranet Site, particularly with obtaining documents from the site. Other Coordinating Committees representatives agreed, and added that occasionally a document can be retrieved, but only after repeatedly re-entering the username and password. Nordlund also asked that routine draft documents be distributed via email, with only final documents or large draft documents posted on the Extranet site. Kristi Geris noted that Kirk Truscott is currently troubleshooting gaining access to the site with Douglas PUD IS Staff, and other Coordinating Committees representatives said they also have had issues with gaining access to the site, and expressed concern that the passwords are timing out. Tom Kahler and Geris said that they will coordinate with Douglas PUD IS Staff to troubleshoot these HCP Extranet Site issues that had been raised by the Coordinating Committees.

II. Douglas PUD

A. CRITFC Request to Tag Sockeye at Wells in 2014 (Tom Kahler)

Tom Kahler said that CRITFC has requested approval from the Coordinating Committees to trap sockeye salmon at Wells Dam in 2014, as described in their annual request that was distributed to the Coordinating Committees by Kristi Geris on March 7, 2014. Kahler summarized that CRITFC's 2014 tagging efforts will include collecting scale samples from up to 800 sockeye, all of which will be passive integrated transponder (PIT)-tagged (if they have not already been tagged). In addition, up to 70 sockeye salmon will be acoustic-tagged, and up to 200 sockeye salmon will receive temperature tags. He said that he confirmed with Jeff

Fryer that the 70 acoustic tags and up to 200 temperature tags are subsets of the 800 total; and he added that Fryer also indicated in a later email that CRITFC may acoustic-tag more sockeye than originally planned.

Kirk Truscott said that the Colville Confederated Tribes (CCT) have no issues with the request; however, he requested that if fish are anesthetized with MS-222 prior to release, they be Floy-tagged. Kahler said that that he can stipulate this request.

Bryan Nordlund asked about the duration of trapping. Kahler said that trapping will occur 3 days per week, 16 hours per day (regular trapping operations), and that Fryer indicated that he planned to trap from late June through early August.

Kahler noted that, in the past, CRITFC's annual sockeye tagging efforts have been conducted using the east ladder trap in coordination with WDFW's trapping efforts for a Summer Chinook Radio Telemetry (RT) Study; however, WDFW's efforts are now complete. He said that WDFW uses the west ladder to collect brood for Grant PUD's Methow Summer Chinook Program, and then he asked Truscott if the CCT plan to use Wells as a contingency trapping location in case they cannot meet summer Chinook brood-collection targets for Chief Joseph Hatchery via their preferred collection methods. Truscott replied that they are planning to do so, but that they can use whichever ladder is available. Kahler recommended requesting that CRITFC use the west ladder, so that the east ladder can remain open to fish passage, unobstructed. Truscott asked if there is a significant discrepancy in the proportion of sockeye that pass Wells Dam via the east or west ladders. Kahler said that based on RT data, sockeye tend to cross back and forth between ladders before passing; however, passage varies annually, and no particular patterns have been observed. Truscott noted that sockeye tend to have compressed passage timing, and with a target of 800 sockeye, trapping efforts may not take very long. Nordlund said that it would be interesting to evaluate whether trapping activities at each ladder affect fish passage preferences. *(*Note: Kahler reviewed with Jayson Wahls the feasibility and practicality of CRITFC conducting their annual sockeye tagging operations in the west ladder at Wells Dam, and Wahls indicated that this option is feasible and would not interfere with brood collection for other programs, as distributed to the Coordinating Committees by Geris on March 26, 2014.)*

The Coordinating Committees representatives present conditionally approved CRITFC's annual request to tag sockeye salmon at Wells Dam in 2014, with the requirements that: 1) fish subjected to MS-222 prior to release must be Floy-tagged; 2) sockeye trapping will only occur on the west ladder and to the extent practical, concurrent to and in coordination with WDFW's summer Chinook trapping for the Carlton program (Jeff Korth will coordinate internally to discuss the feasibility of collecting broodstock and tagging in tandem); 3) in no case would trapping exceed 3 days per week, 16 hours per day; and 4) tagged sockeye must be released upstream from Wells Dam rather than returned to the ladder. Kahler said that he will convey the Coordinating Committees' stipulations to CRITFC.

III. Chelan PUD

A. Valid Flow Duration Curves (Lance Keller)

Lance Keller recalled Chelan PUD's action item to provide: 1) their new Valid Flow Duration Curves; 2) a brief summary describing underlying data and the calculation methods used; and 3) a draft Statement of Agreement memorializing the new Valid Flow Duration Curves. He said that due to the recent situation at Wanapum Dam, Chelan PUD has not been able to complete this action item. He said, however, that Chelan PUD still plans to complete this item as time allows.

B. Chelan PUD 2014 Fish Spill Plan (Lance Keller)

Lance Keller said that the draft Chelan PUD 2014 Fish Spill Plan was distributed to the Coordinating Committees by Kristi Geris on March 6, 2014. He said that the 2014 Fish Spill Plan is largely the same as last year's plan, only with a slightly modified spill gate sequence. He also noted that parts of this plan may be subject to minor changes due to the situation at Wanapum Dam. He said that if this is the case, any minor changes will be addressed in modifications to the Rock Island Interim Fish Passage Plan (IFPP; approved by the Coordinating Committees on March 17, 2014). He said, however, that there is still value in reviewing and approving the Fish Spill Plan because the plan will still be implemented in the event that normal tailwater conditions are achieved in 2014.

Keller explained that the "Interim Spill Plan" included in the Rock Island IFPP identifies certain spillbays that will not be utilized due to the exposure of the spill deflector with lower tailwater elevations, which may cause injury to juvenile fish. He said that the plan also considers powerhouse flexibility for safe fish passage and safety for the project itself.

Bryan Nordlund asked if a higher percentage of involuntary spill is expected, and Keller responded that there is that expectation. Keller added that the river flow is managed such that there is a diel pattern, which causes Rock Island Dam to shut down powerhouses and pass the majority of water via spill during selected time periods. Nordlund asked what the minimum tailwater flow needs to be in order to operate the powerhouses under the current Wanapum forebay elevation, and Keller said that he believes it is around 45,000 cubic feet per second (45 kcfs). Keller added that safeguards are in place to give warning when flows below that level are expected. Jeff Korth asked if 45 kcfs is the lower limit when the current fishway entrances are operating. Keller said that at 45 kcfs, the modified entrances will be operating. He said the bottom of the denil meets the tailrace at a river flow of about 38 kcfs.

Kirk Truscott asked if there are expectations that operations at Rock Island Dam for adult passage will affect the shaping of spill for juveniles into summer spill at Rock Island Dam. He recalled that Chelan PUD had previously indicated that because adult passage is primarily during daytime hours at Rock Island Dam, shaping spill would be structured to take advantage of that fact. He said, however, that summer spill is shaped for juvenile fish passage during nighttime hours. Keller said that from April through June 2014, adequate flows are expected during nighttime hours at Rock Island Dam to carry on normal operations. He said that even when lower flows occur at Rock Island Dam, spill will not be shut down during nighttime hours. He said that if nighttime flows decrease so much that Rock Island Dam cannot generate power, 100% spill will be initiated. He added that this may result in an exceedence of 20% spill (likely to occur in August, if at all). Mike Schiewe asked if total dissolved gas (TDG) may become a problem, and Keller replied that it should not be. Keller explained that spill will be prioritized at the over and under spill gates, which are designed to reduce TDG. He added, however, that testing is planned this weekend at Rock Island Dam to evaluate TDG at different flows.

Keller said that spill is scheduled to start at Rock Island Dam on April 17, 2014, and Chelan PUD would like to obtain approval of the 2014 Fish Spill Plan prior to starting spill. He added that monitoring of the bypass trap will start April 1, 2014, and if it appears that 95% passage will not be met for Plan species, spill will be initiated earlier. Korth suggested adding text to the 2014 Fish Spill Plan linking the document to the Rock Island Dam IFPP. *(*Note: as requested, Chelan PUD added a note to the Chelan PUD 2014 Fish Spill Plan explaining the connection between the spill plan and the Interim Fish Passage Plan.)*

Geris sent an email to the Coordinating Committees on March 25, 2014, notifying them that the final draft Chelan PUD 2014 Fish Spill Plan was available for review with email vote due to Chelan PUD (with a copy to Geris) no later than March 28, 2014. The Coordinating Committees representatives approved the Chelan PUD 2014 Fish Spill Plan via email on March 28, 2014. The final plan (Attachment B) was distributed to the Coordinating Committees by Geris on March 31, 2014.

C. Rocky Reach and Rock Island Juvenile Bypass Operation Plans (Lance Keller)

Lance Keller said that the draft Chelan PUD 2014 RRJFB Operation Plan and draft Chelan PUD 2014 Rock Island Bypass Monitoring Plan were distributed to the Coordinating Committees by Kristi Geris on February 24, 2014. Keller also recalled an action item from the Coordinating Committees conference call on February 25, 2014, for Chelan PUD to provide the 2013 Rocky Reach and Rock Island Bypass Reports to Geris for distribution to the Coordinating Committees by Friday, February 28, 2014. He said that although these reports have not yet been distributed, data have been compiled for the reports, which indicate similar results as in 2012. He noted that in 2013, at Rocky Reach Dam during juvenile fish bypass initiation tests, descale, injury, and mortality rates were below 1%. He also noted that at Rock Island Dam, based on higher mortality rates in summer Chinook fry in 2012, a sanctuary box was installed to provide refuge from conditions and predators; and mortality rates in summer Chinook fry were lower in 2013 than those observed in 2012.

Keller said that in 2014, sampling protocols will not change from 2013, with the exception of the additional tests of September extended operations, per Rocky Reach HCP Section 5.4.1b and Rock Island HCP Section 5.4.1a, as discussed at the Coordinating Committees conference call on February 25, 2014. He said that engineering evaluations indicate that Rocky Reach Dam will be able to operate at normal levels throughout the 2014 season. He said that beginning in July 2014, Turbine Unit 2 (C2) will be taken offline for rotor crack repair and the same alternative RRJFB Surface Collector (SC) Operations will be employed that were approved for the Turbine Unit 1 (C1) outage in April 2013. He said that last week, C2 was shut down to test the alternative prescriptions with C1, and conditions were successful as planned. He added that a worst case scenario would be flows low enough to the point where the 360 cfs could not be achieved and sampling activities could be impacted; so 200 cfs was tested and proved to be successful. Bryan Nordlund asked how many pumps were used during the bypass testing, and Keller said that he will verify the conditions being tested during the preseason tests. *(Note: Keller later indicated that the entrances were tested under normal entrance flows of 3,000 cfs per entrance, or 19 to 20 pumps.)*

Keller said that juvenile salmonid data collected at Rock Island Dam are provided to the Fish Passage Center (FPC), and also to the Data Access in Real Time (DART) database; and Chelan PUD indicated that operations at Rock Island Dam will begin on April 1, 2014. He added that at this point in time, there are only estimates regarding September sampling. He said that normal operations are expected at Rock Island Dam from April through June 2014.

Kirk Truscott asked if juvenile fish sampling protocols at Rock Island Dam and Rocky Reach Dam will also include monitoring for coded wire tags (CWT), along with monitoring for PIT-tags, acoustic tags, and fin clips. Keller said that assessing for CWT is not planned for 2014; and further, he added that Rock Island Dam and Rocky Reach Dam are not equipped to inspect for CWT. Truscott said that the reason he is asking is because Methow Hatchery will soon be releasing CWT-tagged spring Chinook that are adipose fin (ad)-present hatchery-origin recruits (HORs), and there will be no way to separate these from natural-origin recruits (NORs) without scanning for CWTs. He said those data are valuable for assessing whether 95% protection is being met for NORs. Keller noted that based on historical data, there are very low counts of spring Chinook at Rock Island Dam and Rocky Reach Dam on April 1, and then the counts gradually increase. He said this suggests that 95% protection is being met. Truscott said that CWT data would still be beneficial, if the equipment was available to collect it.

The Coordinating Committees representatives present approved the Chelan PUD 2014 RRJFB Operation Plan and Chelan PUD 2014 Rock Island Bypass Monitoring Plan. The final plans (Attachment C and Attachment D, respectively) were distributed to the Coordinating Committees by Geris on March 26, 2014.

D. Rocky Reach Adult Fishway Update (Lance Keller)

Lance Keller recalled that during the Coordinating Committees conference call on February 25, 2014, the Coordinating Committees agreed to extend the 2013/2014 winter maintenance work period at Rocky Reach Dam by 13 days to allow more time to complete required repair work. He said that, as agreed, on the morning of March 14, 2014, the Rocky Reach Fish Ladder was fully operational.

Keller also recalled an action item for Chelan PUD from the February conference call to investigate the feasibility of operating only two of the three Rocky Reach Attraction Water System (AWS) Turbine Pumps (Pumps A, B, and C) in the event that one pump is inoperable, while still maintaining the 1.0-foot head differential, as well as determining how to execute the most efficient in-season repair, if needed. Keller said that Thad Mosey, Chelan PUD Spill Coordinator, summarized contingency planning for Rocky Reach Dam, as follows:

<u>Failure of 1 of 3 pumps</u> (maintain operations and request ladder outage December 1)

- Notify the Coordinating Committees of the failure
- Increase maximum head on the two functional pumps from 4 feet to 5 feet (an alarm is triggered at 5.5 feet)
- Use left and middle spillway entrances to balance flows:
  - Use wing gates in fishway to maintain gradient flow, as needed
  - If more flow is needed, close secondary submerged orifice gates
  - If high flows were to increase, the middle spillway entrance would also pull flow from the left entrance (the middle spillway entrance would be closed, if needed, but the ladder would remain functional)

Failure of 2 of 3 pumps

- Implement same protocol for failure of 1 of 3 pumps
- If the two pumps failed between March 1 and October 31, and fish passage is out of criteria, the procedure would immediately be elevated, as needed

Failure of 3 of 3 pumps

- Request emergency outage
- Get two pumps back online and implement same protocol for failure of 1 of 3 pumps

Bryan Nordlund asked about how maintenance staff can increase maximum head on the pumps. Keller said that he believes this would be achieved using the butterfly valves. He said that these valves have a certain set point and they are kept 35% open to achieve the desired pump efficiency; so the valves would need to be set outside of that efficiency curve while still providing adequate flow. Bob Rose asked what the odds are for three pumps failing. Keller said that all three pumps failing at once is unlikely, but the probability may be more likely if the cause were a common mechanical issue, which is also easier to address than if the causes are unique to each pump.

E. Chelan PUD 2014 Rocky Reach Trap Pilot – Broodstock Collection (Alene Underwood and Catherine Willard)

Mike Schiewe explained that the Chelan PUD 2014 Rocky Reach Trap Pilot is intended to test the feasibility of collecting broodstock for Chelan PUD's 60,516 Methow spring Chinook production obligation at the dam, and has been discussed over the course of several HCP Hatchery Committees meetings. Alene Underwood, Chelan PUD HCP Hatchery Committees Technical Representative, added that the HCP Hatchery Committees had requested that Chelan PUD present this pilot proposal to the Coordinating Committees, and that Chelan PUD is requesting Coordinating Committees approval for the trapping associated with the proposed pilot.

Underwood said that the Chelan PUD 2014 Rocky Reach Trap Pilot presentation (Attachment E) was distributed to the Coordinating Committees by Kristi Geris on March 24, 2014. Underwood explained that the 2014 Rocky Reach Trap Pilot will be the second pilot year to evaluate: 1) trap modifications that were installed based on results of the 2013 pilot study; and 2) the efficacy of using sort-by-code technology to target PIT-tagged NOR adults for broodstock. She added that for the approximately 61k smolt program, 35 to 38 adults are needed for broodstock.

Underwood reviewed results from the 2013 pilot study (slide 3 of Attachment E), noting that the purpose of the 2013 pilot study was to test the feasibility of visually identifying and selectively collecting ad-clipped spring Chinook—once the species was verified, each fish was released (fish were not removed from the water). She said that sampling occurred over a 4-week period, and that that visibility was low because of high turbidity. She also noted that delay in travel times through the Rocky Reach fishway due to trap operations were monitored in 2013, and travel times through the fishway were faster during hours of trapping (although not statistically significant). She reviewed the improvements that were made to the trap as recommended by trap operators from the 2013 pilot study. She noted that the solid trap door was replaced with a grated door because the solid door appeared to be changing flow hydraulics near the door, which was affecting the fish. She also noted that underwater lighting and a camera were added to increase visibility in turbid water, and an electrical control pendant for operating the trap door was installed to provide the trap operator with a better view of the trap. The trap floor was also painted white to create contrast, and an additional PIT-tag array and sort-by-code system were installed.

Underwood reviewed slides 5 and 6 in Attachment E, which depict array locations and the area around the Rocky Reach Trap. She noted that the red box depicted in slide 5 of Attachment E is the location of the trap, and the red box depicted in slide 6 of Attachment E is where a new PIT-tag array will be installed. She explained that a predetermined library of PIT-tag codes will be uploaded into the separation-by-code monitoring system, and the system will be connected to the PIT-tag arrays. She said that as fish ascend the ladder, there will be an auditory and visual signal (light and beep) at baffle #4, another at baffle #6, and another at the newly installed PIT-tag array. Once the last signal occurs, the operator in the counting room will be able to visually observe the target fish and can manually operate the trap. Once a fish is trapped, it will be confirmed with a hand-held PIT-tag detector loaded with the same library of PIT-tag codes. Once confirmed, the target fish will be transferred to a holding tank located directly adjacent to the trap chamber, and Eastbank Hatchery Staff will be notified to transport the fish to Eastbank Hatchery for holding.

Underwood said that trapping would occur Monday through Friday, up to 8 hours per day (from 7:00 a.m. to 3:00 p.m.), with unrestricted passage during non-trapping events (slide 7 in Attachment E). She said that trapping will begin in late April or early May and will continue through about the third week in June 2014.

Underwood said that this broodstock collection option has been discussed within the HCP Hatchery Committees for several months, and they are supportive of the proposal. Schiewe added that there is uncertainty that a sufficient number of PIT-tagged spring Chinook adults will be returning at the current tagging rates, which may mean additional juvenile PIT-tagging efforts in future years if the Rocky Reach Trap continues to be used as a broodstock collection location. He said that, with regards to this year, the Hatchery Committees have also been considering other broodstock collection options including tangle netting in the Chewuch, which the Yakama Nation (YN) has agreed to for the short term. Schiewe said that the Hatchery Committees will vote on the pilot proposal on April 4, 2014, but Coordinating Committees approval is first needed for the passage portion of the proposal.

Bryan Nordlund asked if Lynn Hatcher (NMFS HCP Hatchery Committees Technical Representative) has reviewed this proposal. Underwood indicated that he has, and added that the Rocky Reach Trap Pilot is included in Chelan PUD's Methow Spring Chinook Hatchery and Genetic Management Plan (HGMP). Nordlund noted that he likes this proposal because of its low impact on fish passage.

Nordlund asked if Chelan PUD needs HORs or NORs, and Underwood said that their spring Chinook program is a conservation program, so they are interested in NORs. She added that in low run years, there is a maximum 33% extraction rate, so HORs may be needed in those years.

Jim Craig asked where fish are being tagged. Catherine Willard (Chelan PUD) said that the source of PIT-tagged adults targeted for trapping this year are from PIT-tagging efforts at the

U.S. Geological Survey (USGS) smolt trap on the Chewuch, WDFW's parr PIT-tagging efforts in the Chewuch, and other PIT-tagging efforts occurring in the Methow. She said that Chelan PUD will be focusing on all spring Chinook NORs except for Twisp-origin.

Nordlund asked if there have been comments regarding the possible additional PIT-tagging needed for a long-term program. Underwood said that handling juveniles has been discussed; however, it has not been a significant issue. She said that only 20% of outmigrating smolts can be handled; and Willard added that in the Chewuch, tagging efforts are not even close to that threshold.

Kirk Truscott said that for a small program, in the immediate future, the Rocky Reach Trap is a good option. He noted, however, that this option is largely due to unsuccessful negotiations between Chelan and Douglas PUDs to continue spring Chinook broodstock collection at Douglas PUD facilities to meet Chelan PUD spring Chinook mitigation for the Methow Basin. He said that he hopes Chelan PUD and Douglas PUD will continue the dialogue for future coordination.

Bob Rose said that he trusts that the trap operators will point out issues if they arise. Nordlund said that he is also supportive of the proposal. He added that he had discussed the proposal with Lynn Hatcher and Craig Busack (NMFS HCP Hatchery Committees Alternate). Nordlund also said that he wondered if all broodstock collection was performed at Wells Dam, if the ladder closure to trap at Wells Dam would affect passage times more than trapping the equivalent number of fish for Chelan PUD programs at the Rocky Reach Trap. He said that if Chelan PUD trapping at Wells Dam only adds to the total number of hours of trapping at Wells, then this may turn out to be an unanticipated benefit of Rocky Reach trapping in future years, if the same number of fish can be trapped with fewer hours of trap operation.

Nordlund asked about the purpose of the underwater camera that will be installed near the trap, and Underwood explained that the camera will be used to confirm that the fish is in the trap before operating the trap; it will not be used to identify the fish species. Nordlund asked if in 2013 fish had readily moved into the trap or attempted to back out once in the trap.

Underwood said that some fish did not readily move into the trap, but Chelan PUD believes this had to do with the solid trap door affecting the local hydraulics.

The Coordinating Committees representatives present approved the Chelan PUD 2014 Rocky Reach Trap Pilot.

F. Wanapum Drawdown – Current Updates (Lance Keller)

Lance Keller said that in order to keep everyone informed on the situation at Wanapum Dam, Chelan PUD will plan to provide updates at each Coordinating Committees meeting. He thanked the Coordinating Committees for their continued support and participation. He said that Chelan PUD has a tight timeline to construct the adult fishway extensions; and he added that contracts are already in place, and fabrication of both extensions for the right ladder are currently underway. He said that on March 24, 2014, the left ladder was taken offline and a fish rescue was performed. He added that the left ladder lower weirs that were initially installed to help with encroachment when Wanapum was impounded were also removed. He said that the tailrace entrance (TRE) extension will be installed first, which is expected to be completed by April 11, 2014. The following week, the left powerhouse entrance (LPE) extension will be installed on Powerhouse 2, which is expected to be completed by April 18, 2014. He said that the final installations will be the extended denil structures on the left ladder next to Powerhouse 1. He said that two precast panels will be removed and the denils will be installed in the third entrance, which will route fish back into the ladder. He said that these structures will be submerged during high flows. He said that lamprey ramps with the same slope as the denils will be installed adjacent to the denils. He said that a rest box will also be installed for the lamprey ramps, separate from the rest boxes for the denil structures. He added that everything will be crested (no sharp edges) to decrease the likelihood of fish injury. He noted that all of this is also summarized in the Rock Island IFPP that was submitted to FERC on March 21, 2014, and resubmitted on March 24, 2014.

Bryan Nordlund recommended running water through the lamprey portion as soon as possible because lamprey tend to avoid new infrastructure, possibly because of residues of industrial and human hand oils and lack of a strong river scent.

Mike Schiewe asked if anyone knows a rough timeline to expect for the crack repair at Wanapum Dam—on the level of weeks or months. Keller said that he has not heard a timeline. Nordlund said that forensic analyses need to be completed to answer that question. He said that he thinks 90- to 105-foot holes may need to be drilled if the repair includes anchored tendons from the top of the spillway pier; and Jeff Korth added that only about 2 to 3 bore holes are complete out of about 30 that are needed. Korth said that drilling the holes is expected to take another 2 to 3 weeks. Alene Underwood said that Tom Dresser (Grant PUD) indicated that before FERC and the Board of Consultants (BOC) would approve any repair plan, a root cause analysis first needed to be completed.

Korth asked if the best laid plans do not work, how the fish will be prioritized. He asked, for example, if broodstock cannot be collected for full hatchery programs, whether production in the tributaries or production in the hatcheries is more important. Nordlund agreed that this issue is something to start thinking about, but noted that part of determining what should be done is also determining how it can be done. He said, for example, if trap and haul is implemented, additional infrastructure would need to be installed at Priest Rapids Dam in order to handle that many fish. Bob Rose suggested developing a "worst case scenario" calendar that outlines when these types of decisions would need to be made and when the actions would need to begin, including a list of topics that need to be addressed.

Keith Truscott (Chelan PUD) agreed that these are things that need to be considered; however, he also reminded the Coordinating Committees that the modifications at Rock Island Dam still leave some entrances untreated (i.e., Rock Island Dam will have normal ladder operations for a portion of the run). He added that fish counts and passage monitoring will be ongoing at Rock Island Dam, which will quickly highlight if anything is different in comparison to past years. Keller added that on March 10, 2014, a PIT-tagged steelhead was detected passing Rock Island Dam via the right ladder, which suggests that passage is operational through the right ladder even during low flows.

Nordlund said that in assessing passage between Priest Rapids Dam and Rocky Reach Dam, the temporary pumps in the Wanapum ladders are perhaps the weak link. He said that pumped attraction is never preferred due to the noise and the fact that pumps can fail. He said that Rock Island Dam is in a better position because interim passage relies on gravity, and because the normal fishway entrances can operate when river flows exceed 120 kcfs. Schiewe asked if Wanapum Dam has a contingency plan, such as back-up pumps. Nordlund said that purchase of back-up pumps is the minimum that can be done, and he added that the creators of Wanapum Dam anticipated the need for pumps and included space to install pumps in the dam infrastructure. Korth asked what the limitation was on the pumps, and Nordlund said that it was purely how many pumps could be obtained and installed in the time available before the run arrives, based on existing electrical power available at the fishway exit. Tom Kahler asked how fish passage was managed while Wanapum Dam was being built, and Nordlund said that he was not sure.

Schiewe noted that if a key component in moving fish upstream is trap and haul, then only so many can be moved. Rose asked if dip nets could be deployed in the fish ladders. Keller said that perhaps this would be possible at Wanapum Dam; however, at Rock Island Dam, once fish are in the ladders, Chelan PUD views that as a success. Schiewe noted that, ultimately, these issues need to be addressed based on success of actions at Priest Rapids Dam or Wanapum Dam. Jim Craig noted that, presuming Rock Island Dam passage is operational, trap and haul efforts would only be needed to move fish above Wanapum Dam, which would be a shorter trip than haul and release above Rock Island Dam. Underwood noted that Grant PUD has developed a list of available trucks, both in the short term and the long term. Craig said that USFWS recently distributed a request for transport trucks to address a smolt issue in California. Underwood noted that sometimes smolt trucks cannot accommodate adults because, structurally, the orifices are not large enough for adults.

Schiewe noted that if during a weekly Wanapum briefing, a decision is needed by the Coordinating Committees, a follow-up call will be convened to address the issue and make a decision.

IV. Hatchery and Tributary Committees Update (Mike Schiewe)

Mike Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the last HCP Tributary Committees meeting on March 20, 2014:

- *Review of Policies and Procedures Documents*: The Tributary Committees approved language in the Policies and Procedures document indicating that the Tributary Committees will accept Salmon Recovery Funding Board application forms for projects where Plan Species Account Funds are included as cost shares in Salmon Recovery Funding Board proposals.
- *General Salmon Habitat Program Draft Application Form*: In consideration of the new policy to allow project sponsors to submit General Salmon Habitat Program (GSHP) proposals at any time during the year, the Tributary Committees reviewed and revised the GSHP Draft Application Form, as deemed appropriate.
- *Small Projects Program Application*: The Okanagan Nation Alliance submitted a Small Projects Program application to stabilize and reduce channel and bank erosion by removing a collapsed logging bridge that fell into Shingle Creek. However, due to lack of information, the Tributary Committees were unable to make a funding decision. They requested additional information from the sponsor that more clearly links this project with the Shingle Creek Dam Removal project.
- *Budget Amendment: Methow/Chewuch Groundwater Monitoring Project*: The Wells Tributary Committee approved a budget amendment request from Cascade Columbia Fisheries Enhancement Group to hire a hydrogeologist to do additional data analyses.
- *Budget Amendment: Wenatchee Levee Removal and Riparian Restoration Project*: The Rock Island Tributary Committee denied a budget amendment request from Chelan County Natural Resources Department to move money around within the project budget, because the request was not clearly justified.
- *Next Steps*: The next Tributary Committees meeting will be on Thursday, April 10, 2014.

Schiewe updated the HCP Coordinating Committees on the following actions and discussions that occurred at the last HCP Hatchery Committees meeting on March 19, 2014:

- *Hatchery Evaluation Technical Team (HETT) Non-Target Taxa of Concern (NTTOC) Report Update*: Greg Mackey drafted a report summarizing the model runs that were completed by the HETT in support of the NTTOC objective outlined in the Hatchery Monitoring and Evaluation Plan. The draft report has been reviewed by the HETT and will be distributed to the Hatchery Committees for comment and discussion regarding a path forward for this Monitoring and Evaluation (M&E) objective.

- *Wells Hatchery Steelhead Broodstock Update*: Efforts have been ongoing to backfill adult steelhead inadvertently killed at Wells Hatchery. When the steelhead loss occurred, the Coordinating Committees approved additional trapping to obtain broodstock. Progress has been slow to date. Mike Tonseth (WDFW HCP Hatchery Committees Technical Representative) is optimistic that trapping at the Wells volunteer channel and Wells ladders, and hook and line angling in the Methow will recover the lost broodstock. Kirk Truscott added that the Omak weir is now in place, but only three fish have been trapped. He noted that flows have been low, but they are expected to increase soon based on forecasted rainfall. Jeff Korth also added that Ringold has recruited volunteers to help obtain fish via hook and line angling; and also the Methow and Winthrop volunteer channels opened for collecting steelhead over the last week. Tom Kahler said the number needed for full program is still short by about 140 steelhead.
- *2014 Rocky Reach Trap Pilot Proposal*: Discussions focused on the development of a decision tree process for how to collect broodstock if not enough are collected through the pilot study.
- *2014 Chiwawa Spring Chinook Broodstock Collection*: The group discussed broodstock for Chelan PUD's Chiwawa Program, which is within the HCP but may also involve the Grant PUD program in Nason Creek. Grant PUD is having trouble obtaining Nason Creek broodstock. The Priest Rapids Coordinating Committee (PRCC) Hatchery Sub Committee (HSC) has been discussing compositing fish at Tumwater Dam to fill both programs. NMFS held internal discussions regarding whether this was an appropriate approach. Also being considered is that these populations have been naturally mixing over many years. Follow-up discussions occurred at the PRCC HSC meeting, but not much progress was made. The next step will be for Mike Tonseth to distribute the draft 2014 Broodstock Protocols and the Hatchery Committees will comment. Jeff Korth said that he believes this issue will devolve into timing issues with regards to permitting. He noted that much of the issue is that NMFS did not consider the long-term impacts of compositing in the Biological Opinion, and therefore, it is not covered under current permits.

- *Draft 2014 Broodstock Collection Protocols*: Mike Tonseth laid out a schedule for review and approval of the 2014 Broodstock Protocols. Lynn Hatcher plans to discuss with NMFS the current permit language that states that the annual broodstock protocols will be completed "in coordination with the Hatchery Committees," and why it does not require Hatchery Committees approval like most other HCP issues.
- *Gonadal Mass Methodology*: WDFW finalized a protocol for measuring fecundity at size. The approved protocol is the same as what is currently being implemented at all area hatchery programs. Issues involving sample size are still open to discussion.
- *2014 Wenatchee Juvenile Steelhead Release Proposal*: WDFW discussed volitional release and the use of Blackbird Pond. Issues still pending include whether to use volitional release exclusively, the disposition of fish that do not leave volitionally, and how to deal with predators.

V. HCP Committees Administration

A. Next Meetings (Mike Schiewe)

Mike Schiewe said that the next scheduled Coordinating Committees meeting is April 22, 2014, to be held by conference call. The May 27, 2014 meeting will be held in person at the Radisson Hotel in SeaTac, Washington. The June 24, 2014 meeting will be held in person in eastern Washington, at a location as is yet to be determined. Lance Keller suggested a site visit to Rock Island Dam to view the newly installed ladder extensions when the Coordinating Committees meet in Eastern Washington.

List of Attachments

Attachment A	List of Attendees
Attachment B	Final Chelan PUD 2014 Fish Spill Plan
Attachment C	Final Chelan PUD 2014 RRJFB Operation Plan
Attachment D	Final Chelan PUD 2014 Rock Island Bypass Monitoring Plan
Attachment E	Chelan PUD 2014 Rocky Reach Trap Pilot Presentation

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Keith Truscott††	Chelan PUD
Lance Keller*	Chelan PUD
Steve Hemstrom*†	Chelan PUD
Alene Underwood	Chelan PUD
Catherine Willard	Chelan PUD
Tom Kahler*	Douglas PUD
Jim Craig*	U.S. Fish and Wildlife Service
Bryan Nordlund*	National Marine Fisheries Service
Jeff Korth*	Washington Department of Fish and Wildlife
Kirk Truscott*†	Colville Confederated Tribes
Bob Rose*†	Yakama Nation

Notes:
* Denotes Coordinating Committees member or alternate
† Joined by phone
†† Joined for Chelan PUD's agenda items

2014 Fish Spill Plan

Rock Island and Rocky Reach Dams

Public Utility District No. 1 of Chelan County

Prepared By:

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Hydro Fisheries Biologist
and
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Public Utility District No. 1 of Chelan County
Wenatchee, Washington

Final
March 25, 2014

Introduction and Summary

In 2014, Public Utility No. 1 of Chelan County (Chelan PUD) will implement spill operations for fish passage at the Rock Island and Rocky Reach and projects. Spill timing and spill percentages are specified by the anadromous Habitat Conservation Plans (HCP) for each respective project. Chelan PUD conducted juvenile project survival studies from 2002 through 2011 at Rocky Reach and Rock Island under varying spill levels in order to achieve HCP survival standards. The Rock Island Project completed multiple survival studies over a nine year period (17 total studies) for spring migrating Plan Species (Steelhead, sockeye, yearling Chinook), first using a 20 percent spill level, then a 10 percent spill level. Rock Island will continue to spill 10 percent of day average flow during the spring outmigration period through at least year 2020. Rocky Reach completed its suite of HCP survival studies for spring migrating Plan Species in 2011 (14 studies), under spill and no-spill operation at the dam. HCP juvenile survival standards were achieved for species tested with a no spill operation (yearling Chinook, steelhead, sockeye). Project spill levels are summarized in Table 3 of this plan. Chelan PUD holds valid Incidental Take Statements (ITS) from NOAA Fisheries (NOAA) and the United States Fish and Wildlife Service (USFWS) for HCP fish spill operations at Rocky Reach and Rock Island.

For the 2014 juvenile outmigration, Chelan PUD will operate the Rocky Reach juvenile fish bypass system (JFBS) starting 1-April for the spring juvenile outmigration of yearling Chinook, steelhead, and sockeye. Spring spill at Rocky Reach Dam will consist of hydraulic spill for reservoir control only. HCP Project survival standards were achieved with bypass-only operations. During the subyearling Chinook outmigration in 2014, Rocky Reach will spill 9 percent of day average river flow for a duration covering 95 percent of subyearling outmigration past the dam. Per the HCPs, Chelan will conduct a subyearling Chinook run-timing verification study with extended bypass operations at both Projects in 2014, with methods approved by the HCP Coordinating Committee (HCP CC).

At Rock Island Dam in 2014, Chelan PUD will operate the Project with a 10 percent day-average spill level for the spring outmigration period. Rock Island has also completed HCP spring Plan Species survival testing for all Plan Species with a 10 percent spill level at the dam and has achieved juvenile survival standards for yearling Chinook, steelhead and sockeye and combined adult-juvenile survival for all three species.

During the summer period in 2014, Rock Island will spill 20 percent of the day-average river flow for the outmigration of sub-yearling summer Chinook. Spill is the primary means of juvenile salmon and steelhead passage at Rock Island per Section 5.4.1(a) of the Rock Island HCP. Spring and summer spill will cover 95 percent of the juvenile outmigration for yearling Chinook, steelhead, sockeye, and subyearling Chinook in 2014.

Rocky Reach Spring Juvenile Bypass Operations

Rocky Reach will operate its JFBS continuously through the spring outmigration period, beginning 1-April, 2014. Daily index sampling (for juvenile steelhead, yearling Chinook, and sockeye) will be performed at the bypass sampling facility to estimate the outmigration percentiles for each species through the spring period. During "index sampling" each day, a total of four 30-minute samples (Table 1) will be taken beginning at the top of each hour, 8 am to 11am. Spring spill for fish passage is not required at Rocky Reach in addition to the JFBS operation, but periods of forced spill may occur under high river flows. Some level of forced spill (river flow above 201 kcfs turbine capacity) normally occurs at Rocky Reach in the spring. Over the past 20 years, forced spill has occurred approximately 28 percent of all hours, April through June.

In 2014, as directed by the HCP, Chelan PUD will conduct bypass operations outside of the normal operating period of 1 April to 31 August to assess subyearling Chinook run-timing and achievement of bypass operations for 95% of the subyearling Chinook outmigration. The HCP Coordinating Committee will develop guidelines for conducting this evaluation in 2014.

Sampling protocols at the Rocky Reach bypass system in 2014 will remain consistent with those used in 2004-2013. Daily sampling in spring and summer periods (Monday through Sunday) will use four 30-minute "index periods" at 0800, 0900, 1000, and 1100 hours (Table 1). The sample target for each 30-minute sample will be 350 smolts during the spring period (yearling Chinook, steelhead, and sockeye combined), and 125 smolts for summer period (subyearling Chinook). If the number of fish collected in the bypass sampling raceway is estimated to reach the maximum number prior to completion of the 30-minute sample, the sampling screen will be retracted from the bypass flume and the number of fish collected in the shortened sample period will be proportionately expanded to the entire 30-minute period.

Table 1. Index sampling times at the Rocky Reach juvenile fish bypass and the number of smolts per sample in 2014. Sample times and sample targets have remained consistent since 2004.

Time	Sample Duration	Number of Smolts	Day of Week
08:00-08:30	30 minutes*	350 (spring) 125 (summer)	Monday-Sunday
09:00-09:30	30 minutes*	350 (spring) 125 (summer)	Monday-Sunday
10:00-10:30	30 minutes*	350 (spring) 125 (summer)	Monday-Sunday
11:00-11:30	30 minutes*	350 (spring) 125 (summer)	Monday-Sunday

*Sample duration may be less than 30 minutes if smolt numbers are met prior to full 30 minute sample time

Rocky Reach Summer Spill Operations

Rocky Reach Dam will spill 9 percent of the estimated day average river flow for the subyearling Chinook outmigration. Spill will commence in late May to early June upon arrival of subyearling Chinook smolts in the Rocky Reach bypass samples. Juvenile run-timing information at Rocky Reach will be used to estimate subyearling Chinook passage percentiles (from the University of Washington's Program RealTime run forecaster) and guide spill operations to cover 95 percent of the summer outmigration. Actual subyearling counts in combination with juvenile passage estimates from the University of Washington's Program RealTime run forecaster will determine spill start and stop dates for the summer spill program.

The HCP guidelines for starting and ending summer spill at Rocky Reach are as follows:

1. Summer spill will start at midnight no later than the day on which the estimated 1-percentile passage point is reached, as indicated by Program RealTime run-forecast model. S*ubyearling* Chinook will be defined as any Chinook having a fork length from 76 mm to 150 mm.

2. Summer spill season will generally end no later than 15-August, but not until subyearling index counts from the juvenile bypass sampling facility are 0.3 percent or less of the cumulative run for three out of any five consecutive days (same protocol used 2004-2013) and Program RealTime is estimating that the 95th percentile passage point has been reached and spill passage has covered at least 95% of the subyearling outmigration

Diel Spill Shaping at Rocky Reach and Rock Island

Daily spill volumes will be shaped within each 24-hour period at Rocky Reach during the summer, and at Rock Island during both spring and summer spill periods (Table 2). Spill shaping attempts to optimize spill water volume to maximize spill passage effectiveness for smolts. The diel spill shape functions to provide either higher or lower spill volume during periods of either higher or lower fish passage. Spill shaping is based on the observed diel (24-hour) passage distributions of smolts at each project during spring and summer (Steig et al. 2009, Steig et al. 2010, Skalski et al. 2008, Skalski et al. 2010, Skalski et al. 2011, Skalski et al. 2012). The different spill percentages and time blocks are shaped such that the summation of water volume from all time blocks within the day equals the volume of water that would have been spilled under a constant, unshaped spill level (for instance spill at 9 percent day-average river flow at Rocky Reach with no shaping). The hourly spill shape in 2014 will remain consistent with previous years, 2004-2013.

Table 2. Fish spill percentages and spill shape for the Rocky Reach spill program, 2014.

Project	Season	Daily Spill Average	Within-Day Spill Levels	Duration (# of hours each day)	Time of Day	Spill Shape %
Rocky Reach	Spring	none	--	--	--	--
Rocky Reach	Summer*	9%	Med	1	00:00-01:00	9.0%
			Low	6	01:00-07:00	6.0%
			Med	2	07:00-09:00	9.0%
			High	6	09:00-15:00	12.0%
			Med	9	15:00-00:00	9.0%

*Spill for subyearling Chinook

2014 Run-Timing Predictions

Chelan PUD utilizes the University of Washington (UW) to provide run-timing predictions and year-end observed values for spring and summer out-migrating percentiles for salmon and steelhead. UW's Program RealTime run-time forecasting model is used for this purpose. Program Real-Time provides daily forecasts and cumulative passage percentiles for steelhead, yearling Chinook, sockeye, and subyearling Chinook at both Rocky Reach and Rock Island. This program enables Chelan PUD to better predict the time when a selected percentage of these species will arrive, and when a given percentage of any stock has passed. The program utilizes daily fish counts from the Rocky Reach bypass sampling facility and the juvenile bypass trap at Rock Island Dam. Estimates of passage percentiles are generated with the model's forecast error and are displayed with the daily predictions at:

http://www.cbr.washington.edu/crisprt/

Historic Run Timing

Estimated mean dam passage dates (first percentile to the 95th percentile) for each species at Rocky Reach and Rock Island are summarized in Table 3. Run-timing dates are estimated from daily index sample counts at the Rocky Reach JFBS, 2004-2013, and from the Rock Island Dam smolt bypass trap, 2000-2013 (Table 3). At Rocky Reach, the subyearling Chinook run generally begins the first week of June, with the one-percentile passage date on 1-June (mean date for years 2004-2013). Rocky Reach subyearling passage reaches the 95th percentile, on average, around 9-August (2004-2013, range: 27-July to 24-August).

Rock Island Dam juvenile salmon and steelhead sampling from the Smolt Monitoring Program (SMP), 2002-2013, indicates that the first percentile (one-percent passage) mean passage date for combined spring migrants (yearling Chinook, steelhead, and sockeye) occurs around 18-April (Table 3). The latest spring spill start date for Rock Island per the HCP is 17-April. The summer outmigration of subyearling Chinook smolts at Rock Island Dam generally begins in early June (although fry are encountered earlier), and on average, reaches the 95th percentile passage point around 8-August (range: 1-August to 18-August, 2002-2013).

Table 3. Spill percentages, bypass operation dates, and mean passage percentile dates (2002-2013) for the 1st and 95th percentile passage points for HCP spring and summer outmigrants at Rocky Reach and Rock Island.

Rocky Reach	steelhead	yearling Chinook	sockeye	subyearling Chinook
Percent Spill	0% Spring	0% Spring	0% Spring	9% Summer
1st, 95th percentile Passage Dates	4/16, 5/31	4/16, 5/30	5/6, 5/26	6/1, 8/9
RR Bypass Operating?	Yes 4/1 – 8/31	Yes 4/1 – 8/31	Yes 4/1 – 8/31	Yes 4/1 – 8/31
Rock Island	**steelhead**	**yearling Chinook**	**sockeye**	**subyearling Chinook**
Percent Spill	10% Spring	10% Spring	10% Spring	20% Summer
1st, 95th percentile Passage Dates	4/22, 6/9	4/14, 6/5	4/19, 6/15	6/3, 8/8
RI Bypass Trap Operation	4/1 - 8/31	4/1 - 8/31	4/1 - 8/31	4/1 - 8/31

Source - Rock Island: http://www.cbr.washington.edu/crisprt/index_midcol2_pi.html
Source- Rocky Reach: http://www.cbr.washington.edu/crisprt/index_midcol2_che.html

Rock Island 2014 Spring Spill

In 2014, Rock Island Dam will spill 10 percent of the estimated day average river flow starting no later than 17-April, and will end spill after 95 percent of spring outmigrants have passed the dam (usually the first week of June) and spill passage has been provide for at least 95% of the spring species outmigration. Spill volume will be shaped to maximize spill efficiency (Table 4). Chelan PUD personnel will operate the Rock Island bypass trap, an upper Columbia Smolt Monitoring Program (SMP) site, continuously from 1-April through 31-August, seven days per week to provide daily smolt counts. Index counts will provide the basis to determine the start and end the spring and summer outmigration periods. HCP SOA guidelines to start and end the spring spill program at Rock Island are as follows:

1. The Rock Island spring spill program will begin when the Rock Island daily smolt passage index count exceeds 400 fish for more than 3 days (this corresponds to the approximately 5 percent passage date), or no later than 17-April, as outlined in Section 5.4.1. (a) of the Rock Island HCP.

2. Rock Island spring spill will end following completion of the spring outmigration (95 percent passage point), and subyearling summer Chinook have arrived at the Project.

Rock Island 2014 Summer Spill

Rock Island will spill 20 percent of the estimated daily average river flow for a duration covering 95 percent of the summer out migration of subyearling Chinook. Daily smolt counts from the Rock Island bypass trap will inform decisions on when to start and stop spill. The HCP Coordinating Committee's (HCPCC) agreement guidelines to start and stop the summer spill at Rock Island are outlined as follows:

1. Rock Island summer spill in 2014 will begin immediately after completion of the spring spill. The summer spill level will be 20 percent of day average flow, shaped to increase spill efficiency. Spill will continue for a duration covering 95 percent of the subyearling outmigration.

2. Summer spill will generally end no later than 15-August, or when subyearling counts from the Rock Island trap are 0.3 percent or less of the cumulative run total for any three out of five consecutive-day period, and UW's Program RealTime is estimating 95 percent run completion (same protocol used in 2004-2013).

Table 4. Spill percentages and hourly spill shape for the Rock Island spring and summer fish spill program, 2014.

Project/Season	Daily Spill Average	With-in Day Spill Levels	Duration (# of hours each day)	Time of Day	Spill Shape %
Rock Island Spring*	10%	High	4	0000-0400	12.5
		Med	3	0400-0700	10.0
		Low	5	0700-1200	6.0
		Med	8	1200-2000	10.0
		High	4	2000-2400	12.5
Rock Island Summer**	20%	High	1	0000-0100	23.0
		Med	1	0100-0200	19.0
		low	8	0200-1000	15.0
		Med	1	1000-1100	19.0
		High	13	1100-2400	23.0

*Spring spill for yearling Chinook, steelhead, and sockeye; **summer spill for subyearling Chinook

Spill Program Communication

Chelan PUD's fish spill coordinator will notify the HCP Coordinating Committee (HCPCC) not less than once per week when fish passage numbers indicate that specific triggers for starting or stopping spill are likely to occur in the immediate future. Chelan PUD will notify the HCPCC regarding any unforeseen issues that pertain to the spill program as the season progresses. Communications with the HCPCC on spill information will generally be made by email, pre-scheduled conference calls, and HCPCC monthly meetings.

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2014 Rocky Reach Juvenile Fish Bypass System Operations Plan

Final Plan

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February 2014

Introduction

The Public Utility District of Chelan County (District) constructed and installed a permanent fish bypass system (FBS) in 2002/2003. The bypass system is designed to guide juvenile salmon and steelhead away from turbine intakes at Rocky Reach Dam. The system consists of one surface collector entrance (SC) and the intake screen (IS) system in turbine units 1 and 2. Please refer to Mosey (2004) for a detailed description of the bypass production system.

Studies and data collection at the Rocky Reach FBS fall under one of two general categories "Standard Operations" or "Special Operations" for bypass evaluations. Activities and data collection under standard operations include day to day sampling of run-of-river (ROR) fish to evaluate run timing, species composition, and fish condition after passage. Special operations may include additional sampling time to supply fish for marked fish releases.

2014 Evaluation Requirements

Run-of-river fish are collected at the Juvenile Sampling Facility (JSF) to evaluate and provide fish for the following:

1. Run timing of target species:
    a. Provide standardized juvenile capture rate data to supplement Program RealTime (UW) run-timing predictions
    b. Guide decisions about initiating summer fish spill
    c. Verify bypass operations provide protection for 95% of the juvenile summer Chinook outmigration (September operations to be determined by the Rocky Reach Habitat Conservation Plan Coordinating Committee (RR HCP CC))

2. Fish species composition:
    a. Guide decisions about starting or stopping spill
        i. Currently summer fish spill occurs at Rocky Reach.

3. Origin of fish stocks and identification of marked individuals:
    a. PIT tags
    b. Fin clips

4. Fish condition:
    a. Ensure that the bypass system remains safe for migrating juvenile salmon and steelhead by evaluating:
        i. Descale: 20% or more scale loss on either side
        ii. Injury: Scratches, bruises, or hemorrhages
        iii. Mortality: Any fish dead on arrival to sampling facility

2014 Study Methods

For more information about the study methods please refer to Mosey (2004).

Standard Operations:

1. Sampling Periods (1 April to TBD September):
    a. Monday through Sunday
    b. Collections Times
        i. 30 minute maximum **(or)**
            i. 0800-0830
            ii. 0900-0930
            iii. 1000-1030
            iv. 1100-1130
        ii. Target number of fish
            i. 350 spring species
            ii. 125 summer species

2. Fish Condition:
    a. First 100 fish of each species are examined for condition:
        i. Descale
        ii. Injury
        iii. Mortality

3. Species Composition:
    a. ROR fish collected are enumerated by species
    b. Collect data for Program RealTime to determine start and end of spill
    c. Currently summer fish spill occurs at Rocky Reach.

4. Origin of fish stocks and identification of marked individuals:
    a. PIT tags
    b. Fin clips

Special Operations:

1. Marked Fish Releases (Prior 1 April):
    a. Prior to the 1 April system start-up, hatchery yearling Chinook will be used for marked fish releases to determine if the JFBS is causing descale, injury, or mortality.
        i. Releases will be conducted with hatchery summer chinook prior to the 1 April start date to determine if the JFBS is working properly and to help isolate potential sources of descale, injury, and mortality.
        ii. Fish (n = 100/release) of varying sizes will be randomly selected from hatchery chinook. Only those with no scale loss or injury will be marked.
        iii. Marked fish will be systematically released at locations upstream of the sampling screen in the bypass system and into both intake screens in units C1 and C2.
        iv. If potential problems are identified, resolve problems by 1 April system start-up.

2. Marked Fish Releases (1 April to TBD September):

a. A phased approach will be used to evaluate the descaling rate, injury rate, and mortality rate of fish passing through the bypass system. We developed a sampling protocol and threshold percentages (Table 1) for descale, injury and mortality that will trigger study phases.
b. Identify "ambient" rates of descale, injury and mortality.
c. Once the ambient rate is estimated and if further sampling shows descale problems continuing at 5%, (3% for injury, 2% for mortality) *above* ambient level for three consecutive samples.
    i. If variable rates of descale, injury or mortality do occur between species, then collection of yearling chinook, sockeye, or steelhead may be necessary for marked releases.
    ii. Fish (n = 100/release) of varying sizes will be randomly selected at the juvenile facility and only those migrants with no scale loss or injury will be marked.
    iii. Marked fish will be systematically released at locations upstream of the sampling screen in the bypass system until the problem area is isolated.
d. Identify circumstances when we would refer to the RR HCP CC.

e. The District will consult with the RR HCP CC if any abnormal fish conditions (within values outlined in Table 1) are observed in the sample population.

Table 1. Flow diagram of phased approach and threshold values for conducting marked-fish releases in the *juvenile bypass system at Rocky Reach Dam (Skalski and Townsend 2003)*

	Phase 1		Phase 2		Phase 3		Phase 4
Threshold		**5% initl**		**A*+5%**		**A*+15%**	
Descale	Index sampling for for descale rate	→	Mark-releases to est. ambient descale	→	In-system mark-releases to isolate descale problem	→	refer to HCP Coord. Comm.
Threshold		**3% initl**		**A*+3%**		**A*+10%**	
Injury	Index sampling for for inury rate	→	Mark-releases to est. ambient injury	→	In-system mark-releases to isolate injury problem	→	Temp. bypass shutdown refer to HCP Coord. Comm.
Threshold		**2% initl**		**A*+2%**		**A*+4%**	
Mortality	Index sampling for for mortality rate	→	Mark-releases to est ambient mortality	→	In-system mark-releases to isolate mortality problem	→	Temp. bypass shutdown refer to HCP Coord. Comm.

A* = Ambient percentage

3. Collection of Bull Trout:
    a. Document:

   i. Fork Length and weight measurements
   ii. Condition (descale, injury, or mortality)

b. Allow to recover, then release

Daily Protocol for Fish Collection

Standard Operations:

1. Deploy sampling screen at beginning of each hour (0800, 0900, 1000, 1100 hours).
2. Using direct enumeration to count fish entering the sampling facility
3. Collect for 30 minutes **or** until approximately 350 spring migrants/125 summer migrants have been collected, whichever comes first. RETRACT SCREEN IF 200 TO 300 FISH ARE COLLECTED IN FIRST TWO MINUTES.
4. Retract screen when time period or target number of fish has been reached.
5. Determine species composition of all collected fish in the hourly sample.
6. Scan/examine each fish for PIT tags, fin clips, and acoustic tags.
7. Evaluate fish condition (first 100 fish per species).
8. If needed, collect and hold fish for marked releases (Special Operations).
9. Return to step 1 for next sample period. After the 1100 hour sample, go to step 11.
10. See Special Operations
11. Allow anesthetized fish (examined for species composition and fish condition) to recover in the facility's holding tank for at least 1.5 hours.

Special Operations:

1. If fish are collected for marked fish releases, verify that the required number of target species has been set aside from the four sample periods.
2. If the required number of fish are not collected by the 1100 hour sample period, deploy the sampling screen and repeat steps 2 and 4 under standard operations.
3. Scan/check all anesthetized fish for PIT and acoustic tags.
4. Collect and hold the fish at the facility for transport and/or marking (marked fish releases).
5. Determine species composition for any remaining anesthetized fish and scan for PIT tags.
6. After fish have been collected to meet study needs, estimate the number of fish remaining in the raceway (by species to the extent practical), record the number, and immediately release the fish back into the bypass pipe.
7. Return to step 11 under Standard Operations.

Contingencies:

1. If, after start-up of the bypass system, we encounter any unforeseen problem(s) with fish collection, we will immediately consult with the RR HCP CC on how to correct the problem(s).
2. If we accumulate many fish during a collection period (e.g. just after a hatchery release), we will only handle/sample the number of fish needed to satisfy the

study requirements and then immediately release the remaining fish back into the bypass pipe.

3. If we accumulate many fish during each "index" sample period, we will only evaluate species composition in the first three periods. In the final period, we will evaluate descale and injury, regardless of the number of fish. However, we will be attentive to any injury or descale that may be present among the fish in each of the first three periods. We need to allow enough time (between samples) to gather all species composition information, so that we have representative information on daily passage.

Diversion Screen and Trashrack Cleaning (Units 1 and 2):
During the last week of March, the trashracks in front of Units 1 and 2 (six intakes total) will be cleaned by divers and clammed to remove any dislodged debris. The trash rack cleaning will be repeated as differentials increase across the racks due to debris load. A mid-season cleaning will be scheduled in June. Starting 1 April, the vertical barrier and diversion screens (IS system) will be cleaned one to two times per week or as needed with an automated screen cleaner. Careful observation of trash build up will also be monitored and the screens will be cleaned on a more regular basis if warranted. Frequency of the cleanings may increase depending on debris load during spring run-off and aquatic plant load in the summer. The District will log each screen cleaning, and in the event of high descaling/injury in a single sample, the vertical barrier and diversion screens will be inspected prior to releasing marked fish.

Discussion

The 2014 biological studies at Rocky Reach will encompass the following: 1) a continuing evaluation of the juvenile bypass system, 2) a daily sampling program to monitor fish passage for run timing, and 3) extend operations into September to verify bypass operations are protecting 95% of the juvenile summer Chinook outmigration, with a termination date of operations to be determined by the RR HCP CC. Representatives of various research agencies and the RR HCP CC will be consulted about the development of detailed study plans and protocols. A time line showing important activities and deadlines for these activities has been developed and is presented in Table 2.

Table 2. Tasks and deadlines for the Rocky Reach 2014 biological evaluations.

Task	Deadline
Present 2014 study plan to Committee	**Winter 2013-2014**
Committee discussion/comments on study plan	**Feb. 25, 2014-Mar. 25, 2014**
Pre-season JFB operations testing (marked fish releases prior to 1 April)	March 15, 2014-March 31, 2014
Begin biological evaluation of JFB	April 1, 2014
Complete 2014 biological evaluation	September 30, 2014
Present 2014 evaluation report to Committee	**December 31, 2014**
Committee comments on 2014 report	**February 1, 2015**
Present 2013 report to Committee	March 1, 2014

****Tasks printed in bold text require action by the HCP Coordinating Committee.**

References

Mosey, T. R., S. L. Hemstrom, and J. R. Skalski. 2004. Study Plan for the Biological Evaluation for the Rocky Reach Fish Bypass System-2004. Chelan County Public Utility District, Wenatchee, Washington.

Appendix A

Rocky Reach Surface Collector Operations for July 2014 during C2 Unit Outage

Final Operating Plan for Rocky Reach Surface Collector and C1 Turbine Unit during the C2Turbine unit outage in July 2014

1) RR JFB Surface Collector (SC) will utilize three additional installed SC pumps to increase attraction flow from 6,000 to 6,660 cfs into the SC entrances (3,330 cfs each side) when C2 is removed from service for rotor crack repairs in July 2014.

2) The dewatering screen cleaning system will function normally under the increased entrance flow and the cleaning process should not be affected. The automated screen cleaning routine will be more frequent if increased debris load is encountered.

3) Normal water velocity (Vn) through the dewatering screens in the SC channels will increase proportionally to the SC flow-rate increase, which is approx 11%. Calculations show screen velocity will increase from 0.4 fps to about 0.444 fps (an 11% increase) under the 6,660 SC flow. Water velocity will increase uniformly (no hot spots) across the entire SC dewatering screen surface area as regulated by the tuned screen baffling.

4) RR will increase turbine unit C1 flow, from its normal *soft-limit* set-point of 12.2 kcfs to a *soft-limit* flow of 15.2 kcfs during the C2 outage.

Rock Island Dam Smolt Monitoring and Gas Bubble Trauma Evaluation Plan 2014

Public Utility District #1 of Chelan County

Final Plan

Prepared By:

Lance Keller

February 2014

Introduction:

The primary objective of the Rock Island Smolt Monitoring Project (RISMP) is to provide information on Mid-Columbia juvenile salmonid out-migration timing to the Fish Passage Center (FPC). Another objective of this project is to provide information to the Columbia River basin-wide database for passive integrated transponder (PIT) tagged fish in coordination with Pacific States Marine Fish Commission (PSMFC). This data will improve the fish managers understanding of smolt out-migration timing and survival in the Columbia River System. A further objective of the project is to monitor downstream migrating juvenile salmonids for signs of gas bubble trauma (GBT).

This program is designed to measure the migration characteristics of emigrating salmonids. It also provides a comparison and evaluation of year-to-year migration information such as travel time and peak abundance. Monitoring at Rock Island Dam is ideal for indexing juvenile salmonid emigration and travel time because the trap site is located down river from four major tributaries and several hatcheries that release fish to the mid-Columbia Basin. Daily collections will be used to compute the 10%, 50%, and 90% dates of passage at the collection site.

Bypass Monitoring Requirements:

Sampling will begin on 1 April 2014 and will be completed on a to-be determined date in September 2014 by the Rock Island Habitat Conservation Plan Coordinating Committee (RI HCP CC) 2014. Operations in September 2014 are to verify bypass operations provide protection for 95% of the juvenile summer Chinook outmigration. Data summary, analysis and report writing will occur throughout the sampling period and be completed by 31 January 2015.

A. Tasks

Public Utility District #1 of Chelan County, hereafter referred to as the District, will monitor the gatewell orifice bypass trap from 1 April to a date in September 2014 determined by the RI HCP CC. Personnel monitoring the bypass trap at Rock Island Dam will consist of District employees. A District Fish and Wildlife Specialist will supervise the onsite crew at the bypass trap. A permanent District Biologist will oversee the monitoring program.

Fish will be collected continuously during the monitoring period. Fish will be examined during regular work hours (0700–1530 hrs), unless large numbers of fish are entering the flume of the bypass trap, in which case fish would be removed and recorded as the appropriate sample days catch. Fish will be delivered via the bypass elevator to a 12' x 4'x 3.5' aluminum holding tank in the sampling facility, which is plumbed for continuous flow of river water. Small samples (40-60) of fish will be pre-anesthetized using a pre-mixed solution of MS-222 (1.8 ml per gal. of water) before being moved by net into the sorting holding tank with a solution of MS-222 (3.6 ml per gal of water). *** See MS-222 stock solution mixing rates below.** Fish will be identified by species and examined for marks indicating hatchery origin and descaling. Anesthetized fish will recover in a separate holding tank and be released after they have recovered from anesthesia.

Sub-samples of up to 100 Chinook and steelhead will be examined for signs of GBT twice weekly. The unpaired fins and eyes will be examined for the presence of bubbles. Absence or presence of GBT symptoms as well as the location and severity of symptoms will be reported to the FPC daily throughout the sampling season.

Insertion of PIT tags will begin when an increase in the number of juvenile salmon being captured in the bypass trap is observed, usually around mid-April, and will continue throughout the monitoring season as appropriate for each species. The target of the PIT tagging operation will be the middle 80%, of both the Wenatchee, Methow and Okanogan runs that pass the dam during April and May respectively. Beginning in June, subyearling Chinook will be marked until 4,800 fish have been tagged.

Fish will be injected with PIT tags by hand using a medical syringe/push rod mechanism with a sterile 12-gauge veterinary needle. Tagged fish will be placed on a plastic covered measuring board where the information and length measurements will be recorded by touching the stylus directly on the digitizing board. Data for PIT tagged fish and the number of tagged fish will be recorded directly into a computer via a digitizing board.

Standard PIT tagging procedures will be followed and PIT tags, equipment, and other miscellaneous tagging supplies will be purchased under the RISMP contract. Data will be entered into a computer and supplied to the FPC daily by modem.

B. RIJSF Sampling

Run-of-river fish collected at the Rock Island Juvenile Sampling Facility (RIJSF) to evaluate fish for the following:

1. Run timing of target species:
    a. Provide standardized juvenile capture rate data to supplement Program RealTime (UW) run-timing predictions
    b. Guide decisions about initiating spring and summer fish spill
        i. Currently spring and summer fish spill occurs at Rock Island Dam
    c. Verify bypass operations provide protection for 95% of the juvenile summer Chinook outmigration (September operations)

2. Fish species composition:
    a. Guide decisions about starting or stopping spill
        i. Currently spring (10%) and summer (20%) fish spill occurs at Rock Island Dam.
        ii. Report counts and condition of all salmonid species to the FPC daily.

3. Fish condition:
    a. Evaluate run-of-river fish condition for migrating juvenile salmon and steelhead.
        i. Descale: 20% or more scale loss on either side
        ii. Injury: Scratches, bruises, or hemorrhages
        iii. Mortality: Any fish dead on arrival to sampling facility
        iv. Examine juvenile salmonid emigrants for symptoms of GBT twice weekly. Report GBT examination results to FPC when collected.

4. Origin of fish stocks and identification of marked individuals:
    a. PIT tags
    b. Fin clips
    c. Acoustic tags
    d. Other external marks or tags

5. PIT tagging:

a. Insert PIT tags into between 200 and 600 unclipped Chinook yearlings, unclipped sockeye, hatchery steelhead and wild steelhead weekly (Table 1).
b. Insert PIT tags into as many unclipped subyearling Chinook daily as necessary to reach 600 fish per week over an 8-week period between mid-June and mid-August (seasonal total of 4,800 fish).
c. Transfer PIT tag generated data to PSMFC PITAGIS system daily.

6. Daily reporting:
   a. Report counts and condition of all salmonid species to the FPC daily.
   b. Report the average river flow, average flow through Powerhouse No.1, average flow through Powerhouse No. 2, and average spill daily.
   c. Report GBT examination results to FPC when collected.

Table 1. Weekly PIT tagging quotas at Rock Island Dam during the 2014 smolt monitoring season.

Week Starting	Weekly Quotas				
	Unclipped Chinook Yearling	Unclipped Chinook Subyearling	Unclipped Sockeye	Hatchery Steelhead	Wild Steelhead
07 Apr					
14 Apr					
21 Apr	600		600	200	
28 Apr	600		600	400	200
05 May	600		600	400	200
12 May	600		600	400	200
19 May	600		600	400	200
26 May	600		600	400	200
02 Jun	200			400	200
09 Jun				200	
16 Jun					
23 Jun		600			
30 Jun		600			
07 Jul		600			
14 Jul		600			
21 Jul		600			
28 Jul		600			
04 Aug		600			
11 Aug		600			
18 Aug					
Season Totals	**3,800**	**4,800**	**3,600**	**2,800**	**1,200**

Daily Protocol for Fish Collection:

Standard Operations:

1. Fish will be collected continuously during the monitoring period 0900-0900 (24 hours).
2. Fish will be examined during regular work hours (0700–1530 hrs), unless large numbers of fish are entering the flume of the bypass trap, in which case fish would be removed and recorded as the appropriate sample days catch.
3. Dewatering screens are raised and fish crowded into the transport elevator.
   a. If large numbers of fish are present in the sampling raceway, use more than one elevator trip.
4. Fish will be delivered via the bypass elevator to a 12' x 4'x 3.5' aluminum holding tank in the sampling facility.
   a. Ensure continuous flow of river water to holding tank..
5. Small samples of fish will be moved into the sorting holding tank with a solution of MS-222 (3.6 ml per gal of water). *** See MS-222 stock solution mixing rates below.**
6. Fish will be identified by species and condition.
   a. Evaluate fish condition (first 100 fish per species).
7. Scan each fish for PIT tags, fin clips, external tags and acoustic tags.
8. If needed, collect and hold fish for PIT tagging, acoustic tagging and/or marked releases (Special Operations).
9. Allow anesthetized fish (examined for species composition and fish condition) to recover in the facility's holding tank for at least 1.0 hours.
   a. Release fish after they have recovered from anesthesia.

2014 - MS-222 Recommended Knockdown & Maintenance Dosage

(CCPUD) Stock Solution Mix Ratio MS-222:

1000 grams per 5 gals. of water *(18.925 liters per 5 gals.)*
200 grams per 1 gal. of water *(3.785 liters per 1 gal.)*
53 grams per 1 liter of water

(CCPUD) Stock Solution Used for Fish Examination:

Pre-anesthetized Dose:

Use 1.8 ml of stock solution per gal of water for pre-anesthetized dose
Use 9 ml of stock solution per 5 gals. of water

(CCPUD) Stock Solution Used for Fish Examination:

Knockdown Dose:

Use 3.6 ml of stock solution per 1 gal. of water in knockdown tank OR
Use 18 ml of stock solution per 5 gals. of water

*** The amount of MS-222® used, however, varies throughout the season depending upon temperature, the number of fish in each chamber and the species of fish being sedated**.

Other Operations:

1. PIT tagging:

a. Insert PIT tags into between 200 and 600 unclipped Chinook yearlings, unclipped sockeye, hatchery steelhead and wild steelhead weekly (Table 1).
b. Insert PIT tags into as many unclipped subyearling Chinook daily as necessary to reach 600 fish per week over an 8-week period between mid-June and mid-August (seasonal total of 4,800 fish).
c. Transfer PIT tag generated data to PSMFC PITAGIS system daily.

2. **Collect and hold the fish at the facility for transport (acoustic tagging) and/or marking (marked fish releases). *Only done if fish cannot be collected at RRJSF.***
3. Return to step 8 under Standard Operations.

Bull Trout:

1) Columbia River bull trout are a **federally threatened species** and have federal protection under the **Endangered Species Act (ESA).** The US Fish and Wildlife Service (USFWS) issued a Biological Opinion on the effects to bull trout for incorporating Chelan's HCPs into the Rock Island Project license. The USFWS issued an annual incidental take (injure or kill) level of no more than 2% of the bull trout passing through the juvenile fish bypass per year. In 2014, if a bull trout is incidentally captured during daily sampling at the Rock Island juvenile sampling facility, please follow these protocols:
2) ***Healthy bull trout:*** If you capture a bull trout during sampling, take a fork length measurement, document condition; note the collection time and water temperature. After a bull trout is incidentally subjected to anesthesia and identified in the sorting trough, allow for normal recovery time in fresh water and then release the fish back to the pipe.
3) ***Sick or injured bull trout:*** If you capture a sick or injured bull trout during sampling operations, do not retain it unless you are *absolutely positive* that it is destined to die if released (for example, the fish is unable to right itself, is upside down and barely gilling, pupil is non-responsive). If the fish has a possible chance to survive, take a ***fork length*** measurement, document any apparent physical injury or descale, and note the time. If a bull trout is incidentally subjected to anesthesia and identified in the sorting trough, allow for normal recovery time in fresh water and then release the fish back to the pipe.
4) ***Bull trout mortalities:*** If you encounter a bull trout mortality, please save, identify, and preserve (bag, identify and freeze) the fish, and ***inform Steve Hemstrom ext. 4281 following completion of the Index sampling that day***. Please document and communicate the circumstances in which the fish was found, and any apparent physical injury (including descale) you observe. Make arrangements to deliver the specimen to the Fish and Wildlife building at headquarters. If the fish is mortally injured, retain the fish in a sample bag and preserve in the refrigerator or freezer. Please notify Steve Hemstrom at the end of the day's sampling and arrange for delivery or pick-up of the fish to District Fish and Wildlife department.
5) ***Sub-adult bull trout PIT Tagging:*** No PIT tagging will occur in 2014.
6) ***Sub-adult bull trout tissue sample:*** No tissue samples will be taken in 2014.

Contingencies:

1. If, after start-up of the bypass system, we encounter any unforeseen problem(s) with fish collection, we will immediately work to correct the problem(s) and consult with the HCP Coordinating Committee.

C. Statement of BPA's involvement in the Project

The RISMP is a cooperative study between The District, Bonneville Power Administration (BPA), and the FPC. The District will provide supervisory costs for the project as it relates to District personnel, while BPA will pay for the remaining costs of the project. These costs include (but are not limited to) labor, benefits, transportation, miscellaneous materials and administrative overhead (see attached budget).

D. Time Schedule

Sampling will begin on 1 April 2014 and will be completed in September as determined by the RI HCP CC. Samples will be collected from 0900 hrs to 0900 hrs the following day throughout the sampling period.

E. Reporting Tasks

Fieldwork for this project occurs in the 6-month period between April and September. A final report on the 2014 Smolt Monitoring Program will be issued by 31 January 2015.

Place of Operations:

All sampling will take place at the Rock Island Dam Powerhouse No. 2, which is located 15 miles southeast of the city of Wenatchee, at Columbia River mile 453.

Personnel Involved:

The Senior Fisheries Biologist for Chelan County P.U.D. is Steve Hemstrom. He can be reached at (509) 661-4281, Fax (509) 661-8108, Email steven.hemstrom@chelanpud.org or mail P.O. Box 1231, Wenatchee WA, 98807.

The Fisheries Biologist for Chelan County P.U.D. is Lance Keller. He can be reached at (509) 661-4299, fax (509) 661-8108, Email lance.keller@chelanpud.org or mail P.O. Box 1231, Wenatchee WA, 98807.

Fish &Wildlife Operations Superintendant for Chelan County P.U.D. is Todd West. He can be reached during normal working hours at (509) 661-4559, Email todd.west@chelanpud.org or mail P.O. Box 1231, Wenatchee WA, 98807.

The District crew working at Rock Island Dam will be supervised by a Fish & Wildlife Specialist/Foreman.

Fish and Wildlife Helpers who will be working on the project will be hired in the spring of 2014.

Proposal to Trap Spring-Run Chinook Salmon at Rocky Reach Trap - 2014

March 25, 2014

Alene Underwood
Catherine Willard

Purpose

2014 will represent a second pilot year to evaluate:

- The Rocky Reach Trap (RRT) modifications made in 2014, and
- The efficacy of using sort-by-code technology to target PIT-tagged natural origin adults for broodstock.

Background

RRT to be used for broodstock collection the District's Methow spring Chinook production obligation of 60,516 fish

- 2013 Pilot Results

Total Days Trapping – 15

Total Hours Manning Trap - 59

Total Minutes Trapping - 73

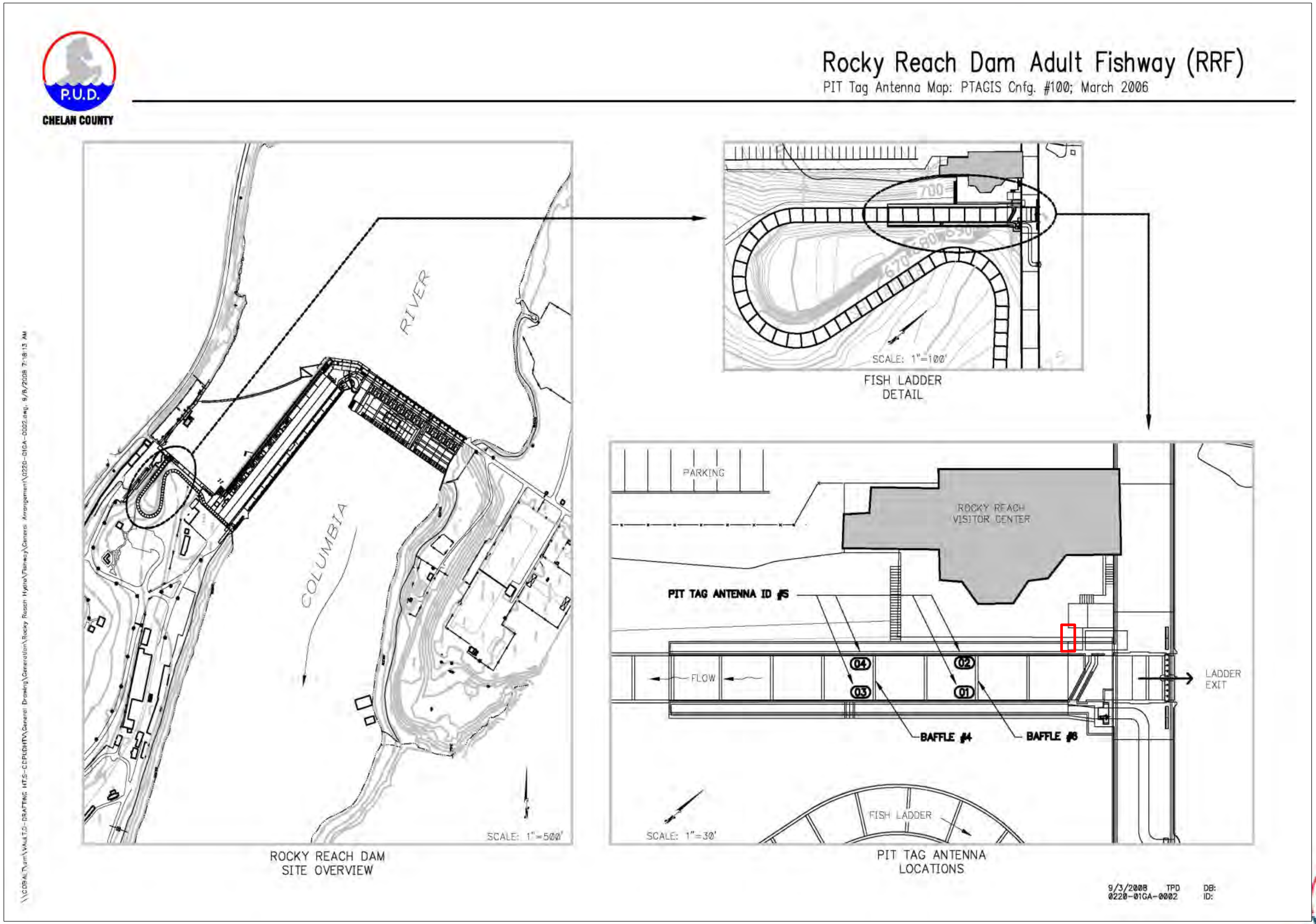
Total # of trapping oppys - 34

Total # of target fish trapped – 8

- Travel times between weirs 4 and 6 in the ladder were 4m25s (non-trapping, n=119) and 3m07s (trapping, n=64); not statistically significant (p=0.2354)

2014 RRT Improvements

- Replace the solid trap door with a rectangular 1" diameter vertical bar screen with 1" spacing;
- Install underwater lighting and an underwater camera;
- Install an electrical control pendant for the technician located above the trapping area;
- Paint the floor in the viewing window white to create contrast;
- Install an additional PIT-tag array and sort-by-code program.



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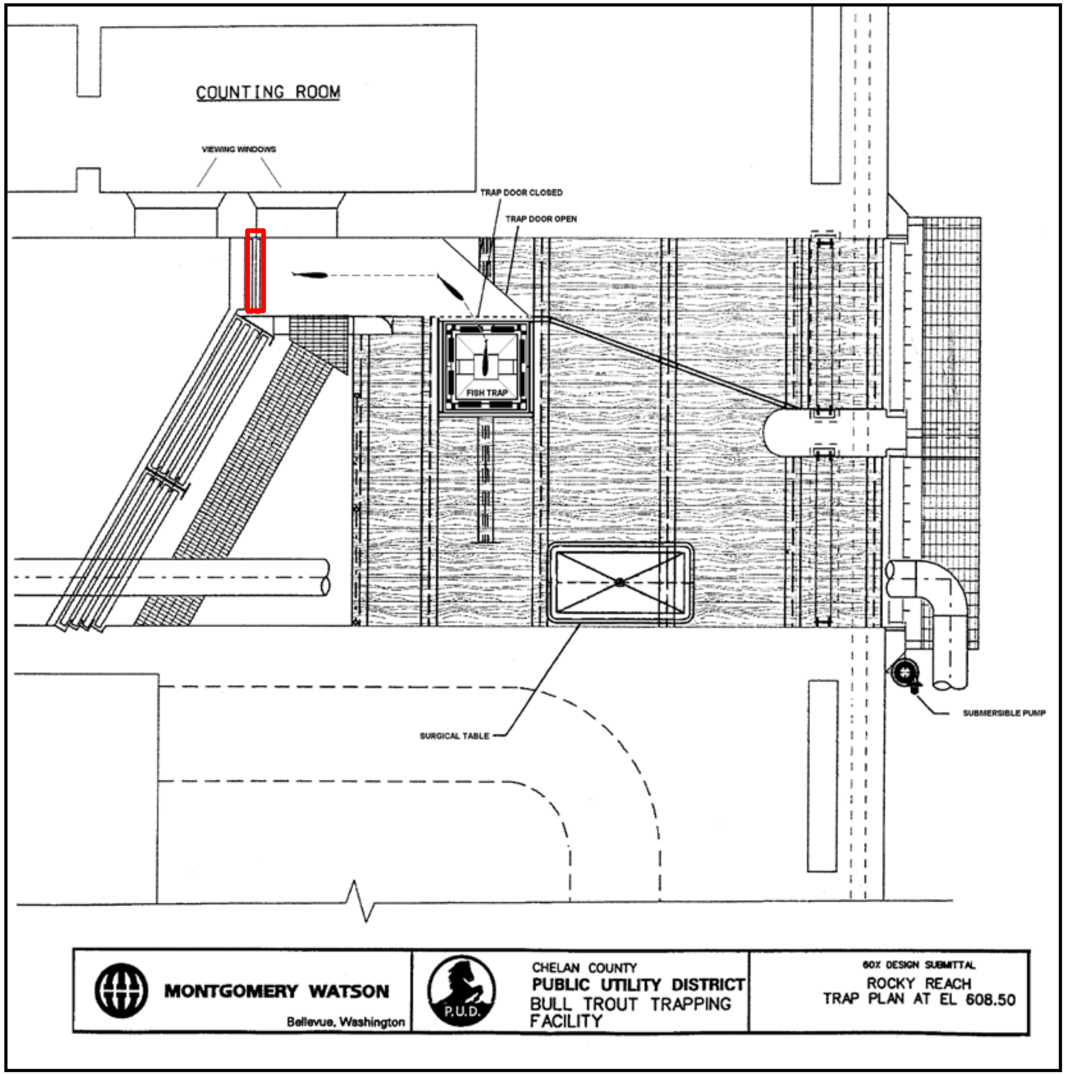
COUNTING ROOM
VIEWING WINDOWS
TRAP DOOR CLOSED
TRAP DOOR OPEN
FISH TRAP
SURGICAL TABLE
SUBMERSIBLE PUMP
MONTGOMERY WATSON
Bellevue, Washington
P.U.D.
CHELAN COUNTY
PUBLIC UTILITY DISTRICT
BULL TROUT TRAPPING
FACILITY
60% DESIGN SUBMITTAL
ROCKY REACH
TRAP PLAN AT EL 608.50

2014 Trapping Details

- Trapping would occur Monday through Friday up to eight hours per day (from 7:00 a.m. to 3:00 p.m.), with unrestricted passage during non-trapping events;
- Based on PIT tag detection between 2006 and 2013, 70% of the PIT-tagged adults move through the RR fishway between 7:00 a.m. and 3:00 p.m;
- Unless the trap operator is attempting to actively trap a target fish, the ladder will be open to passage;
- Trapping will begin in late April and will continue through about the third week in June.

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Seattle, Washington 98101
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FINAL MEMORANDUM

To:	Rock Island HCPs Coordinating Committee	**Date:**	May 27, 2014
From:	Michael Schiewe, Chair		
Cc:	Kristi Geris, Tom Kahler		
Re:	Final Minutes of the April 14, 2014 HCPs Coordinating Committees Conference Call		

The Rock Island Hydroelectric Projects Habitat Conservation Plan (HCP) Coordinating Committee met by conference call on Monday, April 14, 2014, from 9:00 am to 9:30 am. Attendees are listed in Attachment A of these meeting minutes.

ACTION ITEM SUMMARY

- Lance Keller will verify that the estimated 4- to 5-foot clearance located between the bulkhead gate and the fishway wall is not constructed any narrower (Item II-A).

DECISION SUMMARY

- The Rock Island HCP Coordinating Committee representatives present approved Chelan PUD's request to alter the location of the Rock Island left bank adult fishway modifications from the third slot to the first slot (Item II-A).
- The Rock Island HCP Coordinating Committee representatives present approved Chelan PUD's request to extend the ladder outage at the Rock Island left bank adult fishway from April 15 to April 22, 2014 (Item II-B).
- The Rock Island HCP Coordinating Committee representatives present approved Chelan PUD's request to shift spring spill at Rock Island Dam from the left fish ladder to Powerhouse 1 on April 17, 2014, in the interest of safety for the construction crew working in the immediate area of the left fish ladder (Item II-C).

AGREEMENTS

- There were no agreements discussed during today's conference call.

I. Welcome

Mike Schiewe welcomed the Rock Island HCP Coordinating Committee. He said the purpose of this call is to obtain approval of: 1) a slight modification to the Rock Island Left Bank Adult Fishway Denil Plan; 2) an extended outage for the Rock Island left bank adult fishway; and 3) a slight deviation from Chelan PUD's 2014 Fish Spill Plan and Rock Island Interim Fish Passage Plan (IFPP).

II. Chelan PUD

A. Rock Island Left Bank Adult Fishway Denil Plan (Lance Keller)

Lance Keller said that a revised Rock Island Left Bank Adult Fishway Denil Plan was distributed to the Rock Island HCP Coordinating Committee by Kristi Geris late Friday, April 11, 2014. He explained that Chelan PUD's engineering and construction teams were concerned with the planned anchoring of the Rock Island left bank adult fishway denil, resulting in a slight modification to the original denil plan.

Keller said that the original plan was to utilize the third slot to install the denil extension, which involved anchoring the rest box and denil to the bedrock by drilling a 12-inch-diameter post into the bedrock. It was estimated that this could be accomplished by a driller from a mobile floating rig. However, when the drilling contractor investigated the site, he indicated that only a 10-inch-diameter post could be installed with the existing equipment. The driller said that a larger post would require the use of a larger crane to complete the work, which Keller indicated was not feasible because the area is too narrow. Keller said that Chelan PUD's engineering and construction teams raised concerns about the soundness and firmness of the anchored rest box and denil with the smaller post.

As an alternative, Keller said that Chelan PUD's engineering and construction teams suggested installing the denil in the first slot, but continue to modify the third slot to be used as an additional entrance. Keller said that the revised design allows the use of different anchoring and structural support in the tailrace, while continuing to provide the availability of the original two slots for the left bank adult fishway when tailwater elevations provide passage via the original ladder entrances. Keller said that the third slot will also be used as the entrance during modifications to the first slot. He said that there will be no changes to the actual structures, with the exception of minor adjustments to the weir box; he added that fish attendants will still adjust flows based on tailwater elevation. He also noted that the revised plan moves away from drilling and mounting piers in the tailrace; instead, the denil extension will be mounted to I-beams that will be installed on existing infrastructure. Keller said that Chelan PUD's engineering and construction teams are more confident with the revised plan. He said that work on the third slot (right bank fishway) will be completed during nighttime hours in order to provide fish passage during all daytime hours. He said that when the denil structure is installed, a bulkhead and slide gate installed in the third slot will divert flow to the other entrances. He said that fish passage at the left bank fish ladder would be available 24 hours a day, 7 days a week during construction.

Bryan Nordlund asked if the denil extension will be outside of the turbine boil, and Keller indicated that it will be. Keller added that the extension will be on the ladder side of the turbine boil, upstream of the turbine boil. Nordlund also noted on the revised plan the area between the bulkhead gate and the fishway wall with an estimated 4- to 5-foot clearance that appears to be a potential pinch point, and he wanted to confirm that the area is not made any narrower. Keller said that he will verify those specifications. Keith Truscott added that deadspace in the west end of the upper rest box can also be eliminated in the back corner with an inside radius to turn the flow and adults. Nordlund asked, regarding the three slotted gates, for confirmation that the area around the gate closest to the powerhouse where the denil structure will be located (near the rectangle with an elevation of 547 feet) will not interfere with flow. Keller said that the area is part of the stabilization of the dam, and is out of the way of normal fishway operations. He added that these concrete structures are what the denil will be anchored to.

Kirk Truscott also noted the area with the 4- to 5-foot clearance where one point indicates "547 or add floor (non-removable)," and then just downstream from that point is "559.13." He asked if the invert elevation of that section of the ladder is 547 feet, if the "559.13" location is a deep pool, and if so, if that area could be turbulent. Keller explained that "559.13" is the elevation of the weir box, and the downstream concrete elevation is 547 feet. He said the plan is to fill that area to make the transition more fluid and linear. Nordlund asked if Chelan PUD was planning to request approval for filling that area, and Keller replied no, that he believes that was a design note for the engineers to indicate there is a height difference there. Nordlund said he would prefer that the elevation remain at 547 feet opposed to adding to it.

The Rock Island HCP Coordinating Committee representatives present approved Chelan PUD's request to alter the location of the Rock Island left bank adult fishway modifications from the third slot to the first slot.

B. Rock Island Left Bank Adult Fishway Extended Outage (Lance Keller)

Lance Keller said that components of the revised Rock Island Left Bank Adult Fishway Denil Plan will require a longer ladder outage. He said that Chelan PUD's engineering and construction teams estimate that construction will require an outage until April 22, 2014 (the original target date was April 15, 2014). He said that the ladder can be re-watered on April 15, 2014, but once the needed parts arrive, the ladder would need to be dewatered and a fish rescue performed again. Keller suggested that it would be better for fish to keep the ladder out of service so it does not need to be taken out of service during the spring adult migration. He said if work is completed ahead of schedule, the ladder would be brought back online as soon as possible. Bryan Nordlund asked if this means there will be no fish passage at the left bank fish ladder until April 22, 2014, and Keller said that that was correct. Kirk Truscott asked if spring passage at the left bank ladder was de minimis anyway, and Keller said that was also correct.

The Rock Island HCP Coordinating Committee representatives present approved Chelan PUD's request to extend the ladder outage at the Rock Island left bank adult fishway from April 15 to April 22, 2014.

C. Rock Island Right Bank Adult Fishway Extension and Spring Spill (Lance Keller)

Lance Keller recalled that the installation of the denil structure at the tailrace entrance at the right bank adult fishway was completed at Rock Island Dam. He said that the construction crew is now working on the left powerhouse entrance at the right bank adult fishway, which is on schedule to be completed as planned by April 17, 2014. He said this is significant because this is also the date that spring fish spill starts at Rock Island Dam. He said that per Chelan PUD's 2014 Fish Spill Plan and Rock Island IFPP, the over-under gates and notched gates are both to be used for spring spill. However, due to the location of the left powerhouse and the over-under and notched gates, dam operators have indicated that those gates will not be used because of safety concerns for the barge crew working in that area. Keller said that on April 17, 2014, dam operators instead plan to shift the 10% spill away from that area to Powerhouse 1. He added that this shift will likely result in more than 10% spill for that day.

The Rock Island HCP Coordinating Committee representatives present approved Chelan PUD's request to shift spring spill at Rock Island Dam from the center fish ladder to Powerhouse 1 on April 17, 2014, in light of safety considerations for the construction crew working in the immediate area of the left fish ladder.

List of Attachments

Attachment A List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA
Kristi Geris	Anchor QEA
Keith Truscott	Chelan PUD
Lance Keller*	Chelan PUD
Keith Truscott*	Chelan PUD
Todd West	Chelan PUD
Kirk Truscott*	Colville Confederated Tribes
Bryan Nordlund*	National Marine Fisheries Service
Scott Carlon*	National Marine Fisheries Service
Jim Craig*	U.S. Fish and Wildlife Service
Steve Lewis	U.S. Fish and Wildlife Service
Jeff Korth*	Washington Department of Fish and Wildlife
Bob Rose*	Yakama Nation

Notes:
* Denotes Coordinating Committees member or alternate

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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Coordinating Committees	**Date:**	May 27, 2014
From:	Michael Schiewe, Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the April 22, 2014 HCPs Coordinating Committees Conference Call		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met by conference call on Tuesday, April 22, 2014, from 9:30 am to 11:00 am. Attendees are listed in Attachment A of these meeting minutes.

ACTION ITEM SUMMARY

- Lance Keller will coordinate with Steve Hemstrom to develop a timeline for completing the new Valid Flow Duration Curves, including a brief summary describing underlying data and the calculation methods used, and a draft Statement of Agreement (SOA) memorializing the new Valid Flow Duration Curves (Item I-B).
- Chelan PUD will provide the 2013 Rocky Reach and Rock Island Bypass Reports to Kristi Geris for distribution to the Coordinating Committees (Item I-B).
- Jeff Korth will coordinate with Charlie Snow about developing a summary table that documents the hatchery and natural origin composition of steelhead trapped at both the east and west fish ladders at Wells Dam when the Washington Department of Fish and Wildlife (WDFW) conducts stock assessment and brood collection from August 1 to October 31, 2014 (Item II-A).
- Tom Kahler will develop a summary table that documents the hatchery and natural origin composition of summer and fall Chinook trapped at both the east and west ladders at Wells Dam when WDFW conducted stock assessment and brood collection from August 1 to October 31, in years prior to 2013 (Item II-A). *(Note: Kahler provided these data for trapping activities in 2013 to Kristi Geris following the conference call on April 22, 2014, which she distributed to the Coordinating Committees that same day.)*

- Chelan PUD will provide periodic adult fish passage reports for Rock Island Dam to Kristi Geris for distribution to the Coordinating Committees (Item III-B).
- Mike Schiewe will coordinate with Lance Keller and Tom Kahler regarding meeting logistics for the Coordinating Committees meeting on June 24, 2014 (Item V-A).

DECISION SUMMARY

- There were no decisions approved during today's conference call.

AGREEMENTS

- Coordinating Committees representatives present agreed to allow WDFW to conduct stock assessment and brood collection for steelhead at both the east and west ladders at Wells Dam from August 1 to October 31, 2014, contingent that trapping at the east ladder is limited to one day per week, and also that WDFW provides a summary table that documents the hatchery and natural origin composition of steelhead trapped per ladder to help inform trapping decisions in future years (Item II-A).

REVIEW ITEMS

- Kristi Geris sent an email to the Coordinating Committees on April 21, 2014, notifying them that the draft Douglas PUD 2013 Pikeminnow Program Annual Report is out for a 60-day review period, with comments due to Tom Kahler by Friday, June 20, 2014.

DOCUMENTS FINALIZED

- There are no documents that have been recently finalized.

I. Welcome

Mike Schiewe welcomed the Coordinating Committees and asked for any additions or other changes to the agenda. Tom Kahler added a brief reminder about the draft Douglas PUD 2013 Pikeminnow Program Annual Report that is out for review.

A. *Meeting Minutes Approval (Mike Schiewe)*

The Coordinating Committees reviewed the revised draft March 25, 2014 meeting minutes. Three outstanding edits were discussed:

- Jeff Korth approved revisions to his edit regarding the Columbia River Inter-Tribal Fish Commission (CRITFC) annual request to tag sockeye salmon at Wells Dam in 2014, and an action item for him to coordinate internally to discuss the feasibility of collecting broodstock and tagging in tandem.
- Lance Keller approved an edit to Chelan PUD's 2014 Fish Spill Plan discussion clarifying a comment made by Bryan Nordlund about operating the powerhouses under the current Wanapum forebay elevation.
- The Hatchery Committees reviewed and approved late revisions submitted by Catherine Willard on Chelan PUD's Rocky Reach Trap discussion.

Kristi Geris said that all other comments and revisions received from members of the Committees were incorporated in the revised minutes. The Coordinating Committees members present approved the March 25, 2014 meeting minutes, as revised. Geris will finalize the minutes and distribute them to the Committees.

B. *Review of Action Items (Mike Schiewe)*

Action items from the last Coordinating Committees meeting on March 25, 2014, and follow-up discussions were as follows: *(Note: italicized item numbers below correspond to agenda items from the March 25, 2014 meeting.)*

- *Tom Kahler and Kristi Geris will coordinate with Douglas PUD Information Systems (IS) Staff to troubleshoot HCP Extranet Site issues raised by Coordinating Committees members (Item I-C).*
  Geris said that a help document was developed and distributed to the Coordinating Committees on April 1, 2014. The document was designed to address the common issues that Coordinating Committees representatives noted during the meeting on March 25, 2014, including step-by-step instructions for accessing the HCP Extranet sites, troubleshooting errors, retrieving documents, and other daily Extranet tasks.

- *Tom Kahler will convey to the Columbia River Inter-Tribal Fish Commission (CRITFC) the Coordinating Committees' conditional approval of CRITFC's annual request to tag sockeye salmon at Wells Dam in 2014, with the requirements that: 1) fish subjected to MS-222 prior to release must be Floy-tagged; 2) sockeye trapping will only occur on the west ladder; 3) to the extent practical, trapping will occur in coordination with the WDFW's summer Chinook trapping for the Carlton program (Jeff Korth will coordinate internally to discuss the feasibility of collecting broodstock and tagging in tandem) and would in no case exceed 3 days per week, 16 hours per day; and 4) tagged sockeye must be released upstream from Wells Dam rather than returned to the ladder (Item II-A).*
  Kahler said that these conditions were conveyed, as noted.
- *Chelan PUD will provide: 1) their new Valid Flow Duration Curves; 2) a brief summary describing the underlying data and the calculation methods used; and 3) a draft SOA memorializing the new Valid Flow Duration Curves (Item III-A).*
  Lance Keller said that work on these is still underway and that he will coordinate with Steve Hemstrom to develop a timeline for completing this action item.
- *Chelan PUD will provide the 2013 Rocky Reach and Rock Island Bypass Reports to Kristi Geris for distribution to the Coordinating Committees (Item III-C).*
  Lance Keller requested that this action item be carried forward.
- *Chelan PUD will verify the conditions being tested during the preseason tests at the Rocky Reach Juvenile Fish Bypass (RRJFB), including how many pumps will be operated during testing (Item III-C).*
  Lance Keller provided this clarification in the revised draft March 25, 2014 meeting minutes, and will also address further today.

II. Douglas PUD

A. 2014 Trapping Activities (Tom Kahler)

Tom Kahler said that a 2014 Trapping Schedule for Douglas PUD Trapping Facilities (Attachment B) was distributed to the Coordinating Committees by Kristi Geris on April 11, 2014. He noted that trapping associated with obtaining Wells steelhead broodstock that was scheduled for March and April is no longer needed because sufficient broodstock have been collected to replace broodstock that were lost. He added that the Wells steelhead trapping scheduled for August through October is for back-up purposes in case not enough hatchery-origin recruits (HORs) are collected in the tributaries the following year. He also noted WDFW's stock-assessment effort where they trap, passive integrated transponder (PIT)-tag, and release 10% of the run. He said that Charlie Snow (WDFW) indicated that they prefer to trap at both the east and west ladders; however, Kahler indicated that he was uncertain about allowing this because he had already told CRITFC that they could only trap in the west ladder. Kahler said that WDFW only plans to sample one day per week, and he asked the Coordinating Committees if they approve this activity. He added that WDFW's trapping effort would be following the peak sockeye salmon and summer Chinook runs.

Bryan Nordlund asked if there is an advantage for WDFW trapping at both ladders. Kahler said he believes that it is an issue of obtaining a representative sample of the run at large. He added that it is believed that Wells Hatchery-stock fish preferentially use the west ladder whereas Methow and Okanogan natural-origin recruits (NORs) tend to use the east ladder. He said, however, that he did not know whether empirical data supports this belief. Nordlund said that if WDFW is only sampling one day per week, there are few concerns; however, if there is higher use than that, consistent with the message sent to CRITFC, the National Marine Fisheries Service (NMFS) would prefer trapping at only one ladder. He added that this may be reconsidered if there are data supporting that different runs use certain ladders.

Jeff Korth noted that the Coordinating Committees told CRITFC to trap only in the west ladder "if possible." Kahler agreed, and added that CRITFC was not told that they absolutely could not use the east ladder.

Nordlund asked what "run trap to full each day" means (in reference to the trap on the Wells Hatchery outfall channel, as depicted on Attachment B). Kahler explained that when fish "volunteer" and enter the hatchery outfall channel, they hold in a pool before jumping up a false weir into the trap. He said that fish may hold in the pool below the trap for long time periods, so staff leaves the trap open. He said that when the trap fills up, they shut the entrance and process those fish, and those fish that did not enter the trap that day will remain in the holding pool until they eventually move up.

Kirk Truscott said that if WDFW traps at both the east and west ladders, the Colville Confederated Tribes (CCT) request that WDFW provide a report that describes the origin composition of fish they sample to inform future trapping operations—in particular, whether there is a need to operate both traps for stock assessment. Korth said that he will coordinate with Snow about developing a summary table that documents the hatchery and natural origin composition of steelhead trapped at both the east and west fish ladders at Wells Dam during the period when WDFW conducts stock assessment and brood collection from August 1 to October 31, 2014; and Kahler indicated that he will develop a similar summary table that documents the hatchery and natural origin composition of summer and fall Chinook. *(Note: Kahler provided these data for trapping activities in 2013 to Geris following the conference call on April 22, 2014, which she distributed to the Coordinating Committees that same day.)*

The Coordinating Committees representatives present agreed to allow WDFW to conduct stock assessment and brood collection at both the east and west ladders at Wells Dam from August 1 to October 31, 2014, contingent that trapping at the east ladder is limited to one day per week, and also that WDFW provides a summary table that documents the hatchery and natural origin composition of steelhead trapped per ladder to help inform trapping decisions in future years.

B. Draft Douglas PUD 2013 Pikeminnow Program Annual Report (Tom Kahler)

Tom Kahler said that Kristi Geris sent an email to the Coordinating Committees on April 21, 2014, notifying them that the draft Douglas PUD 2013 Pikeminnow Program Annual Report is out for a 60-day review period, with comments due to him by Friday, June 20, 2014.

III. Chelan PUD

A. RRJFB System Pre-Season Marked Fish Release Results (Lance Keller)

Lance Keller said that last month, pre-season testing of the RRJFB was conducted by releasing 400 marked fish, including 100 released in each entrance to the surface collector (SC), and 100 in each gatewell slot in Turbine Unit 1 (C1) and Turbine Unit 2 (C2). Keller said that 394 of the 400 fish released were recollected, with no evidence of descaling observed. He added that the missing 6 fish were from the entrance releases in the SC, and he presumed that those fish were probably released too close to the entrance and were able to avoid entrainment and escape.

Keller recalled a question that Bryan Nordlund asked during the last Coordinating Committees meeting on March 25, 2014, regarding how many pumps were operated during preseason testing, and Keller indicated that the SC was sampled in the normal configuration, which is 19 to 20 pumps depending on the current forebay elevation. Nordlund said that the purpose of his question was to gain a better sense of whether higher flow would cause problems, and added that these results suggest that this is not an issue.

Nordlund said that, regarding the missing 6 fish, in the past, pikeminnow have been observed on video near the SC entrance; he asked if that may have been an issue this year. Keller said that since the 2006 and 2007 Dual-frequency Identification Sonar (DIDSON) studies, fishway attendants conduct daily observations to monitor for pikeminnow. He added that typically, if pikeminnow are present, half-moon-shaped descaling is observed, which indicates an unsuccessful pikeminnow predation event. He said if that is observed, actions are taken to remove the pikeminnow. Nordlund asked if DIDSON technology is currently available for monitoring. Keller said that pikeminnow typically do not appear until June or July and then decrease over time. He added that the DIDSON cameras are run by summer interns that normally work from late April through August; however, in 2014, Chelan PUD does not plan to staff interns for DIDSON video analysis.

B. Wanapum Drawdown Update (Lance Keller)

Lance Keller recalled that on March 26, 2014, the Federal Energy Regulatory Commission (FERC) issued the order approving the Rock Island Interim Fish Passage Plan (IFPP), which addresses both adult and juvenile interim fish passage. Keller said that FERC also requires that Chelan PUD submit a monthly report starting May 1, 2014, including documentation of weekly and monthly calls, actions taken and needed changes, and any other documentation of consultation. He said that Chelan PUD must also provide copies of these monthly reports to the Coordinating Committees.

Keller said that modifications to the tailrace entrance (TRE) and left powerhouse entrance (LPE) on Powerhouse 2 are now underway. He recalled that during the Coordinating Committees conference call on April 14, 2014, Chelan PUD requested to temporarily move fish spill away from the center ladder to Powerhouse 1. He said that due to high winds on April 16 and 17, 2014, the crane could not operate; and therefore, the modified fish spill continued through April 18, 2014. Keller also noted that on April 21, 2014, about half of the water over Gate 24 was observed spilling onto the splat pad on Gate 23, which may be a concern for juvenile fish passage; therefore, Gate 24 was removed from the juvenile fish passage portion of the Rock Island IFPP. He added that during low tailwater, when the splat pad on Gate 23 is exposed, Gate 24 will not be used; however, if high tailwater is achieved for a long period of time, Gate 24 may be brought back into sequence.

Keller said that also during the Coordinating Committees conference call on April 14, 2014, Chelan PUD requested an extended ladder outage at the Rock Island left bank adult fishway from April 15 to April 22, 2014. He said that yesterday, April 21, 2014, re-watering of the left ladder began, and the ladder is expected to be brought back online today, as planned. He said that the slide gate is now in place, and the contractor is now mobilizing equipment to the left ladder. He added that until construction starts at the left ladder, both entrances will be open for fish passage.

Keller said that, lastly, Chelan PUD would like to make sure the level of communication regarding this matter is adequate for Coordinating Committees members. Bob Rose, Jim Craig, and Bryan Nordlund agreed that communication so far has been satisfactory. Kirk Truscott asked if Chelan PUD plans to report PIT-tag data as they become available, or if Grant PUD will provide that information. Keller said that PIT-tag data collected at Wanapum Dam do not auto-populate to the PIT-Tag Information System (PTAGIS)—those data need to be manually uploaded. He added, however, that PIT-tag data collected at Priest Rapids Dam and Rock Island Dam automatically upload every 3 hours. He said that Chelan PUD and Grant PUD are currently discussing how to evaluate those data (including visual counts), and also how to make those data available on a daily basis. He said that average travel times between Priest Rapids Dam and Wanapum Dam have been about 2 days, with an additional 2 days from Wanapum Dam to Rock Island Dam. Truscott asked that Chelan PUD let the Coordinating Committees know where to find those data, once these details are sorted out. Keller said that Chelan PUD will provide periodic adult fish passage reports for Rock Island Dam to Kristi Geris for distribution to the Coordinating Committees. He added that, currently, 56 NOR steelhead and 26 HOR steelhead have been detected passing Rock Island Dam via the right ladder; and 10 NOR steelhead and 7 HOR steelhead have been detected passing via the center ladder. He also added that about 20 spring Chinook have also been observed passing Rock Island Dam.

IV. Hatchery and Tributary Committees Update (Mike Schiewe)

Mike Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the last HCP Tributary Committees meeting on April 10, 2014:

- *Small Projects Program Application: Remove Collapsed Bridge from Shingle Creek*: The Okanagan Nation Alliance (ONA) requested funds to stabilize and reduce channel and bank erosion by removing a collapsed logging bridge that fell into Shingle Creek. The Tributary Committees requested additional information, which was provided by ONA. Subsequently, the Tributary Committees approved funding for this project ($6,693).
- *Small Projects Program Application: Silver Reach Mining Impacts Evaluation and Feasibility Study*: Trout Unlimited requested funds to evaluate the extent to which heavy metal contamination from local mining activities may be affecting nearby locations. The Tributary Committees requested additional information, and they are awaiting those data prior to making a decision.
- *Silver Side Channel Concept Design*: The Rocky Reach Tributary Committee invited the Cascade Columbia Fisheries Enhancement Group (CCFEG) to their June meeting to further describe the concept design for the Silver Side Channel and results from their monitoring work.
- *Time Extension: Methow/Chewuch Groundwater Monitoring Project*: The Wells Tributary Committee approved a no-cost budget amendment request from CCFEG to extend the contract to the end of 2014 so they could continue to monitor water levels at the Burns-Garrity and Silver Side Channel sites.

- *ONA Monitoring Options*: The Tributary Committees asked ONA to submit proposals for two projects: 1) Penticton Channel Monitoring Spawning Platforms; and 2) Okanagan River Restoration Initiative Effectiveness Monitoring. If the Committees agree to fund one or both projects, the funds for monitoring would come from the Tributary Assessment Program, not the Plan Species Accounts.
- *Next Steps*: The next Tributary Committees meeting will be held on Thursday, May 8, 2014.

Schiewe updated the HCP Coordinating Committees on the following actions and discussions that occurred at the last HCP Hatchery Committees meeting on April 16, 2014:

- *Hatchery Evaluation Technical Team (HETT) Non-Target Taxa of Concern (NTTOC) Report Update*: Greg Mackey provided an update on the NTTOC effort. Mackey had pulled together all of the model runs that have been completed to date into a draft summary report that was first provided to the HETT for review; and now the draft report is with the Hatchery Committees for a 60-day review period. At the close of the review period, the Hatchery Committees will determine next steps regarding finalizing the report and a path forward for this Monitoring and Evaluation (M&E) objective.
- *Wells Hatchery Steelhead Broodstock Update*: The re-collection of Wells steelhead broodstock is now complete. Recall that on November 17, 2013, disinfectant was inadvertently discharged through a drain that led to the steelhead holding pond causing a loss of broodstock; the drain has since been welded shut. The CCT were able to obtain 58 steelhead from Omak Creek for the Okanogan program. Jeff Korth added that excess fish provided for broodstock by Ringold Hatchery will be returned.
- *Methow Hatchery Spring Chinook Early Maturation Sampling*: Sampling of 300 Methow Hatchery spring Chinook juveniles for an evaluation of early maturation was completed; however, the results are not yet available. Greg Mackey plans to report the results to the Hatchery Committees when available.
- *Draft 2014 Broodstock Collection Protocols*: WDFW submitted the draft 2014 Broodstock Collection Protocols to NMFS on April 15, 2014. Most comments received from the Hatchery Committees were incorporated into this draft.

Submitting the draft protocols was somewhat rushed this year, and discussions are now ongoing to develop a system that avoids a similar situation in future years.

- *Hatchery Committees Approval of Annual Broodstock Protocols—Statement of Agreement*: Lynn Hatcher is discussing internally the possibility of developing a schedule and possible permit modification that will require Hatchery Committees approval of the annual protocols. There is still uncertainty with regards to collecting broodstock for the Nason Creek and Chiwawa spring Chinook programs; some of the uncertainties could have been avoided by better coordination between the HCP Hatchery Committees and the Priest Rapids Coordinating Committee Hatchery Sub Committee.
- *Chelan PUD 2014 Rocky Reach Trap (RRT)/Methow Spring Chinook Broodstock Collection Proposal*: NMFS clarified that while they approved the RRT as a collection location for Chelan PUD's Methow spring Chinook program, they had concerns about the number of PIT-tagged fish that would be required if this was a long-term operation, and in particular the handling required to PIT-tag these fish.
- *Hatchery and Genetic Management Plan (HGMP) Update*: NMFS provided an update on permitting and the HGMP process. USFWS and NMFS have been holding joint permitting discussions every other month, with the next scheduled for early May 2014, and everyone who has interest can attend.

V. HCP Committees Administration

A. Next Meetings (Mike Schiewe)

Mike Schiewe said that the next Coordinating Committees meeting is scheduled for May 27, 2014, and will be held in-person at the Radisson Hotel in SeaTac, Washington. He said that the June 24, 2014 meeting will be held in-person in eastern Washington, at a location as is yet to be determined. He added that he would coordinate with Lance Keller and Tom Kahler regarding meeting logistics, and he noted that a site visit to Rock Island Dam has been discussed. The July 22, 2014 meeting will be held either by conference call or in person at the Radisson Hotel in SeaTac, Washington, as is yet to be determined

List of Attachments

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Lance Keller*	Chelan PUD
Tom Kahler*	Douglas PUD
Jim Craig*	U.S. Fish and Wildlife Service
Bryan Nordlund*	National Marine Fisheries Service
Jeff Korth*	Washington Department of Fish and Wildlife
Kirk Truscott*	Colville Confederated Tribes
Bob Rose*	Yakama Nation

Notes:
* Denotes Coordinating Committees member or alternate

2014 Trapping Schedule for Douglas PUD Trapping Facilities

Trapping Location	Species	Program	Trapping Entity	March	April	May	June	July	August	September	October	November
Wells Ladders	Spring Chinook	DPUD Methow/Twisp GSI	WDFW			E & W traps, 3 d/wk, 16-hr/d						
	Summer Chinook	GPUD Carlton	WDFW					W. trap, max 3 days/wk, 16-hrs/d				
	Summer Chinook	CCT CJH Okanogan (contingency for CCT terminal collections)	WDFW/CCT					CJH CONTENGENCY; concurrent with WDFW				
	Steelhead	DPUD Columbia/Met. safety-net; GPUD -Ok; USFWS WNFH	WDFW	W trap, max 3 d/wk, 16 hrs/d					E(&W?) traps, max 3 d/wk, 16-hrs/d (usually 1d/wk)			
	Coho	YN Methow Reintroduction	YN/WDFW							E&W, 5 d/wk, 9hr/d; >10/10 7d/wk		
	Sockeye	CRITFC Tagging	CRITFC, CCT, YN, WDFW				W. trap, max 3 d/wk, 16-hr/d					
Wells Outfall	Summer Chinook	Douglas Wells	WDFW					Run trap until full each day				
	Summer Chinook	WDFW Chelan Hatchery Lk. Chelan	WDFW					Concurrent with Collection for Wells				
	Summer Chinook	USFWS Entiat (contingency for Entiat Hatchery collection)	WDFW/USFWS					Contingency for collect. @ Entiat H				
	Summer Chinook	YN Yakima Reintroduction (green eggs)	WDFW					Concurrent with Collection for Wells				
	Summer Chinook	CPUD Chelan Falls (contingency for Eastbank outfall)	WDFW (Eastbank crew)					Ditto				
	Summer Chinook	Surplus to Tribes	WDFW						Ditto			
	Steelhead	DPUD Met. safety-net/Columbia; GPUD Ok; USFWS WNFH	WDFW						Run trap until full each day			
	Coho	YN Methow Reintroduction	YN							Run trap until full each day		
Methow Outfall	Spring Chinook	DPUD Methow	WDFW			Trap checked multiple times per day						
	Steelhead	DPUD Met. safety-net/Columbia	WDFW	Trap checked multiple times per day								
	Coho	YN Methow Reintroduction	YN						s	Trap checked daily		
Twisp Weir	Spring Chinook	DPUD Twisp	WDFW			Continuously monitored during trapping						
	Steelhead	DPUD Twisp	WDFW	Traps checked multiple times per day								

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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Coordinating Committees	**Date:**	June 25, 2014
From:	Michael Schiewe, Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the May 27, 2014 HCPs Coordinating Committees Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Radisson Gateway Hotel, in SeaTac, Washington, on Tuesday, May 27, 2014, from 9:30 am to 11:00 am. Attendees are listed in Attachment A of these meeting minutes.

ACTION ITEM SUMMARY

- Chelan PUD and Kristi Geris will coordinate to redistribute comments submitted by Chelan PUD on the Entiat Pilot Milfoil Control Project, and also distribute the responses received from the Chelan County Noxious Weed Control Board (CCNWCB; Item II-B).
- Chelan PUD will notify the Coordinating Committees when the next public comment period is scheduled for the Entiat Pilot Milfoil Control Project (Item II-B).
- Coordinating Committees representatives will provide Kristi Geris with a list of individuals from their respective organization that plan to attend the site tour part of the Coordinating Committees June 24, 2014 meeting at Rock Island Dam, no later than Wednesday, June 18, 2014 (Item II-D).
- The next Coordinating Committees meeting will be held in person at Rock Island Dam, in eastern Washington, on June 24, 2014, at an earlier-than-usual start time of 9:00 a.m. A site tour will be held in the morning, with the business portion of the meeting held after at the Rock Island Maintenance Office building (Item V-A).

DECISION SUMMARY

- There were no decisions approved during today's meeting.

AGREEMENTS

- Coordinating Committees representatives present agreed to provide Charlie Snow (Washington Department of Fish and Wildlife [WDFW]) with read-only access to the final document library on the HCP Hatchery Committees Extranet site (Item I-B).
- Coordinating Committees representatives present agreed to continue holding their monthly meetings at the Radisson Gateway Hotel, in SeaTac, Washington, along with the occasional conference call and meeting in eastern Washington (Item II-D).

REVIEW ITEMS

- Kristi Geris sent an email to the Coordinating Committees on April 21, 2014, notifying them that the draft Douglas PUD 2013 Pikeminnow Program Annual Report is out for a 60-day review period, with comments due to Tom Kahler by Friday, June 20, 2014.

DOCUMENTS FINALIZED

- There are no documents that have been recently finalized.

I. Welcome

Mike Schiewe welcomed the Coordinating Committees and asked for any additions or other changes to the agenda. The following revisions were requested:

- Scott Carlon requested an update on the injured adult Chinook salmon that have been observed at Wells Dam.
- Via email, Jeff Korth requested Coordinating Committees' approval of access to the HCP Hatchery Committees Extranet site for Charlie Snow.

A. Meeting Minutes Approval (Mike Schiewe)

The Coordinating Committees reviewed the revised draft April 14, 2014 conference call minutes. Kristi Geris said that all comments and revisions received from members of the Committees were incorporated in the revised minutes, and that there were no outstanding edits or questions to discuss. Coordinating Committees members present approved the April

14, 2014 conference call minutes, as revised. Geris will finalize the minutes and distribute them to the Committees.

The Coordinating Committees reviewed the revised draft April 22, 2014 conference call minutes. Geris said that all comments and revisions received from members of the Committees were incorporated in the revised minutes, and that there were no outstanding edits or questions to discuss. Coordinating Committees members present approved the April 22, 2014 conference call minutes, as revised. Geris will finalize the minutes and distribute them to the Committees.

B. HCP Extranet Site Access (Mike Schiewe)

Mike Schiewe said that Jeff Korth requested, via email, Coordinating Committees approval to provide Charlie Snow access to the HCP Hatchery Committees Extranet site. Schiewe said that Korth's request follows the new formal process that was agreed upon by the Coordinating Committees to keep track of which non-HCP representatives have access to the HCP Extranet sites. Schiewe added that Snow contributes key technical support to the Hatchery Committees. Coordinating Committees representatives present agreed to provide Snow read-only access to the final document library on the HCP Hatchery Committees Extranet site. Kristi Geris sent an email to Julene McGregor (Douglas PUD Information Systems Staff) following the meeting on May 27, 2014, requesting access for Snow, as discussed.

II. Chelan PUD

A. Rock Island Powerhouse 2 Unit Efficiency Curve (Lance Keller, Keith Truscott, Brett Bickford)

Lance Keller said that a Rock Island Powerhouse 2 Unit Efficiency Curve (critical energy infrastructure information-designated material—not for public distribution) was distributed to the Rock Island HCP Coordinating Committee by Kristi Geris late May 23, 2014.

Keith Truscott said that this efficiency curve was developed in response to Coordinating Committees questions about net head and turbine efficiency, and also as a tool for Chelan PUD to use in evaluating future adult and juvenile fish passage efficiencies with increasing net head. Truscott explained that net head at Rock Island Dam is anticipated to increase from the 45- to 50-foot range to a 55- to 60-foot range in late summer and early fall, which, according to the efficiency curve, increases turbine efficiency. He added that operating Powerhouse 2 enables the continual operation of the Juvenile Fish Bypass System, which is a reporting location for the Fish Passage Center, and also a source of data for an avian predation study. He said that operating Powerhouse 2 helps support fish attraction flow.

Brett Bickford (Chelan PUD) reviewed the efficiency curve. He said that the vertical axis represents discharge flow in cubic feet per second (cfs), and the horizontal axis represents net head in feet. He said the green lines represent the blade opening position in degrees; the orange lines represent the wicket gate position, which controls the flow through the unit; and the blue lines represent turbine efficiency. He said that moving along the horizontal axis (net head), in late summer and early fall, net head is anticipated to be in the 55- to 60-foot range—a range in which the efficiency curve indicates that turbine efficiency increases. He said that the unit was originally designed to operate at a 40- to 50-foot range (as requested by Chelan PUD). He said the original manufacturer conducted a 3-month study to validate turbine efficiencies at a 50- to 60-foot range—the unit was tested up to a net head of 58 feet and efficiencies appeared to be as predicted with the original design.

Truscott noted that Rock Island Dam was operating at 42 feet of head when the juvenile studies were conducted, which equaled about 94 to 95% turbine efficiency. He added that those flows and efficiencies mark the current survival study for Rock Island Dam. He said that there should be no decrease in juvenile salmonid survival, and better efficiency, which means an equal or better fish passage survival at the higher range of net head—as opposed to the reduced head.

Bickford also noted that with higher head, more electricity is produced; however, Chelan PUD is electing not to produce more than 54 megawatts (MW) to help keep flow lower and stay within the 95% efficiency range. *(Note: Bickford later clarified via email on June 25, 2014, that each generating unit's output will be limited to a maximum of 54 MW, and that the flow to generate 54 MW goes down as the head increases. He added that the Hill chart for these units identifies the turbine efficiency is greater at higher heads. These generating units have variable pitch turbines and as the flow is varied, the blades can be adjusted to* *maintain a high efficiency. The flow range for these units is 0 to 18,000 cfs. For the highest head case, the flow would only need to be about 15,000 cfs to generate 54 MW resulting in an efficiency near 94.5%.)*

The Coordinating Committees had no comments at this time, but indicated that they would contact Chelan PUD with questions if they arise.

B. Entiat Pilot Milfoil Control Project (Lance Keller)

Lance Keller recalled that in 2013, the Coordinating Committees discussed the CCNWCB exploratory treatment of milfoil in the area of Entiat Park that was initially scheduled to take place at the end of 2013. Keller said that since then, the CCNWCB has received two grants—one from the Washington State Department of Natural Resources for monitoring and mapping, and the other from the Washington State Department of Ecology (Ecology) to apply the treatment. Keller said that Terry McNabb (Aquatechnex, LLC) has already been contracted to apply the herbicide Triclopyr triethylamine (TEA) in September 2014, and the CCNWCB will soon be applying for the permit, which will include a public comment period. Keller said that Chelan PUD will notify the Coordinating Committees when the next public comment period is scheduled for this project.

Keith Truscott added that Chelan PUD submitted several comments on the proposed actions and the CCNWCB only addressed a few of Chelan PUD's questions; the most important comments were not addressed. Truscott said that Chelan PUD is concerned that the CCNWCB has not completed their due diligence in addressing impacts to aquatic species. He said that Chelan PUD plans to resubmit comments when the next opportunity arises, and he encouraged Coordinating Committees representatives to consider commenting as well. Truscott said that the application for a permit is expected any day now, which would trigger the beginning of a 30-day comment period.

Carmen Andonaegui asked when Chelan PUD submitted comments on the proposed actions, and Keller replied that comments were submitted last year. Andonaegui suggested recirculating those comments, and Keller said that Chelan PUD and Kristi Geris will coordinate to redistribute comments submitted by Chelan PUD on the Entiat Pilot Milfoil

Control Project, and also distribute the responses received from the CCNWCB. Andonaegui asked if Chelan PUD is requesting that the Coordinating Committees submit comments, and Schiewe clarified that it is the individual agencies that would submit comments. He recalled that last year, comments were submitted by the National Marine Fisheries Service (NMFS), the Colville Confederated Tribes (CCT), U.S. Fish and Wildlife Service, and WDFW.

Truscott added that Chelan PUD is not opposed to another tool to help control the spread of milfoil; however, he cautioned that the use of Triclopyr TEA should be adequately researched prior to its application. Schiewe asked if comments submitted to the CCNWCB also are transmitted to Ecology. Truscott said that at one point, information was not being transmitted to all necessary departments within Ecology; however, Chelan PUD has since attempted to distribute information to all departments, as appropriate.

C. Wanapum Drawdown Update (Lance Keller)

Lance Keller said that there was no Wanapum briefing this week (due to the holiday). He said that from May 19 to May 26, 2014, the average daily flow at Rock Island Dam was 202,000 cfs (202 kcfs), average spill was 35 kcfs, and average percent spill was 17.5%. He said that Steve Hemstrom provided a summer spill notification for Rocky Reach and Rock Island dams to Kristi Geris on May 23, 2014, which she distributed to the Coordinating Committees that same day. He recalled that as of May 24, 2014, at 0000 hours, summer spill was initiated at Rock Island Dam, increasing from the spring spill level of 10% up to the 20% summer level, and at Rocky Reach Dam increasing from 0% up to 9% of daily average river flow. He said that the average forebay elevation at Rock Island Dam is 612.5 feet and the average tailwater elevation is 570.25 feet, which are in line with typical conditions for this time of year.

Keller said that as of May 22, 2014, a total of 14,045 spring Chinook salmon and 265 steelhead have been counted at Rock Island Dam. He added that all 50 of the evaluation fish that were acoustic-tagged at the Priest Rapids Off-Ladder Fish Trap have been detected passing Rock Island Dam. He said that construction is still ongoing at the Rock Island left bank ladder, and that installation of the denil structures will begin this week. He said that modifications to the left ladder are on schedule to be completed by June 30, 2014. He also noted that as discussed during the Wanapum briefing on May 19, 2014, a bull trout was detected utilizing the left ladder on May 17, 2014, while construction equipment was present for denil installation. He said that the Chelan PUD Rock Island Interim Fish Passage Plan Monthly Report that summarizes May 2014 activities will be filed with the Federal Energy Regulatory Commission on June 1, 2014, and will also be distributed to the Coordinating Committees at that time.

Injured Chinook Salmon Encountered at Wells Dam

Lance Keller said that he recently received an email indicating that adult Chinook salmon observed at Wells Dam are exhibiting possible denil injuries. The email contained photographs of the injured fish, which Kristi Geris distributed to the Coordinating Committees following the meeting on May 27, 2014 (Attachments B, C, D, and E). Keller said that Todd West (Chelan PUD) and Thad Mosey (Chelan PUD) are investigating this further. Keller said that photographs taken on May 18, 2014, of the center ladder at Rock Island Dam show injured fish at the bottom of the ladder. He added that no denil structure was installed at this ladder. He said that at this point, the source of injury is not known with any certainty; he added that West and Mosey do not believe the injuries were caused by the Rock Island denil structures because the structures are completely submerged and not in use.

Scott Carlon said that although the email may have suggested that the injuries were caused by denil structures at Wanapum Dam, he did not believe that this was the case. Keith Truscott said that West and the fish counting group at Rock Island Dam are reviewing passage data and compiling information on the number of gross injuries in each ladder. Keith Truscott recalled that currently, modifications have only been installed at the right bank ladder at Rock Island Dam. He said that he would like to determine if the injuries are distributed across all three ladders or only one. Mike Schiewe asked if Douglas PUD has observed similar fish injuries in the past, and Tom Kahler replied that the most common injuries observed at Wells Dam in the past have been net scars. Kirk Truscott asked if injured fish are being encountered at the left ladder at Wells Dam, and Kahler replied that they are. Kirk Truscott noted that trapping is not occurring at the left ladder at Wells Dam, so there is no denil structure in use there. Carlon added that an engineer at NMFS indicated that they have never seen this type of fish injury caused by a denil that is properly installed.

D. HCP-CC Meeting Location Evaluation (Lance Keller)

Coordinating Committees June 24, 2014 Meeting

Lance Keller said that by the Coordinating Committees meeting on June 24, 2014, significant progress will have been made on the left ladder; however, he noted that all improvements will still be submerged. Keith Truscott suggested holding the site visit in the morning to align with the construction schedule, and then holding the business part of the meeting following the site visit. Truscott also verified that the business part of the meeting on June 24, 2014, will be held at the Rock Island Maintenance Office Building. Mike Schiewe noted that this site visit will be a good opportunity for all interested parties within the HCP agencies to view the modifications, and added that a list of attendees will need to be compiled for Rock Island Dam security purposes. Coordinating Committees representatives agreed to provide Kristi Geris with a list of individuals from their respective organization that plan to attend the site tour part of the Coordinating Committees June 24, 2014 meeting at Rock Island Dam, no later than Wednesday, June 18, 2014.

Future Coordinating Committees Meetings

Lance Keller said that Becky Gallaher (Chelan PUD), who assists with meeting logistics, has been researching options for meeting locations; Gallaher had asked Keller to check with the Committees members regarding their opinions on the current meeting location and arrangements. Keith Truscott added that an internal audit is driving the need to evaluate whether the current meeting location makes sense both financially and logistically. Scott Carlon noted that the Priest Rapids Coordinating Committee (PRCC) did not renew the office space lease next door, and so they will now also meet at the Radisson Gateway Hotel, the day after each Coordinating Committees meeting. Mike Schiewe also noted that the Coordinating Committees will still plan to occasionally meet by conference call and in eastern Washington. Truscott said that considering the PRCC's meeting schedule, it makes sense to keep the Coordinating Committees meetings in western Washington. Tom Kahler said that Douglas PUD looked into reserving a less expensive meeting room at SeaTac Airport, but parking may be an issue. Truscott said that Chelan PUD also looked into reserving a room at the airport and found that the meeting rooms are less expensive than the Radisson; however, parking is an issue, and flexibility is limited with scheduling in advance, holding a room, and the cancelation policy. He added that the Radisson accommodates canceling within the same month without penalty.

Coordinating Committees representatives present agreed to continue holding their monthly meetings at the Radisson Gateway Hotel, in SeaTac, Washington, along with the occasional conference call and meeting in eastern Washington.

III. Douglas PUD

A. Wells Trapping Update (Tom Kahler)

Tom Kahler said that Douglas PUD recently held their annual meeting with the agencies that use the Wells Project for trapping activities, and so far, using only the west ladder for trapping activities has been adequate for collection of spring Chinook broodstock. He said that the Columbia River Inter-Tribal Fish Commission's sockeye tagging effort is still planned for the west ladder only; as the steelhead run materializes, WDFW's stock assessment and brood collection will be conducted at both ladders, as previously agreed upon. Kahler recalled his action item from the Coordinating Committees conference call on April 22, 2014, to develop a summary table that documents the hatchery/natural-origin (HORs and NORs, respectively) composition of summer and fall Chinook salmon trapped at both the east and west ladders at Wells Dam when WDFW conducted stock assessment and brood collection from August 1 to October 31, in years prior to 2013. He said he has not yet compiled those data for years prior to 2013; however, he did provide these data for trapping activities in 2013 to Kristi Geris following the conference call on April 22, 2014, which she distributed to the Coordinating Committees that same day.

IV. Hatchery and Tributary Committees Update (Mike Schiewe)

Mike Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the last HCP Tributary Committees meeting on May 18, 2014:

- *Small Projects Program Application: Silver Reach Mining Impacts Evaluation/Feasibility Study*: The Tributary Committees deferred voting on a request from Trout Unlimited for $96,355 to evaluate the extent to which heavy metal contamination from local mining activities at the Red Shirt Mill and the Alder Creek confluence wetland may affect the feasibility of restoration actions proposed in the Twisp to Carlton Reach on the Methow River. The Tributary Committees are uncertain why Ecology has not taken a larger role in this effort. Tom Kahler indicated that Trout Unlimited was asking this same question.

- *General Salmon Habitat Program: Methow Valley Irrigation District Instream Flow Improvement Project*: This is a project with several objectives to increase instream flow, among other things. Trout Unlimited requested about $2,000,000 from the PRCC No-Net Impact (NNI) funds; however, the PRCC is unlikely to support such a large request. Therefore, the CCT on behalf of Trout Unlimited requested that the Tributary Committees support a larger part of the request than the $400,000 provided by the Wells Committee, which would then reduce the amount requested from NNI funds. Ultimately, the Rock Island and Rocky Reach Tributary Committees agreed to contribute $600,000 ($300,000 each) to the project. Jim Craig noted that additional funding is also being provided by Ecology.
- *General Salmon Habitat Program Draft Proposals*: General Salmon Habitat Program and Salmon Recovery Funding Board draft proposals have been submitted, and 9 of the 12 proposals requested funds from the Tributary Committees. No draft proposals were received for projects in the Entiat or Okanogan River basins. Final evaluation of the draft proposals will occur in June 2014; sponsors of those projects still under consideration will be asked to submit full, detailed proposals by August 2014.
- *Next Steps*: The next Tributary Committees meeting will be held on Thursday, June 12, 2014.

Schiewe reported that the HCP Hatchery Committees did not meet this month due to the absence of urgent agenda items. He said that a conference call is scheduled for tomorrow, May 28, 2014, to discuss the draft Chiwawa Spring Chinook Broodstock Collection Protocol. The proposal is to collect HOR and NOR spring Chinook salmon at Tumwater Dam, and collect NORs at the Chiwawa Weir. He said that sideboard language has been established for operating the weir, including hours of operation and numbers of allowable bull trout encounters. He said that the program requirement is 74 NORs, as this is a conservation program.

Schiewe said that another topic of interest to the Hatchery Committees has been the scheduling and processing of the annual broodstock protocols. He said that in the past, the protocols have been developed by WDFW with the goal to get a final version to NMFS by April 15; however, each year it has been increasingly more difficult to meet this deadline. He said that NMFS is discussing changes to the permit language, which will require a firmer schedule to meet review and approval deadlines. He said that this topic will likely be revisited at the next Hatchery Committees meeting on June 18, 2014.

V. HCP Committees Administration

A. Next Meetings (Mike Schiewe)

Mike Schiewe said that the next Coordinating Committees meeting will be held in person at Rock Island Dam, in eastern Washington, on June 24, 2014, at an earlier than usual start time of 9:00 a.m. A site tour will be held in the morning, with the business portion of the meeting to follow at the Rock Island Maintenance Office building.

He said that the July 22 and August 26, 2014 meetings will be held either by conference call or in person at the Radisson Hotel in SeaTac, Washington, as is yet to be determined.

List of Attachments

Attachment A	List of Attendees
Attachment B	Photograph 1 of Injured Chinook Salmon Encountered at Wells Dam
Attachment C	Photograph 2 of Injured Chinook Salmon Encountered at Wells Dam
Attachment D	Photograph 3 of Injured Chinook Salmon Encountered at Wells Dam
Attachment E	Photograph 4 of Injured Chinook Salmon Encountered at Wells Dam

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris†	Anchor QEA, LLC
Lance Keller*	Chelan PUD
Brett Bickford†	Chelan PUD
Keith Truscott*†	Chelan PUD
Tom Kahler*	Douglas PUD
Jim Craig*	U.S. Fish and Wildlife Service
Scott Carlon*	National Marine Fisheries Service
Carmen Andonaegui*	Washington Department of Fish and Wildlife
Kirk Truscott*†	Colville Confederated Tribes
Bob Rose*†	Yakama Nation

Notes:
* Denotes Coordinating Committees member or alternate
† Joined by phone

Attachment B

Attachment C

Attachment D

Attachment E

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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Coordinating Committees	**Date:**	July 29, 2014
From:	Michael Schiewe, Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the June 24, 2014 HCPs Coordinating Committees Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at Rock Island Dam in eastern Washington, on Tuesday, June 24, 2014, from 9:00 am to 2:00 pm. Attendees are listed in Attachment A of these meeting minutes.

ACTION ITEM SUMMARY

- Lance Keller will obtain clarification from Brett Bickford (Chelan PUD) about statements attributed to Bickford in the draft May 27, 2014, Coordinating Committees meeting minutes, regarding Chelan PUD's Rock Island Powerhouse 2 Unit Efficiency Curve; Kristi Geris will incorporate any necessary revisions and will distribute the meeting minutes as final (Item II-A). *(Note: Bickford provided clarification to his statements via email on June 25, 2014, which Geris incorporated into the draft May 27, 2014 meeting minutes and distributed to the Coordinating Committees that same day.)*
- Kristi Geris will contact Julene McGregor (Douglas PUD Information Systems Staff) to request read-only access to the final document library on the HCP Coordinating Committees Extranet site for Aaron Beavers (National Marine Fisheries Service [NMFS]), as approved by the Coordinating Committees (Item II-C). *(Note: Geris sent an email to McGregor on June 25, 2014, requesting access for Beavers, as discussed.)*
- Lance Keller will provide Kristi Geris with key dates and values regarding the Rocky Reach Turbine Unit 2 (C2) rotor crack repair for incorporation into the meeting minutes (Item V-B). *(Note: Keller provided Geris with this information on June 26, 2014.)*

- Lance Keller will provide Chelan PUD draft comments on the Entiat Pilot Milfoil Control Project to Kristi Geris for distribution to the Coordinating Committees (Item V-C). *(Note: Keller provided these comments to Geris on June 25, 2014, which Geris distributed to the Coordinating Committees that same day.)*

DECISION SUMMARY

- There were no decisions during today's meeting.

AGREEMENTS

- Coordinating Committees representatives present agreed to provide Aaron Beavers (NMFS engineer) read-only access to the final document library on the HCP Coordinating Committees Extranet site (Item II-C).

REVIEW ITEMS

- Kristi Geris sent an email to the Coordinating Committees on June 20, 2014, notifying them that the draft Wells Hatchery Adult Handling Facility 60% Design documents are out for a 60-day review period, with comments due to Tom Kahler and Greg Mackey by Monday, August 18, 2014 (Item III-A).

DOCUMENTS FINALIZED

- The final Douglas PUD 2013 Pikeminnow Program Annual Report was distributed to the Coordinating Committees by Kristi Geris on June 25, 2014 (Item III-B).

I. Site Tour

Chelan PUD reviewed the newly installed denil structures and slide gates during a site tour of the left and right ladders at Rock Island Dam.

II. Welcome

Mike Schiewe welcomed the Coordinating Committees and asked for any additions or other changes to the agenda. The following revisions were requested:

- Lance Keller added a Rocky Reach 2013 broodstock collection update.
- Tom Kahler added a 2013 Douglas PUD Pikeminnow Program Annual Report update.

A. Meeting Minutes Approval (Mike Schiewe)

The Coordinating Committees reviewed the revised draft May 27, 2014 meeting minutes. Kristi Geris said that there were two items remaining to be discussed regarding statements attributed to Brett Bickford regarding Chelan PUD's Rock Island Powerhouse 2 Unit Efficiency Curve. Lance Keller said that he will obtain clarification from Bickford, and will provide Geris with any necessary edits, which Geris will incorporate into the revised minutes and distribute as final. Geris said that other all comments and revisions received from members of the Committees were incorporated in the revised minutes. Coordinating Committees members present approved the May 27, 2014 meeting minutes, as revised. *(Note: Bickford provided clarification to his statements via email on June 25, 2014, which Geris incorporated into the draft May 27, 2014 meeting minutes and distributed to the Coordinating Committees that same day.)*

B. Last Meeting's Action Items (Mike Schiewe)

Action items from the Coordinating Committees meeting on May 27, 2014, and follow-up discussions, were as follows: *(Note: italicized item numbers below correspond to agenda items from the May 27, 2014 meeting.)*

- *Chelan PUD and Kristi Geris will coordinate to redistribute comments submitted by Chelan PUD on the Entiat Pilot Milfoil Control Project, and also distribute the responses received from the Chelan County Noxious Weed Control Board (CCNWCB; Item II-B).*

  Geris distributed past meeting minutes excerpts and associated documents to the Coordinating Committees on June 2, 2014.

- *Chelan PUD will notify the Coordinating Committees when the next public comment period is scheduled for the Entiat Pilot Milfoil Control Project (Item II-B).*
  Lance Keller provided this information to Geris on June 9, 2014, which Geris distributed to the Coordinating Committees that same day.
- *Coordinating Committees representatives will provide Kristi Geris with a list of individuals from their respective organization that plan to attend the site tour part of the Coordinating Committees June 24, 2014 meeting at Rock Island Dam, no later than Wednesday, June 18, 2014 (Item II-D).*
  This was accomplished.

C. HCP-CC Distribution List and Extranet Site Access Approval (Mike Schiewe)

Mike Schiewe said that Bryan Nordlund requested, via email, Coordinating Committees approval to provide Aaron Beavers access to the HCP Coordinating Committees Extranet site. Schiewe explained that the Coordinating Committees have recently transitioned to a SharePoint file sharing system, and Nordlund's request follows the new formal process that was agreed upon by the Coordinating Committees to keep track of which non-HCP representatives have access to the HCP Extranet sites. Nordlund said that Beavers will serve as engineering support to Scott Carlon, and having direct access to the HCP Coordinating Committees Extranet site will be helpful. Coordinating Committees representatives present agreed to provide Beavers read-only access to the final document library on the HCP Coordinating Committees Extranet site. Kristi Geris said that she will contact Julene McGregor to request read-only access to the final document library on the HCP Coordinating Committees Extranet site for Beavers, as approved by the Coordinating Committees. *(Note: Geris sent an email to McGregor on June 25, 2014, requesting access for Beavers, as discussed.)*

III. Douglas PUD

A. Wells Hatchery Modernization 60% Design – Adult Handling Facility (Greg Mackey)

**Note: this agenda item is also documented in a stand-alone memorandum.*

Greg Mackey said that Kristi Geris sent an email to the Coordinating Committees on June 20, 2014, notifying them that the draft Wells Hatchery Adult Handling Facility 60% Design Report and the associated site plans (Attachment B) are available for a 60-day review period, with comments due to Tom Kahler and Mackey by Monday, August 18, 2014. Mackey also provided the Wells Hatchery Adult Handling Facility 60% Design Overview Drawing (Attachment C), which Geris distributed to the Coordinating Committees via email following the meeting on June 26, 2014. Mackey said that although the Wells Hatchery Modernization is a voluntary action and was not a requirement of the Federal Energy Regulatory Commission (FERC) license, Douglas PUD's FERC License still requires agency review of many actions, such as this one. He explained that the new Adult Handling Facility review falls under the jurisdiction of the HCP Coordinating Committee because it involves fish passage. These meeting minutes will serve as the consultation record for the Adult Handling Facility, which is a component of the Wells Hatchery Modernization.

Mackey reviewed Attachment C, an overview of the hatchery grounds, noting the location of the existing Hatchery Building and existing raceways. He said that a new Adult and Early Rearing Incubation Building will be constructed. He pointed out the old spawning channel, which is approximately 1 mile long and winds back and forth, ultimately connecting to the volunteer channel. He said that the spawning channel did not perform as expected when built back in the 1960s. The hatchery was converted to a more standard hatchery shortly thereafter and the spawning channel was then used for water conveyance, only. The water system is being rebuilt for the hatchery; therefore, the channel will be demolished as part of the Modernization project. The footprint of the channel will be used as building sites for some of the new infrastructure. He said that most existing infrastructure at the hatchery will remain, and several new facilities will be constructed. He said that construction is planned to start in 2015, and construction plans were designed so that Wells Hatchery can remain fully operational throughout the duration of the construction. He noted the adult volunteer channel that begins at the southeast corner of the site and runs along the east perimeter to the existing trapping and spawning facilities. He said that the existing trapping and spawning facilities will be removed and the adult volunteer channel will be truncated and connected to a new fish ladder that will lead to the new Adult Holding, Spawning and Surplus Facility (i.e., "Adult Handling Facility").

Mackey reviewed page 1 of Attachment B, noting that the existing adult volunteer channel is located to the south, and will be connected to the new ladder, with a new upwell to supply water to the channel. He pointed out the main building, holding ponds, crowding channel, fish ladder, and transfer pipes and truck loading area. He said that the truck loading area located to the east of the new Adult Handling Facility was designed to facilitate direct loading of fish to trucks (water to water transfer). He said that the series of horizontal pipes located on the east side of the facility allow fish to be returned to each of the six holding ponds, and he added that the larger ponds are for summer Chinook salmon, while the smaller ponds are for steelhead and spring Chinook salmon. He also noted that the hatched-colored pipe connected to the west corner of Pond 6 is connected to the Wells Dam west ladder trap. He said that each pond is equipped with an automatic crowder that moves west to east, into another crowder channel that leads into the building. This allows the fish held in any of the adult ponds to be crowded into the new Adult Handling Facility.

Mackey reviewed page 2 of Attachment B. He said that the new Adult Handling Facility will serve many purposes, including as a handling facility for west ladder-trapped and volunteer channel-trapped fish, a spawning facility, a monitoring and evaluation (M&E) facility, an area for surplusing excess fish, and a facility for adult management. Mackey explained that when fish enter the new Adult Handling Facility from the adult volunteer channel, they enter via the new fish ladder (i.e., "Fishway") that is located to the south into two trap holding pools with false weirs, enabling staff to work fish from one pool while trapping the other., and then up to approximately 20 fish at a time are crowded into a pipe that leads to the electronarcosis (EN) unit. Mackey explained that the EN unit uses low voltage direct current (DC) voltage to sedate fish, and recovery is almost instantaneous, versus an electroanesthesia (EA) system that uses higher alternating current (AC) voltage to "stun" a fish. He said that the Wells HCP Hatchery Committee thoroughly discussed this aspect of the design, and support using EN. He added that there were also requests to include the capability of a back-up anesthetic method. He said that the facility will be able to use a variety of chemical anesthetics as backup to the EN unit. He noted that with EN, non-target species can be returned to the river immediately with minimal handling, while target fish can be sent to the CO_2 anesthetic tank, to monitoring and evaluation, trucks, or to holding ponds. He said that fish entering the new Adult Handling Facility from the holding ponds can be diverted directly to the CO_2 tank or EN unit, depending on operational needs. CO_2 is preferred for spawning or surplusing, while EN would be used for monitoring and evaluation and initial sorting from the west ladder trap. Lastly, Mackey added that the design for the spawning and workup area was structured after the setup at Winthrop National Fish Hatchery (NFH): everything is on casters and can be easily moved to accommodate different tasks.

Mackey briefly reviewed pages 3, 4, 5, and 6 of Attachment B, which depict the outside of the new Adult Handling Facility, a side profile of the Fishway, a structural partial plan for the holding ponds, and a structural partial plan for the Fishway, respectively. He recalled an earlier discussion with Bryan Nordlund on preventing fish held in the ponds from jumping at the water discharge from the fish return pipes and minimizing the velocity of fish entering the ponds from the return pipes and noted that HDR engineers have worked to address these issues. Nordlund asked if, when using the west ladder trap, sorting must be completed in the new building, or if it can be completed at the trap. Mackey replied that the west ladder trap is operated by “live” trapping, so workers can choose which fish to trap and which to pass upstream at the trap. Once fish are in the Adult Handling Facility, they can be further sorted with much greater attention to detail (using marks, tags, etc.). Mackey also said that both well water and surface water will supply the hatchery, and that clean hatchery water will be discharged through the adult volunteer channel rather than the facility drain to enhance homing to the facility. Nordlund asked if, when using a chemical anesthetic such as tricaine methane sulfonate (MS 222), the effluent will be isolated so as to not drain into the same channel as other effluent. Mackey said that waste water will drain to a settling pond, and he will check on having the effluent from chemical anesthetic tank(s) drain into the settling pond. Nordlund suggested rerouting MS 222 water to a holding area for evaporation.

Nordlund also cautioned that there can be a learning curve on how to properly use CO_2 for fish. Mackey said that, realizing the EN unit is not optimal for some tasks, such as spawning or surplusing fish, the CO_2 tank can be used instead. However, CO_2 is not intended to be used on fish prior to being identified as broodstock. In other words, trapped wild fish or other non-target fish would be sorted using EN and sent to the proper destination with as little effect on the fish as possible. He added that separate recovery tanks can also be installed, if needed, or one tank can be used as a recovery tank while the other is in use as an aesthetic tank. Nordlund agreed that 2-step anesthesia is a good idea. He then asked how many and what species of fish typically enter the volunteer channel, noting that he is curious about capacity issues. Mackey said that the surplus pond, which would be one of the largest holding ponds depicted on page 1 of Attachment B, is designed to hold at least 600 fish at one time. He added that there is a fair amount of free board within each pond, so they can be filled deeper to increase capacity, if needed. Nordlund asked if fish from the west ladder trap will be metered so as to not overfill Pond 6, and Mackey replied that they will be. Mackey added that Pond 6 is designed to hold at least 200 fish, which is more than the number that would be trapped at the west ladder in any one day. He also added that if, somehow, Pond 6 does become full, trapping would be halted. He explained that trapping typically ends at 8:00 p.m., the next day trapped fish are sorted, and then trapping does not commence until the following day.

Jeff Korth asked if Douglas PUD has considered building additional rearing ponds on the other side of the site. Mackey said that there will already be one extra pond; however, there is not enough room to build any more ponds. He said that Douglas PUD originally planned to construct the new Adult Handling Facility closer to the dam; however, this was not possible due to dam safety considerations. He added that locations that allowed linking the new Adult Handling Facility into the volunteer channel were constrained and there would be no space to add more ponds.

Korth also suggested considering the recent upgrades at Priest Rapids Dam, including the complications that arose from those modifications. Mackey said that Douglas PUD and Wells Hatchery WDFW staff toured the Priest Rapids facility, noting the upgrades, and pros and cons of these upgrades. He also added that much of the Adult handling Facility design was based on upgrades at Winthrop NFH, which work very well. Mackey said that the fish and staff flow in the Wells design have been carefully thought out in collaboration with the WDFW staff. He also noted that the design team is aware of the issues encountered with the crowders at the Priest Rapids Hatchery.

Nordlund asked how many staff will be required to crowd fish out of the holding ponds and then also crowd them into the appropriate tank. Mackey said that only one staff person will be needed to operate the crowders to move fish into the building. Nordlund also asked about the Y-pipe that is depicted in the handling area of page 2 of Attachment B, and Mackey clarified that this pipe allows fish to be sent back to the river from two locations within the facility, with the two pipes joining in a "Y."

Mackey asked that the Coordinating Committees contact him or Kahler with questions as they arise. He added that no additional workshops are planned for the HCP Hatchery Committees; however, Mike Schiewe reminded the Coordinating Committees that the HCP Hatchery Committees have already thoroughly reviewed the hatchery components of the design at the Master Plan stage and the 30% design stage.

B. 2013 Douglas PUD Pikeminnow Program Annual Report Update(Tom Kahler)

Tom Kahler recalled that Kristi Geris sent an email to the Coordinating Committees on April 21, 2014, notifying them that the draft Douglas PUD 2013 Pikeminnow Program Annual Report was out for a 60-day review period, with comments due to Kahler by Friday, June 20, 2014. He said that comments were received and incorporated into the draft report. The final Douglas PUD 2013 Pikeminnow Program Annual Report was distributed to the Coordinating Committees by Geris on June 25, 2014.

IV. NMFS

A. Tumwater Trap Operations (Bryan Nordlund)

Bryan Nordlund recalled that a few years ago, the Hatchery Committees agreed to a fish passage monitoring program at the Tumwater Dam fish ladder. He said that the program included monitoring passive integrated transponder (PIT)-tagged adults moving in, and exiting, the ladders. Nordlund asked if this has continued and if there is a monitoring report available that documents the results.

Alene Underwood (Chelan PUD) explained that fish passage issues were first discovered at Tumwater Dam in 2010. She said in 2011, the first report documenting these issues was developed and submitted to NMFS and the U.S. Fish and Wildlife Service (USFWS). She said in subsequent years, fish passage monitoring at Tumwater Dam continued. She said that the Hatchery Committees agreed to a protocol to monitor fish passage delays at weirs 15 and 18, and for every 10 fish, the median delay could not exceed 48 hours. She said that if delays exceeded 48 hours, all trapping would cease immediately and fish would be allowed to pass the dam via the ladder until such time that the median passage time is less than 24 hours. She said that one such exceedance occurred in 2011, and trapping was temporarily halted, as planned. She said in 2011, Chelan PUD provided weekly Tumwater Dam fish passage reports to the HCP Hatchery Committees; however, in 2012 and 2013, the frequency of reporting decreased. She said that although reporting to the HCP Hatchery Committees decreased, ongoing coordination with NMFS and USFWS has remained consistent. She said that Chelan PUD has decided to return to providing weekly Tumwater Dam fish passage reports to the HCP Hatchery Committees each Friday; she added that Chelan PUD will now also regularly coordinate with the Washington Department of Fish and Wildlife (WDFW).

Nordlund explained that his questions were triggered because he noticed that additional funding was awarded for the Reproductive Success Study (RSS). Underwood said that initially, sampling natural-origin recruits (NORs) at Tumwater Dam was only supposed to occur up until 2018; she noted that sampling involved 100% of the run. She said that now, from here forward, because adult management requires managing for percent hatchery-origin spawners (HORs), which requires handling all fish anyway, the thought is to capitalize on this for the RSS and to extend the sampling of HORs to 2018 as well. She said that the Operations Plans and time frames will not change, noting that the trap will be staffed 24 hours per day, 7 days per week (24/7) until July 15, 2014 (began on June 16, 2014). She added that after sockeye appear at Tumwater around mid-July, trapping will be limited to 3 days per week and up to 16 hours per day. Nordlund emphasized that the priority for Tumwater operations needs to be passing NORs to the spawning grounds, and Underwood assured him that Chelan PUD will continue monitoring Tumwater Dam to avoid delays.

Nordlund also recalled that in the 1990s, the primary purpose of Tumwater Dam was to trap sockeye, and the facility was used sparingly for trapping Chinook salmon. He said that the trapping structure at Tumwater Dam is small—appearing to be (although not verified) either a 15-inch denil or steeppass, and that passage data indicate a marked difference between jack and adult passage rates. *(Note: Nordlund later noted that per Josh Murauskas, analysis of Data Access in Real Time PIT-tag data indicate that with 100% trapping of Chinook, adult Chinook were significantly obstructed from passing the site, as compared to Chinook jacks*

(24.4% versus 4.7%, P<0.01). Since tail beat amplitude at burst speed is about 40% of a salmon's body length (per Powers and Orsborne), Murauskas expects that the larger salmon's tail will more readily strike the sides of the trapping ladder and interrupt burst speed, causing passage to either be impaired or fail. If a fish was precisely migrating on the centerline of the trapping ladder, this means that any fish greater than about 36-inch body length will have migration impaired. Similarly, if a smaller fish migrates off of the centerline, its tail could strike the sides of the trapping ladder.) Nordund said that fish are relying on their burst velocity to pass. He suggested considering increasing the size of the trapping ladder. He asked if Grant PUD brood collection relies on trapping at Tumwater Dam, as well, and Underwood replied that they do. Underwood added that Chelan PUD uses the facility less than others. She also noted that in 2015, Chelan PUD has budgeted for a study to investigate the size of the denil at Tumwater Dam.

Jeff Korth said that he discussed this issue with Andrew Murdoch (WDFW), and Murdoch indicated that he has never observed a Chinook salmon that was unable to pass the denil at Tumwater Dam. Korth also noted the increasing abundance of summer Chinook salmon passing Tumwater Dam, and Underwood suggested that this could be because trapping does not occur 24/7 during a majority of the summer Chinook run.

Nordlund suggested the potential of using Priest Rapids Coordinating Committee No-Net-Impact (NNI) funds to replace the Tumwater trapping ladder, if based on future or existing PIT-tag data, passage delay or selective passage remains a problem. Underwood said that Grant PUD has already offered those funds for this purpose, and planning is underway for this effort. Nordlund added that he believes the steeppass at Priest Rapids Dam is the same order of size as the trap ladder at Tumwater Dam; however, the difference might be that of a primary versus secondary passage route.

V. Chelan PUD

A. Rocky Reach 2013 Broodstock Collection Update (Alene Underwood and Catherine Willard)

Lance Keller introduced Chelan PUD's HCP Hatchery Committee Technical Representative and Alternate, Alene Underwood and Catherine Willard, respectively, whom Keller said would provide an update on Chelan PUD's Rocky Reach 2013 broodstock collection progress.

Underwood recalled that last April 2013, Chelan PUD provided a presentation for the Coordinating Committees about the Rocky Reach Trap 2013 Pilot Study. She said that the Rocky Reach Trap 2014 Pilot Study was slightly different in that target fish were trapped using existing PIT-tag arrays and also a newly installed PIT-tag array, and a sort-by-code function and a predetermined library of PIT-tag codes. She said that Chelan PUD's Methow spring Chinook salmon obligation included 38 NOR broodstock; she noted that Chelan PUD already knew there were not enough PIT-tagged NORs in the system to meet this target, and so HORs were also targeted. Underwood said that based on results of the 2013 Pilot Study, trap improvements were made, including: 1) replacing the solid trap door with a grated or perforated trap door; 2) adding underwater lighting; 3) installing an electrical control pendent to give the two operators the opportunity to operate the door depending on visibility; 4) painting the trap floor white; and 5) installing additional cameras. She added that to test the efficacy of the sort-by-code system, a visual and auditory system was also installed, which functioned as planned. She said that Willard will review a summary of results. Underwood added that fish passage at Rocky Reach Dam was continuously open and available throughout this pilot trapping effort, except for when fish were actively being trapped.

Willard provided the Coordinating Committees with a Rocky Reach Trap 2014 Pilot Summary (Attachment D), which Kristi Geris distributed to the Coordinating Committees via email following the meeting on June 27, 2014. Willard said that trapping occurred for 28 days from May 7 to 9, 2014, and from May 12 to June 5, 2014. She noted that active trapping occurred on 25 of those days, as no target fish were detected on 3 days. She said that 106 PIT-tagged out-migrating smolts were detected as returning adults at the Rocky Reach Trap, 25 of which were trapped, including: 21 Methow HORs; two Chewuch NORs; one presumed Methow NOR (genetic testing will be used to confirm); and one Chiwawa HOR (stray). She added that the single Chiwawa stray that was trapped was also the only one detected at Rocky Reach (see Table 1 in Attachment D). She said that the core trapping time periods were modified based on fish detections through the ladder (see Table 2 in Attachment D), but typically, trapping efforts did not occur later than 7:00 p.m. because of reduced daylight conditions. She said there were a total of 43 trapping attempts (including the 25 successful traps), opposed to 34 trapping attempts that were achieved during the 2013 Pilot Study. Willard also noted that there were three trapping mortalities, including one adipose fin (ad-) absent and two ad-present fish. She said that the ad-absent mortality was discovered as an old carcass that was likely impinged at some point during trapping. She said that the two ad-present mortalities were caught on video footage, which was reviewed to confirm the cause of death. She said that one was impinged against the ladder wall when the trap door opened during a compressor test. She added that during that time, the water was turbid and the impinged fish was not seen. She said that the other ad-present mortality was a non-target fish that was impinged in the door closure area while trapping a target fish. She noted that the two NOR mortalities and the three trapped NORs will be subtracted from the NOR allowance for the Chewuch tangle netting effort, leaving 33 NORs to target.

Bryan Nordlund asked if it is possible that the trap door could be causing some of the injuries to fish that have been observed earlier at Wells Dam. Willard said that Chelan PUD considered this as well, and based on the injuries sustained to the three mortalities at the Rocky Reach Trap, Chelan PUD does not believe the trap door could be the cause of the other fish injuries. She went on to explain that the Rocky Reach Trap door "squished" the fish, opposed to creating the slice marks observed on the other injured fish. Nordlund said that it may be possible that the trap door sliced a passing fish and went undetected. He added that sea lions may be the culprit for most injuries, but others are hard to explain, and he suggested improvements to the trap door to prevent potential fish injuries. Underwood said that Chelan PUD has discussed installing an additional camera that would provide a visual of the upstream side of the trap (behind the trap door). She added, however, that there is nothing on the trap door itself that could scrape because the edges are rounded. She also noted that a large number of fish injuries persisted after Chelan PUD ceased operating the trap, and also the number of trapping attempts versus the number of fish injuries did not match up. Nordlund said that he liked the idea of installing an additional camera to view upstream of the gate area. He suggested also considering installing an upstream crowding gate that crowds non-target fish out of the gate closure area while a trap gate traps the target fish. He also suggested putting a "stopper" on the gate pneumatically operated gate shaft, preventing complete closure and reducing the potential for a fish to be pinched between the ladder wall and the trap gate. Underwood said that Chelan PUD staff have suggested installing a downstream gate, and that they will also continue to consider potential causes of the fish injuries, and ultimately, what modifications can alleviate these concerns for future studies.

Mike Schiewe asked if the fish that were detected but not trapped were passing during trapping hours or when the trap was not being operated, and Willard replied that it was both. Keller added, however, that most of the missed fish were passing when the trap was not being operated. Underwood said that a much more comprehensive analysis is planned for these data, which will include these types of evaluations.

Nordlund said that, overall, he really liked the utility of the Rocky Reach Trap because it does not appear to delay fish passage, and added that it is a useful tool although still requires adaptive management for prototype development. Jeff Korth asked if Chelan PUD has any ideas on how to improve the efficiency of the trapping events, adding that he thought the results could have been better. Underwood said that improving trapping efficiency may be difficult. She added that fish behavior was unpredictable, noting that the fish would move up and down the ladder or move through the window area in groups; and Underwood noted that they wanted to avoid trapping multiple fish at the same time. She said that if a bull trout was observed, staff were instructed to not attempt trapping at all. She added that last year, a list of improvements was developed, and the same will be done this year to help improve trapping efficacy in future years. Willard added that Chelan PUD is considering trapping in two different shifts.

Korth asked how many NORs were detected of the 106 target fish detected, and Willard replied that there were 17 NORs detected. Korth also asked what tag codes were uploaded to the sort-by-code library, and Underwood said that all fish that have been PIT-tagged in the Methow over the past 5 years, except Twisp fish and jacks were uploaded into the library. Underwood said that there is a lot of room for improvement, but Chelan PUD was still very pleased with the outcome of this year's pilot.

B. Rocky Reach C2 Rotor Crack Repair (Lance Keller)

Lance Keller recalled that a few years ago, Rocky Reach engineers rehabilitated the turbine units at Rocky Reach Dam, including installing wedge carriers on each unit, and during these improvements, rotary cracks were discovered in multiple units. Keller recalled that C2, one of the smaller units at Rocky Reach Dam, provides the primary attraction flow to the cul-de-sac area near the Rocky Reach forebay. He said that repairs to C2 were originally scheduled to begin on July 3, 2014; however, Rocky Reach engineers have requested an earlier outage starting June 30, 2014, to perform a blade evaluation. Keller added that C2 is scheduled to be back online in November 2014.

Keller said that the 2014 Rocky Reach Bypass Operations Plan proposes the same alternative operations to be implemented during the C2 outage as those implemented in 2013 when Turbine Unit 1 (C1) was offline for repair. He recalled that alternative operations include three additional Rocky Reach Juvenile Fish Bypass surface collector (SC) pumps to increase flow from 3,000 cubic feet per second (3 kcfs) to 3.3 kcfs into the SC entrances; also, C1 flow will be increased from its normal set-point flow of 12.2 kcfs to a soft-limit flow 15.2 kcfs during the C2 outage. He also noted that normal water velocity through the dewatering screens in the SC channels will increase proportionally to the SC flow-rate increase, and that the same monitoring that was performed during the C1 outage will also be performed during the C2 outage. Keller said that he will provide Kristi Geris with key dates and values regarding the Rocky Reach C2 rotor crack repair, as just discussed, for incorporation into the meeting minutes. *(Note: Keller provided Geris with this information on June 26, 2014.)*

C. Entiat Pilot Milfoil Control Project (Lance Keller)

Lance Keller said that the Notice of Intent, the Discharge Management Plan, and the Integrated Aquatic Vegetation Management Plan (IAVMP) were posted to the HCP Coordinating Committees Extranet site on June 9, 2014, and Kristi Geris notified the Coordinating Committees that same day. Past meeting minutes excerpts and associated documents regarding the Entiat Pilot Milfoil Control Project were also distributed to the Coordinating Committees by Geris on June 2, 2014. Bryan Nordlund noted that Dale Bambrick was addressing this issue for NMFS. Keller said that the comment period for the herbicide application at Entiat Park ends July 6, 2014. He said that Chelan PUD has already submitted comments, and he will provide those comments to Geris for distribution to the Coordinating Committees. *(Note: Keller provided these comments [Attachment E] to Geris on June 25, 2014, which Geris distributed to the Coordinating Committees that same day.)*

Keller read Chelan PUD's final comment to the Coordinating Committees, as follows:

> *"Chelan PUD does not agree that this Discharge Management Plan or the IAVMP, which is part of the Discharge Management Plan has evaluated the compatibility of aquatic herbicide applications with endangered fish species and other fish species as stated in our comments previously. We request that the permit application not be approved until the chemicals proposed in this application are reviewed in-depth by the applicant in consultation with USFWS, WDFW, Washington State Department of Ecology (Ecology), and NMFS."*

Tom Kahler asked who the applicant is, and Keller replied that the applicant is the Chelan County Noxious Weed Board (CCNWB) and their consultant, AquaTechnex, LLC. Bryan Nordlund said that he provided this information to Dale Bambrick (NMFS), and Nordlund asked if Bambrick has contacted Chelan PUD. Keller said that he has not, but that he will reach out to Bambrick. Nordlund recalled that this is the same pilot project originally proposed in 2012, but the proposed application area has now grown larger. Keller said that the number of chemicals planned for use has also increased from only Triclopyr triethylamine (TEA), to Triclopyr TEA, Diquat dibromide, Endothall (dipotassium salt), and 2,4-D Amine. Aaron Beavers asked what the purpose of application is, and Keller said that the original purpose of application was to control Eurasian milfoil in swimming areas. Keller said that the CCNWB is also now proposing application in marina areas and also at the mouth of the Entiat, which raises concern for lamprey, sturgeon, and other resident fish.

D. Wanapum Drawdown Update (Lance Keller)

Lance Keller asked the Coordinating Committees if they had any additional questions that were not addressed during the site tour. He also asked if the level of data and communication has been adequate concerning activities at Rock Island Dam as they relate to the Wanapum drawdown. The Coordinating Committees representatives present had no further questions at this time. Keller said that river flows are already dropping off, and that the target date for the intermediate pool raise (560- to 562-foot range) is still the fourth quarter of 2014, which means the current lowered pool elevation will remain throughout the 2014 fish passage season. Keller said that Chelan PUD will file the Rock Island Interim Fish Passage Plan June 2014 Monthly Report with FERC by July 1, 2014, and will also distribute the report to the Coordinating Committees when it is available. He said that since construction has been completed, Chelan PUD has been in a monitoring mode, which means there is not much to report that is different from last month's progress report. He said, therefore, that Chelan PUD is planning to request modifying submittal deadlines of the monthly reports to occur less frequently, as Grant PUD has already done. He added that if the Coordinating Committees want additional information, Chelan PUD can always accommodate those requests.

VI. Hatchery and Tributary Committees Update (Mike Schiewe)

Mike Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the last HCP Hatchery Committees meeting on June 18, 2014:

- *Grant PUD Access to Use Excess Production Capacity at Douglas PUD Facilities to Produce Steelhead and Spring Chinook Salmon:* Douglas PUD sought Hatchery Committees approval to allow Grant PUD access to use excess production capacity at Douglas PUD facilities to produce steelhead and spring Chinook salmon. The question that the Hatchery Committees considered was whether Grant PUD's production would affect Douglas PUD's NNI and inundation obligation. The Hatchery Committees approved the request for 2015. Douglas PUD plans to request approval of this access over a 10-year period, rather than annually requesting access, under which the next request for approval of access will fall in line with the next hatchery recalculation.
- *Hatchery Evaluation Technical Team Non-Target Taxa of Concern (NTTOC) Report Update:* Greg Mackey led the Hatchery Committees' effort to complete the NTTOC Modeling Report, which evaluates interactions between hatchery fish and non-target fish. The project employed the PCD1 ecological risk assessment model. Mackey said that among all interactions modeled, there were only three containment exceedances. He added that these exceedances were modeled to occur in the Columbia River where

fish behavior is less understood, and subsequently confidence is lowest. He said, therefore, not a lot of weight was put into these exceedances.

- *Rocky Reach Trap Pilot Update:* Alene Underwood and Catherine Willard presented the same information to the Hatchery Committees that they presented during today's Coordinating Committees meeting.
- *Penticton Sockeye Hatchery:* Alene Underwood reported that the new hatchery will soon come online, and a grand opening will be held in the next couple of months. Chelan PUD is pleased with the progress made to date. The hatchery is jointly funded by Chelan PUD and Grant PUD.
- *Annual Hatchery M&E Implementation Plan Schedule:* This year, the Hatchery Committees agreed that Chelan PUD will submit their draft 2015 Hatchery M&E Implementation Plan to the Hatchery Committees for review by August 2014. Chelan PUD had requested a September due date to coincide with completion of more of the current M&E seasonal activities before planning M&E activities for the following year. This discussion will likely continue.
- *Hatchery and Genetic Management Plan (HGMP) Update:* Lynn Hatcher provided the regular HGMP update from NMFS. Permitting is moving forward, slowly but surely. The slow progress is partly due to the outside scrutiny that has been placed on hatchery programs by legal challenges from environmental groups.
- *Annual Broodstock Collection Protocols:* Lynn Hatcher plans to present a Statement of Agreement in September 2014 requiring Hatchery Committees approval of the annual Broodstock Collection Protocols. This requirement, which will also be incorporated into the new permits, will create a more rigorous review and approval schedule for the annual protocols.
- *Trapping at Tumwater Dam:* Lynn Hatcher discussed the same information with the Hatchery Committees that was presented by Bryan Nordlund during today's Coordinating Committees meeting.

Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the last HCP Tributary Committees meeting on June 19, 2014:

- *Silver Side Channel Design and Groundwater Monitoring Presentation*: Tom Kahler said that the Cascade Columbia Fisheries Enhancement Group provided a presentation on monitoring efforts that were funded by the Tributary Committees, and they also presented designs (also funded in-part by the Tributary Committees) for a restoration project that they intend to complete.

- *Statement of Work Amendment and Time Extension for Nason Creek Upper White Pine Reconnection Project*: The Rock Island Tributary Committee denied the Chelan County Natural Resources Department's request for a time extension and modification to the statement of work to extend the project timeline through the end of August to conduct a field review of the 30% design pole locations and to summarize all actions completed under this project agreement.
- *Small Projects Program Application for Silver Reach Mining Impacts Evaluation/ Feasibility Study*: The purpose of this project was to evaluate the extent to which heavy metal contamination from local mining activities may affect the feasibility of restoration actions proposed in the Twisp to Carlton Reach on the Methow River. The Tributary Committees are investigating why Ecology has not taken a larger role in this effort, and are also discussing this project with USFWS. This proposal has been tabled until the Tributary Committees hear back from the project sponsor.
- *Okanagan Nation Alliance Monitoring Proposals*: The Rocky Reach Tributary Committee approved funding for the Penticton Channel Monitoring Spawning Platforms and the Wells Tributary Committee approved funding for the Okanagan River Restoration Initiative Phase II Effectiveness Monitoring Project. Tom Kahler clarified that Chelan PUD and Douglas PUD will provide funding for the approved monitoring projects through their respective Tributary Assessment Funds rather than through the Rocky Reach and Wells Plan Species Accounts.
- *General Salmon Habitat Program Draft Proposals*: The Tributary Committees solicited full proposals from four of the nine draft proposals received. Tom Kahler said that the Regional Technical Team will make their scoring decisions the day before the next Tributary Committees meeting. He added that this year, driven by the Salmon Recovery Funding Board, the whole process has been moved up 1 month.
- *Next Steps*: The next Tributary Committees meeting will be held on Thursday, July 10, 2014.

VII. HCP Committees Administration

A. Next Meetings (Mike Schiewe)

Mike Schiewe said that the next scheduled Coordinating Committees meeting is July 22, 2014, to be held by conference call. The August 26, 2014 and September 23, 2014 meetings will be held either by conference call or in person at the Radisson Hotel in SeaTac, Washington, as is yet to be determined.

B. Bryan Nordlund's Retirement (Mike Schiewe)

Mike Schiewe and the Coordinating Committees thanked Bryan Nordlund for his contributions throughout the years. Schiewe reminded the Committees of a reception honoring Nordlund that will take place later this evening.

List of Attachments

Attachment A	List of Attendees
Attachment B	Draft Wells Hatchery Adult Handling Facility 60% Design Site Plans
Attachment C	Draft Wells Hatchery Adult Handling Facility 60% Design Overview Drawing
Attachment D	Rocky Reach Trap 2014 Pilot Summary
Attachment E	Chelan PUD Draft Comments on Entiat Milfoil Herbicide Treatment

Attachment A
List of Attendees

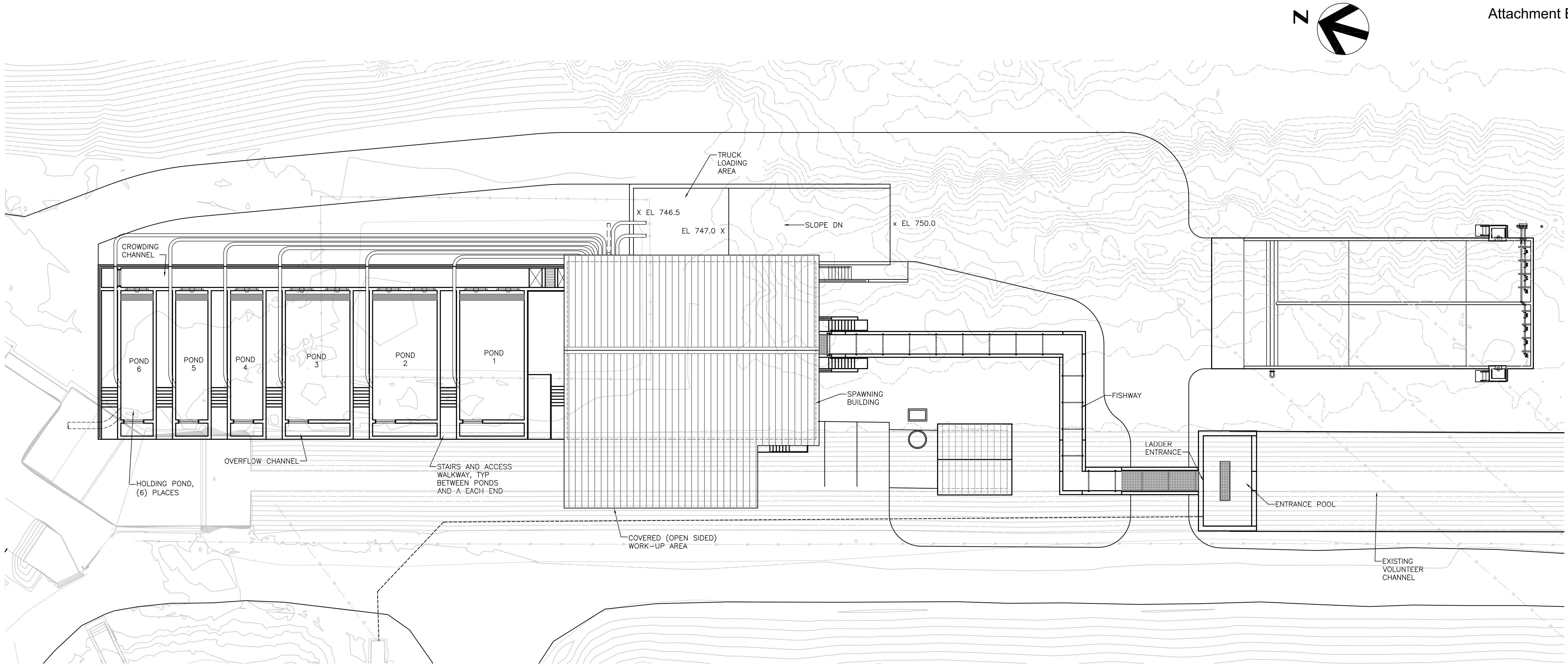
Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Tom Schadt	Anchor QEA, LLC
Lance Keller*	Chelan PUD
Keith Truscott*†	Chelan PUD
Alene Underwood	Chelan PUD
Catherine Willard	Chelan PUD
Tom Kahler*	Douglas PUD
Greg Mackey	Douglas PUD
Jim Craig*	U.S. Fish and Wildlife Service
Steve Lewis†	U.S. Fish and Wildlife Service
Bryan Nordlund*	National Marine Fisheries Service
Scott Carlon*	National Marine Fisheries Service
Aaron Beavers	National Marine Fisheries Service
Jeff Korth*	Washington Department of Fish and Wildlife
Carmen Andonaegui*†	Washington Department of Fish and Wildlife

Notes:

* Denotes Coordinating Committees member or alternate

† Joined for the site tour

Attachment B



1 OVERALL PLAN

SCALE: 1/6" = 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	ACB
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

ADULT HANDLING FACILITY

OVERALL PLAN

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SCALE	AS NOTED

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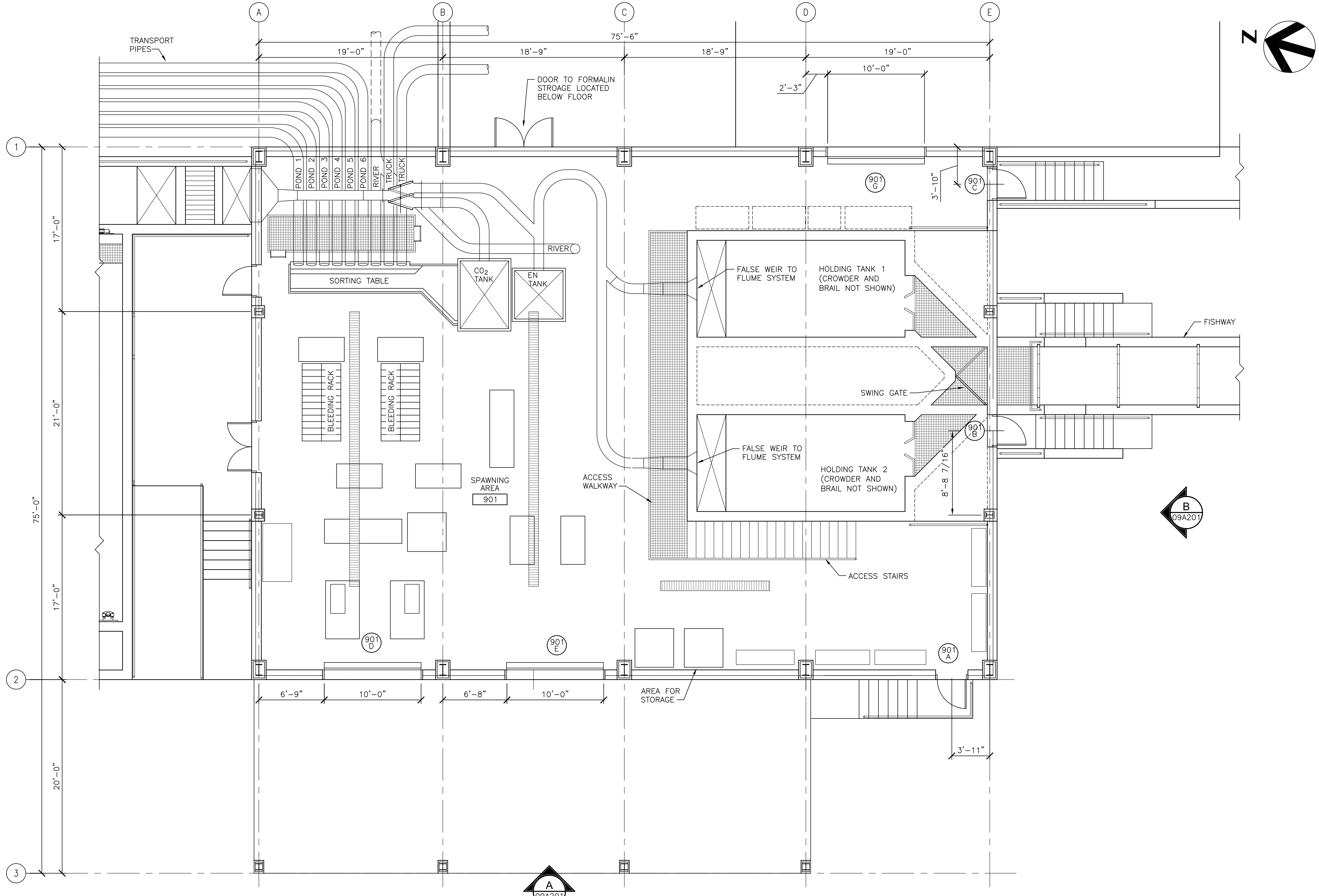
Attachment B



1 FLOOR PLAN - SPAWNING BUILDING

SCALE: 3/16" = 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	ACB
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

ADULT HANDLING FACILITY

SPAWNING BUILDING PLAN

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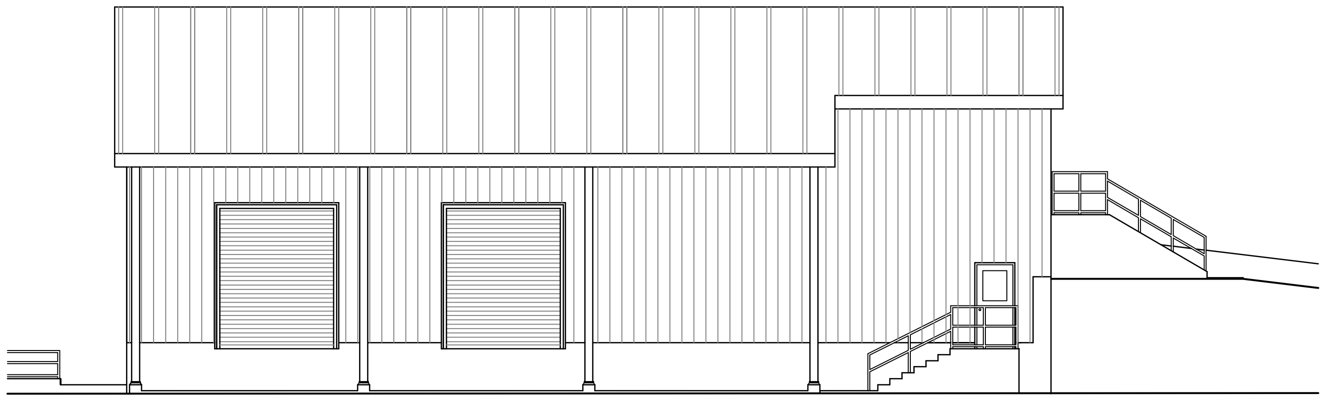
SCALE	AS NOTED

SHEET 09A101

Attachment B



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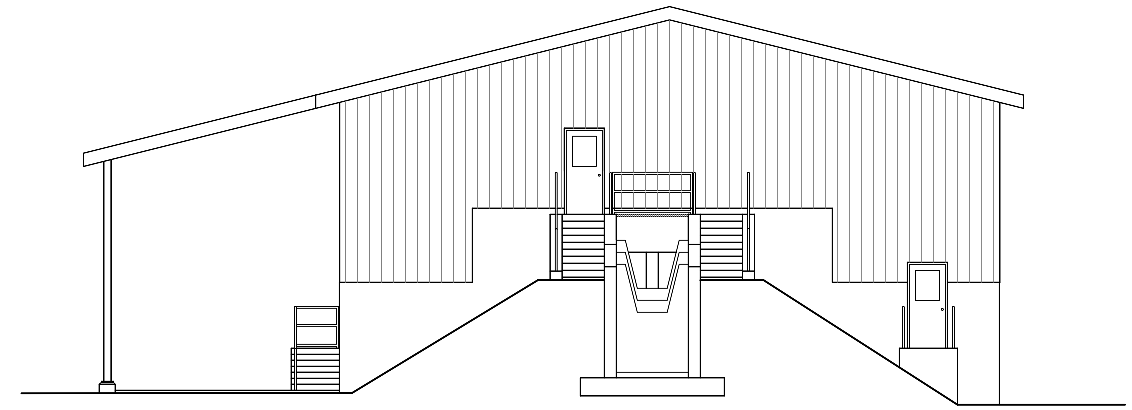

B ELEVATION
SCALE: 1/8" = 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	ELEVATIONS
DESIGNER 1:	EEO
DESIGNER 2:	ACB
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

ADULT HANDLING FACILITY

SPAWNING BUILDING ELEVATIONS 1

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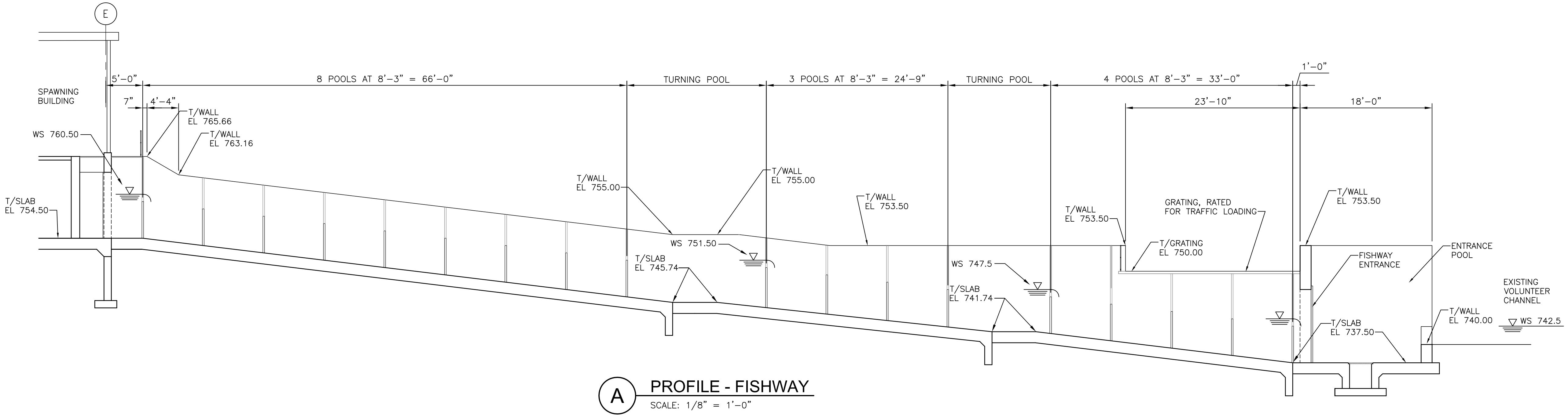
SCALE	AS NOTED

SHEET **09A201**

Attachment B



A PROFILE - FISHWAY

SCALE: 1/8" = 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	ACB
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

ADULT HANDLING FACILITY

STRUCTURAL SECTIONS 1

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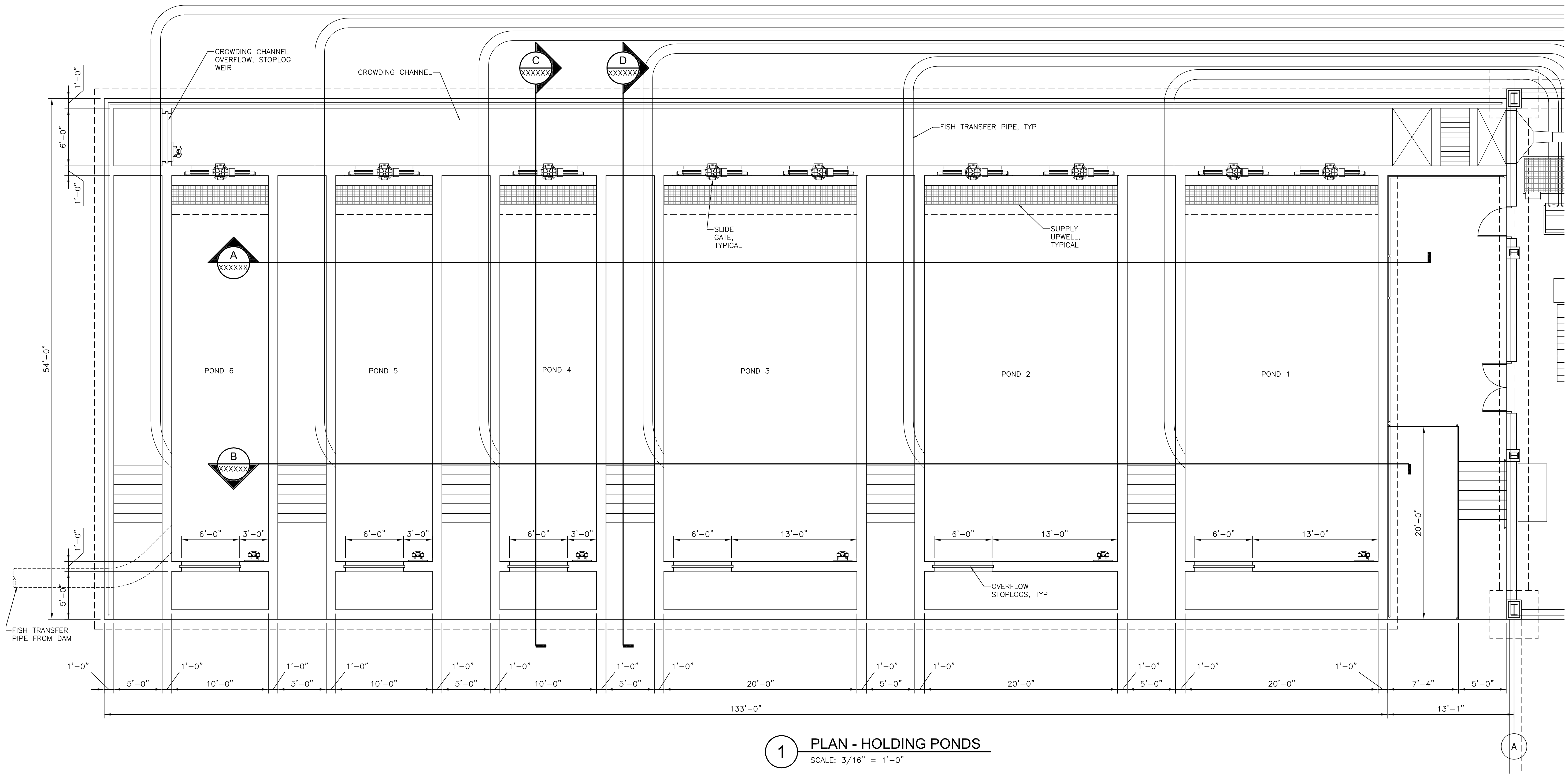
SCALE	AS NOTED

SHEET 09S301

Attachment B



1 PLAN - HOLDING PONDS
SCALE: 3/16" = 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	ACB
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

ADULT HANDLING FACILITY

STRUCTURAL PARTIAL PLAN HOLDING PONDS

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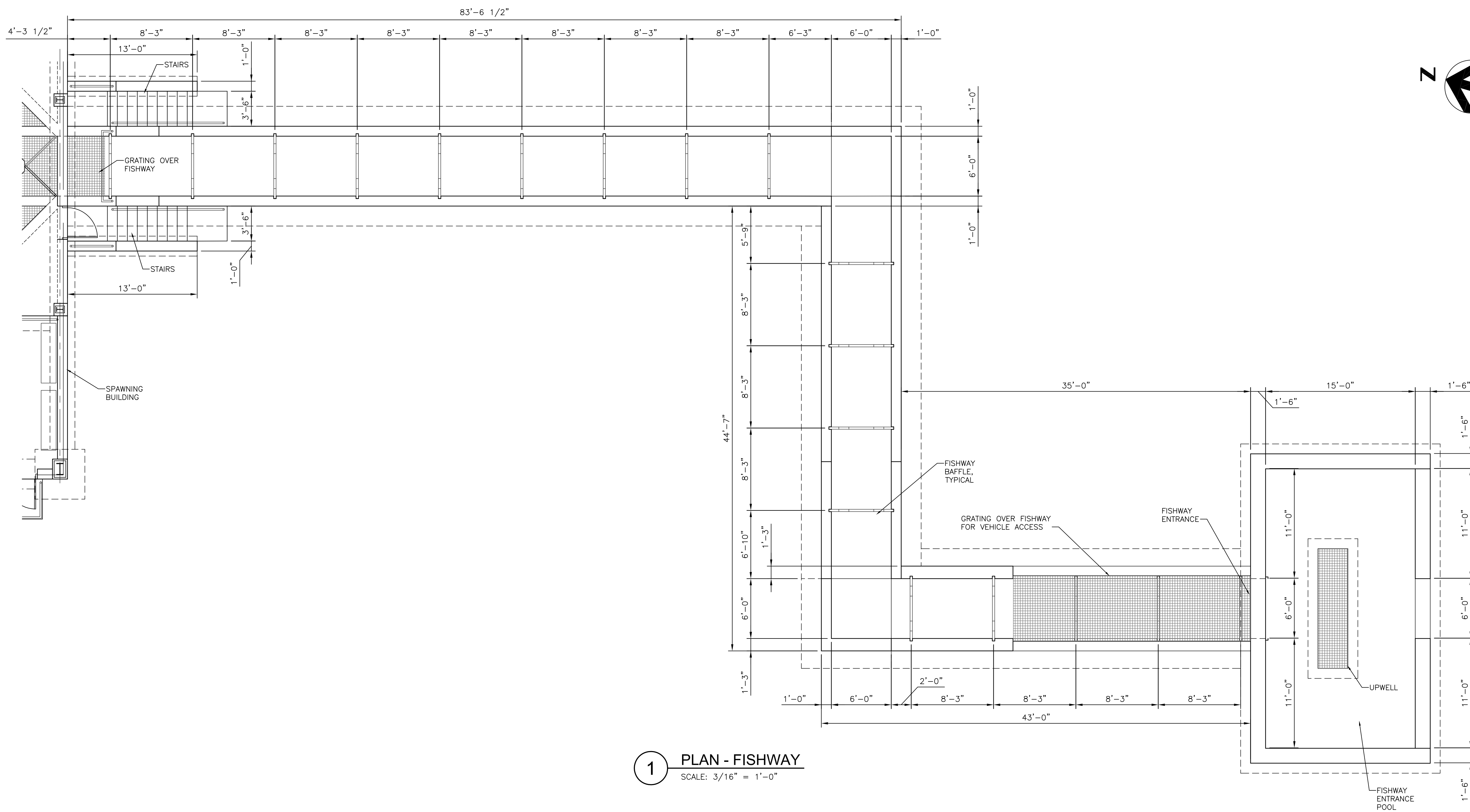
SCALE	AS NOTED
SHEET	09S401

Attachment B



1 PLAN - FISHWAY

SCALE: 3/16" = 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	ACB
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

ADULT HANDLING FACILITY

STRUCTURAL PARTIAL PLAN FISHWAY

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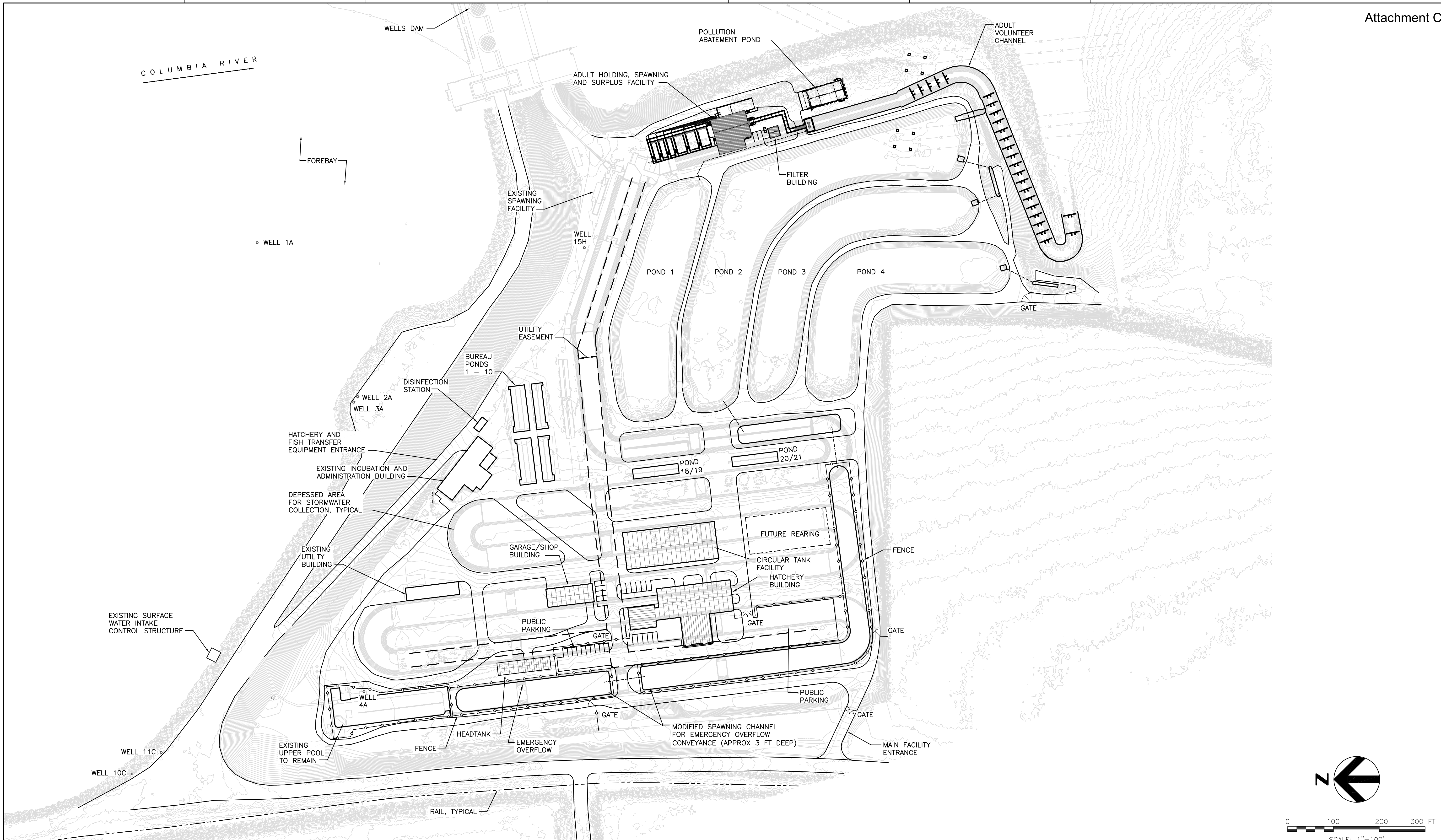
SCALE	AS NOTED

SHEET 09S403

Attachment C



HDR Fisheries
DESIGN CENTER

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

ISSUE	DATE	DESCRIPTION

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

SITE
OVERALL PLAN

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FILENAME	03C102.dwg
SCALE	SCALE AS NOTED

SHEET
03C102

Rocky Reach Trap (RRT) Pilot, 2014

Summary

- Trapping began May 7th and concluded on June 5th
- Trapping occurred for 28 days (May 7th to May 9th and May 12th to June 5th).
- 106 target fish were detected at Rocky Reach between May 7th and June 5th.

Table 1. Type of targeted fish detected and trapped at RRT between May 7th and June 5th.

Type	Targeted fish detected at RR[1]	# Trapped (% Trapped)
Methow Hatchery Origin	88	21 (24%)
Chewuch Natural Origin	6	2 (33%)
Methow Natural Origin	11	1 (9%)
Chiwawa Hatchery Origin	1	1 (100%)

[1]Between the trapping dates of May 7th to June 5th.

- Core trapping hours = 7:00 a.m. to 3:00 p.m.; if a target fish was detected in the ladder the trapping crew would extend their hours.

Table 2. Percent of targeted fish detected at RR during time periods.

Time period	Percent of targeted fish detected at RR
7:00 a.m. to 3:00 p.m.	54%
3:00 p.m. to 7:00 p.m.	21%
7:00 pm to 7:00 a.m.	25%

Table 3. Summary of trapping mortalities.

Date	AD present or AD absent
05/14/14	AD Present
05/22/14	AD Present
05/29/14	Ad Absent/Jack

Chelan PUD Draft Comments

Section and Question	*Aquatechex, LLC, Aquatic Plant and Algae Management General Permit and Discharge Management Plan (DMP) for treatment of submergent aquatic plants in the Columbia River at Entiat Park (Application) June 24, 2014*
Notice of Intent	
VI. Water Body Information	The applicant stated that there are no 303(d) listings for Lake Entiat (Columbia River). The Department of Ecology does have 303(d) listings for Lake Entiat (Columbia River). Please add the 303(d) listings to the NOI.
VII. Chemicals for Planned Use	The chemicals listed in the Notice of Intent are, Diquat dibromide, Endothall (dipotassium salt), Glyphosate, Imazamox, Triclopyr TEA, and 2,4-D Amine. However, these are not, the same chemicals listed in the legal notice published in the Wenatchee World on May 30, 2014 and June 6, 2014. The Notice of Intent lists the possible use of above named chemicals. The IAVMP proposes the use of Triclopyr TEA. It is unclear which chemical is planned for use for this pilot project. In Chelan PUD's review of the registered EPA labels for the chemicals listed in this application the following statements were found and are listed in the table below. The statements from the labels and MSDS are relevant to the pilot project. The information was gathered from the CDMS website (http://www.cdms.net/Home.aspx)

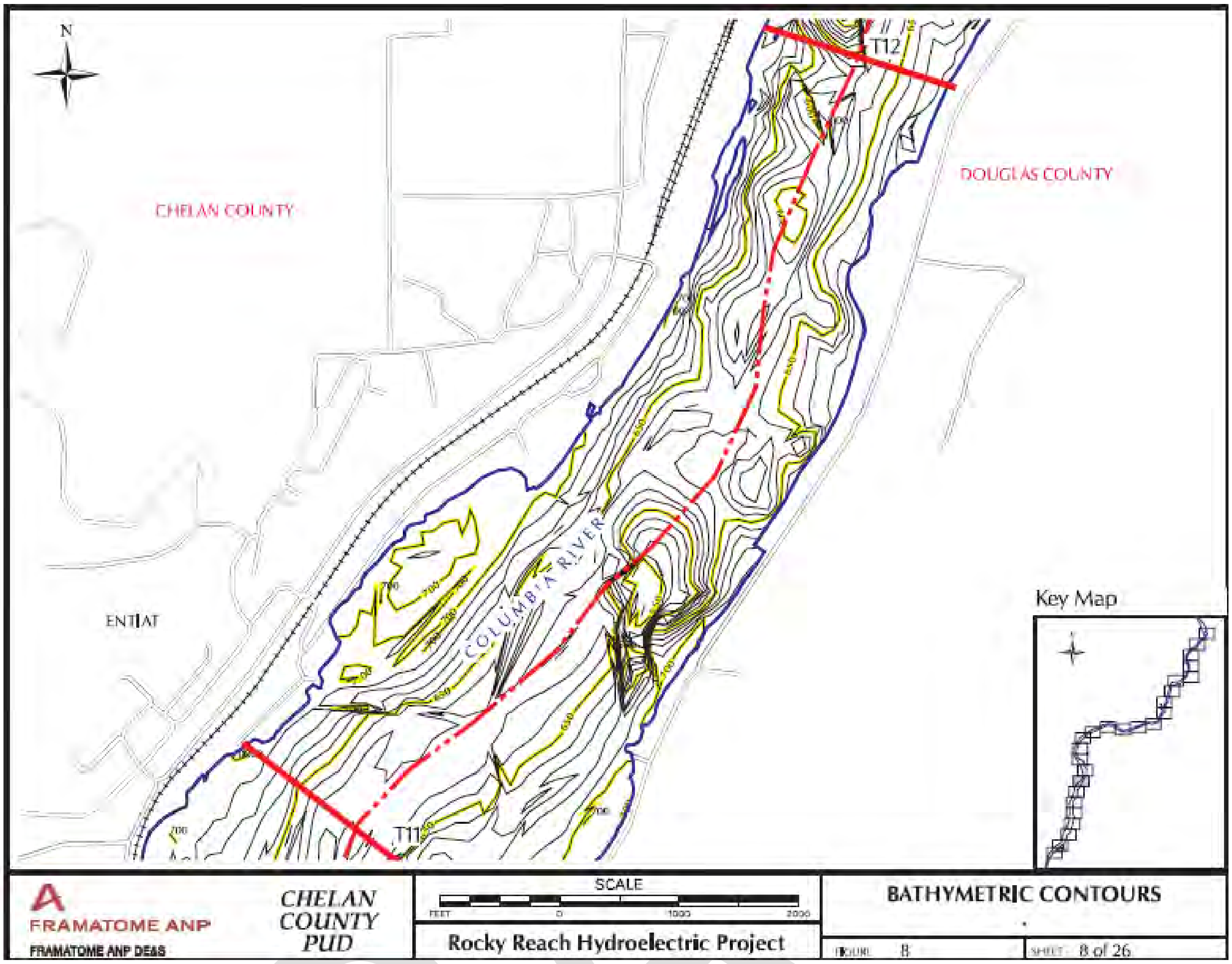
Chemical Name	***Cautions from label or MSDS***
Diquat dibromide	• This pesticide is toxic to aquatic invertebrates • Do not apply directly to water
Endothall (dipotassium salt)	• This pesticide is toxic to mammals • Treatment of aquatic plants can result in oxygen loss from decomposition of dead plants. This loss can cause fish suffocation • For quiescent or slow moving water treatments • Do not use the treated water to irrigate the following for 7 days after the treatment: annual nursery or greenhouse crops including hydroponics and newly seeded or transplanted annual crops, newly seeded or transplanted ornamentals and newly sodded or seeded turf
Glyphosate	• Treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of dead plants. This oxygen loss can cause fish suffocation • This product does not control plants which are completely submerged or have a majority of their foliage under water • Consult local state fish and game agency and water control authorities before applying this product to public water
Imazamox	• The pesticide should only be applied when the potential for drift to adjacent sensitive areas (e.g. residential areas, bodies of water, known habitat for threatened or endangered species, or nontarget crops) is minimal
Triclopyr TEA	• Toxic to trout and mallards • Consult with the State agency for fish and game before applying to public water to determine if a permit is needed • use in reservoirs with little or no continuous outflow • The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination • Do not use treated water for irrigation for 120 days following application.
2,4-D Amine	• May be toxic to fish and aquatic invertebrates • Do not apply within 1,500 ft. of an active potable or irrigation water intake • Apply only to emergent aquatic weeds in ponds, lakes, reservoirs, marshes, bayous, drainage ditches, non-irrigation canals, rivers, and streams that are quiescent or slow moving • Specific water use setbacks from intakes for irrigation purposes

Legal Notice	
In the legal notice that was published in the Wenatchee World, it is not specified what formulation of Triclopyr will be used. It is important to be specific as to which formulation of Triclopyr will be used in the pilot project.	
Discharge Management Plan	
II.5.	A bathymetric map of the treatment area should be added. The general description on the IAVMP is too general for the reviewer to fully comprehend how the herbicide application will remain concentrated, have good contact response, or readily disperse due to the site-specific bathymetry and relationship to the Columbia River thalweg. Chelan PUD has provided a reference to the bathymetric map of the Columbia River (at Lake Entiat) at the end of these comments for your convenience. Delete the unnecessary references to Water Supply Bulletins.
II.6.	Since the downstream boundary of the treatment area is at the mouth of the Entiat River, it is not fully correct to state that there are no tributaries. Downstream drift of application herbicide would affect the mixing zone at the confluence of the Entiat and Columbia rivers.
II.7.	Correct the list of pertinent 303(d) parameters required in this section. We did not find a list at the end of the document and the NOI incorrectly states that there are none.
II.8.	Bring the table or the list of common names from page 8 of the IAVMP into the Application. Add the information regarding submersed, floating, floating-leaved and emergent to the list.
II.9.	All state-listed aquatic noxious weeds in the water body or along the shoreline are not listed in this response, only Eurasian Milfoil. Please complete the list.
II.10.	There is a known state sensitive plant species in the Lake Entiat water body between Rocky Reach and Wells dams.
II.12.	The fish species list is incomplete in the DMP and the IAVMP. A fish species list (from Fish Presence and Use Study for relicensing of the Rocky Reach Project) is provided for your convenience at the end of this document.
II.13.	Please provide the table from Page 5 of the IAVMP in this application, with an additional column to designate the ESA listed species, and specify that the migration windows are for the adult upstream migrations. Please add the migration windows for downstream migrating juveniles. The migration timing for Pacific lamprey in the IAVMP is incorrect and the timing for bull trout adults is only part of the migration window for this species. Reference pages 5-8 of the IAVMP as additional information.
II.14.	A list of aquatic animals can be found in study reports and documents at http://www.chelanpud.org/rr_relicense/
II.15.	Please research the question and if none, say so. The letter cited in the IAVMP is not applicable as it only refers to rare plants and high quality ecosystems.
II.16.	A list of waterfowl and other birds can be found in study reports and documents at http://www.chelanpud.org/rr_relicense/. Again, the letter cited in the IAVMP is not applicable.
II.17.	Contact Chelan PUD wildlife biologists regarding nesting areas and rookeries in the vicinity.
II.19.	While the Columbia River system is a highly managed body of water with flows and water levels tightly controlled; flood control is the first priority.
II.20.	Copy the sentence about the park, including a shoreline trail, from IAVMP page 4 into the Application. Add that upland from the shoreline the land use is primarily highway, urban and industrial.
II.23.	The applicant answered no to this question. There are surface water withdrawals for irrigation and some of the chemicals listed in this application packet have irrigation restrictions.

II.25.	The Application only lists the various forms of the recreation beneficial use. Please add the complete list of Ecology's designated beneficial uses for the Columbia River in the project area.
III.1.	Citing page 3 of the IAVMP fails to address the question. Summarize the relevant information in the IAVMP and from the Milfoil Mapping Project in the response.
III.2.	State that Eurasian water milfoil is the prime problem, state its designation, and mention any other undesirable plants that will be affected by the application, such as curly leaf pondweed.
III.4.	The information in the Application is not relevant to the question. There are no nutrient loads or other factors that contribute to excessive plant growth. State officials first became aware of Eurasian water milfoil as a problem plant in 1974 when Eurasian water milfoil moved downstream from the Canadian Okanogan Lake Chain into Lake Osoyoos, despite government efforts to halt its downstream spread. From Osoyoos, Eurasian water milfoil moved downstream into the Okanogan River and the Columbia River. It was also introduced into the Pend Oreille River and by 1995, Eurasian water milfoil was found in lakes near these rivers (http://www.ecy.wa.gov/programs/wq/plants/weeds/aqua004.html).
III.5.	State that the aquatic plant growth is a nuisance for recreational use around the swim beach, boat docks and launches associated with the park. There are no documented impairments to other beneficial uses in the project area.
IV.1.	This is a management project proposed to reduce plant densities for the benefit of recreational uses. The applicant references page 3 of the IAVMP. On page 3 of the IAVMP, Problem Statement, it is stated that: *"The outcome of this pilot project will determine for the agencies and governments involved whether this treatment is economically feasible and environmental sound and can be expanded throughout the Columbia River System"* We do not believe that this pilot project and IAVMP should determine the use of chemical treatment in the Columbia River System. The economic reasonableness, feasibility and environmental soundness of using herbicides that are either not safe for aquatic life or have not received USFWS and NMFS consultation should not be determined by one pilot study. The USFWS, in a letter dated November 23, 2011 (page 43 of the IAVMP) stated: *"The proposed project would implement aquatic invasive species management planning including an aquatic plant species inventory, a dye study to evaluate flow and potential herbicide dispersion rates, and an evaluation of potential herbicide toxicity to sensitive fish species along a 2 mile stretch of the Columbia River just upstream of the Entiat River delta."* When will the evaluation of potential herbicide toxicity to sensitive species occur? Chelan PUD is not aware of any evaluation of sensitive fish species to the chemicals proposed for use in the application, or any consultation of this chemical use with the USFWS. Could the applicant please provide documentation of the evaluation of these herbicides and any consultation that has occurred with the USFWS? In reference to evaluation of potential herbicide toxicity request by USFWS, the IAVMP on page 17 states: *"Toxicity endpoints that represent lowest observed effect levels, or no observed effect levels should be considered when protection of listed and sensitive species is the objective. Therefore a more in-depth review of behavioral and other chronic endpoints associated with triclopyr should be undertaken prior to conduction the pilot project."* To Chelan PUD's knowledge, no further in-depth review of behavioral and other chronic endpoints associated with Triclopyr have not been explored. Would the applicant please provide the documentation satisfying the further in-depth review of the chronic and behavioral endpoints associated with Triclopyr?
IV.2.	Bring in the relevant goal and objective statements (1 and 3) from the IAVMP. Do not include any speculation about benefits to juvenile salmon (2) since there is no scientific basis for this claim. In regards to goal (3) how does the applicant propose to achieve this goal when several of the chemicals listed in this application are harmful to fish and by applying those chemicals, native salmonids may be negatively affected?
V.1.	Include the map from the IAVMP page 29 and add the boundary of the treatment area.

V.2.	Stick to the specifics of this project and bring in the specific application timing window from the IAVMP and address how that will benefit recreation. The reference regarding the timing window by the applicant refers to the **Recommended Fish and Wildlife Treatment Windows for Ecology's Aquatic Plant and Algae Management Permit** (Ecology's website http://www.ecy.wa.gov/programs/wq/pesticides/final_pesticide_permits/aquatic_plants/aquatic_plant_permit_index.html) This timing window is not accurate for Chelan County as several priority species are absent. Chelan PUD requests that Ecology revise this timing window in consultation with USFWS and WDFW, as USFWS has been delegated the regulatory authority over the fish and wildlife of the Endangered Species Act.
V.3.	Succinctly state the essence of the surveillance plan, then cite the IAVMP for more detail.
V.4.	State the goal for reduction of Eurasian water milfoil density
V.5.	State how you will monitor for harm to fish during herbicide application and how you will assess whether the benthic community has been altered (before/after) in the treatment area. State the timing windows specific to this project, not Lake Washington. The applicant stresses the importance of reading the EPA approved product labels for aquatic herbicides use. Please see the comment for the NOI, Question VII. Chemicals for planned use.
VI.1.	Mere presence of Eurasian water milfoil is not an appropriate threshold for action since this is not an eradication project
VI.2.	Describe the amount of plant density necessary to meet the goal and objectives of this project to improve conditions for recreation.
VII.1.	Revise the response to reflect reality. The aquatic plant community in the treatment area has been relatively stable for many years and recreational use has also been high at this site. Eliminate the hyperbole about plants spreading, making boating, swimming and fishing unsafe, and fish and wildlife habitat declining. These assertions are simply not supported by the evidence.
VII.3-5.	Bring in Table 3 from the IAVMP.
VII.6.	Primarily managed for flood control and beneficial uses associated with the Rocky Reach Project's FERC License conditions.
VII.8.	Mechanical harvesting has been successfully used for years to prevent excessive plant growth from inhibiting boating use at the park. This Application is to test an alternative method that may be more effective and cost efficient.
VII.9	Add rotovation to the list of alternatives in Table 3 from the IAVMP.
VII.10.	Grass carp are prohibited from introduction to the Columbia River
VII.11.	This Application needs to reflect use of only the triclopyr formulation proposed in the IAVMP.
VIII.3.	Discuss only the specific timing window selected in the IAVMP.

VIII.6.	The applicant states that, "*The General NPDES permit that requires the development of this Discharge Management Plan has evaluated the compatability of aquatic herbicide application with human health, fisheries, wildlife, waterfowl, wetland, range plants, endangered species, water rights holders and the ecology of the water body.*" Chelan PUD does not agree that this Discharge Management Plan or the IAVMP, which is part of the Discharge Management Plan has evaluated the compatibility of aquatic herbicide applications with endangered fish species and other fish species as stated in our comments previously. We request that the permit application not be approved until the chemicals proposed in this application are reviewed in-depth by the applicant in consultation with USFWS, WDFW, Ecology, and NMFS. Chelan PUD further requests, that Ecology, during the 30 day comment review period of any Aquatic Plant and Algae Management General Permit Discharge Management Plan and SEPA Addendum for New Applicants, send applications directly to USFWS, WDFW, and NMFS for consultation on ESA listed water body herbicide applications.
X.1-2.	Only discuss the application method selected in the IAVMP.



Fish species known to occur, or believed to occur, in Rocky Reach Reservoir.

Acipenseridae
White sturgeon *Acipenser transmontanus*
Salmonidae
Chinook salmon *Oncorhynchus tshawytscha*
Sockeye salmon *Oncorhynchus nerka*
Kokanee *Oncorhynchus nerka*
Rainbow trout *Oncorhynchus mykiss*
Steelhead *Oncorhynchus mykiss*
Cutthroat trout *Oncorhynchus clarki*
Brown trout *Salmo trutta*
Bull trout *Salvelinus confluentus*
Mountain whitefish *Prosopium williamsoni*
Percidae
Walleye *Stizostedion vitreum*
Yellow perch *Perca flavescens*
Centrarcidae
Largemouth bass *Micropterus salmoides*
Smallmouth bass *Micropterus dolomieui*
Black crappie *Pomoxis nigromaculatus*
Bluegill *Lepomis macrochirus*
Pumpkinseed *Lepomis gibbosus*
Gadidae
Burbot *Lota lota*

Ictaluridae
Channel catfish *Ictalurus punctatus*
Black bullhead *Ictalurus melas*
Catostomidae
Largescale sucker *Catostomus macrocheilus*
Bridgelip sucker *Catostomus columbianus*
Longnose sucker *Catostomus catostomus*
Mountain sucker *Catostsomus platyrhynchus*
Cyprinidae
Carp *Cyprinus carpio*
Northern pikeminnow *Ptychocheilus oregonensis*
Redside shiner *Richardsonius balteatus*
Chiselmouth *Acrocheilus alutaceus*
Peamouth *Mylocheilus caurinus*
Tench *Tinca tinca*
Longose dace *Rhinichthys cataractae*
Speckled dace *Rhinichthys osculus*
Percopsidae
Sand roller *Percopsis transmontana*
Cottidae
Prickly sculpin *Cottus asper*
Torrent sculpin *Cottus rhotheus*
Gasterosteidae
Threespine stickleback *Gasterosteus aculeatus*
Petromyzontidae
Pacific lamprey *Entosphenus tridentatus*

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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Coordinating Committees	**Date:**	July 22, 2014
From:	Kristi Geris		
Cc:	Mike Schiewe, HCP Coordinating Committees' Chair		
Re:	Final Summary of the June 24, 2014 Wells Hatchery Modernization 60% Design Adult Handling Facility Workshop		

This memorandum provides a summary of the Wells Hatchery Modernization 60% Design Adult Handling Facility Workshop that was held at Rock Island Dam in eastern Washington, on Tuesday, June 24, 2014, from 12:00 pm to 1:00 pm. Attendees are listed in Attachment A to this memorandum.

ACTION ITEM SUMMARY

- No action items were discussed during today's meeting.

REVIEW ITEMS

- Kristi Geris sent an email to the Coordinating Committees on June 20, 2014, notifying them that the draft Wells Hatchery Adult Handling Facility 60% Design documents are available for a 60-day review period, with comments due to Tom Kahler and Greg Mackey by Monday, August 18, 2014 (Item I).

I. Wells Hatchery Modernization 60% Design Adult Handling Facility Workshop (Greg Mackey)

Greg Mackey said that Kristi Geris sent an email to the Coordinating Committees on June 20, 2014, notifying them that the draft Wells Hatchery Adult Handling Facility 60% Design Report and the associated site plans (Attachment B) are available for a 60-day review period, with comments due to Tom Kahler and Mackey by Monday, August 18, 2014. Mackey also provided the Wells Hatchery Adult Handling Facility 60% Design Overview Drawing (Attachment C), which Geris distributed to the Coordinating Committees via email following the meeting on June 26, 2014. Mackey said that although the Wells Hatchery Modernization is a voluntary action and was not a requirement of the Federal Energy Regulatory Commission (FERC) license, Douglas PUD's FERC License still requires agency review of many actions, such as this one. He explained that the new Adult Handling Facility review falls under the jurisdiction of the HCP Coordinating Committee because it involves fish passage. These meeting minutes will serve as the consultation record for the Adult Handling Facility, which is a component of the Wells Hatchery Modernization.

Mackey reviewed Attachment C, an overview of the hatchery grounds, noting the location of the existing Hatchery Building and existing raceways. He said that a new Adult and Early Rearing Incubation Building will be constructed. He pointed out the old spawning channel, which is approximately 1 mile long and winds back and forth, ultimately connecting to the volunteer channel. He said that the spawning channel did not perform as expected when built back in the 1960s. The hatchery was converted to a more standard hatchery shortly thereafter and the spawning channel was then used for water conveyance, only. The water system is being rebuilt for the hatchery; therefore, the channel will be demolished as part of the Modernization project. The footprint of the channel will be used as building sites for some of the new infrastructure. He said that most existing infrastructure at the hatchery will remain, and several new facilities will be constructed. He said that construction is planned to start in 2015, and construction plans were designed so that Wells Hatchery can remain fully operational throughout the duration of the construction. He noted the adult volunteer channel that begins at the southeast corner of the site and runs along the east perimeter to the existing trapping and spawning facilities. He said that the existing trapping and spawning facilities will be removed and the adult volunteer channel will be truncated and connected to a new fish ladder that will lead to the new Adult Holding, Spawning and Surplus Facility (i.e., "Adult Handling Facility").

Mackey reviewed page 1 of Attachment B, noting that the existing adult volunteer channel is located to the south, and will be connected to the new ladder, with a new upwell to supply water to the channel. He pointed out the main building, holding ponds, crowding channel, fish ladder, and transfer pipes and truck loading area. He said that the truck loading area located to the east of the new Adult Handling Facility was designed to facilitate direct loading of fish to trucks (water to water transfer). He said that the series of horizontal pipes located on the east side of the facility allow fish to be returned to each of the six holding ponds, and he added that the larger ponds are for summer Chinook salmon, while the smaller ponds are for steelhead and spring Chinook salmon. He also noted that the hatched-colored pipe connected to the west corner of Pond 6 is connected to the Wells Dam west ladder trap. He said that each pond is equipped with an automatic crowder that moves west to east, into another crowder channel that leads into the building. This allows the fish held in any of the adult ponds to be crowded into the new Adult Handling Facility.

Mackey reviewed page 2 of Attachment B. He said that the new Adult Handling Facility will serve many purposes, including as a handling facility for west ladder-trapped and volunteer channel-trapped fish, a spawning facility, a monitoring and evaluation (M&E) facility, an area for surplusing excess fish, and a facility for adult management. Mackey explained that when fish enter the new Adult Handling Facility from the adult volunteer channel, they enter via the new fish ladder (i.e., “Fishway”) that is located to the south into two trap holding pools with false weirs, enabling staff to work fish from one pool while trapping the other., and then up to approximately 20 fish at a time are crowded into a pipe that leads to the electronarcosis (EN) unit. Mackey explained that the EN unit uses low voltage direct current (DC) voltage to sedate fish, and recovery is almost instantaneous, versus an electroanesthesia (EA) system that uses higher alternating current (AC) voltage to “stun” a fish. He said that the Wells HCP Hatchery Committee thoroughly discussed this aspect of the design, and support using EN. He added that there were also requests to include the capability of a back-up anesthetic method. He said that the facility will be able to use a variety of chemical anesthetics as backup to the EN unit. He noted that with EN, non-target species can be returned to the river immediately with minimal handling, while target fish can be sent to the CO_2 anesthetic tank, to monitoring and evaluation, trucks, or to holding ponds. He said that fish entering the new Adult Handling Facility from the holding ponds can be diverted directly to the CO_2 tank or EN unit, depending on operational needs. CO_2 is preferred for spawning or surplusing, while EN would be used for monitoring and evaluation and initial sorting from the west ladder trap. Lastly, Mackey added that the design for the spawning and workup area was structured after the setup at Winthrop National Fish Hatchery (NFH): everything is on casters and can be easily moved to accommodate different tasks.

Mackey briefly reviewed pages 3, 4, 5, and 6 of Attachment B, which depict the outside of the new Adult Handling Facility, a side profile of the Fishway, a structural partial plan for the holding ponds, and a structural partial plan for the Fishway, respectively. He recalled an earlier discussion with Bryan Nordlund on preventing fish held in the ponds from jumping at the water discharge from the fish return pipes and minimizing the velocity of fish entering the ponds from the return pipes and noted that HDR engineers have worked to address these issues. Nordlund asked if, when using the west ladder trap, sorting must be completed in the new building, or if it can be completed at the trap. Mackey replied that the west ladder trap is operated by "live" trapping, so workers can choose which fish to trap and which to pass upstream at the trap. Once fish are in the Adult Handling Facility, they can be further sorted with much greater attention to detail (using marks, tags, etc.). Mackey also said that both well water and surface water will supply the hatchery, and that clean hatchery water will be discharged through the adult volunteer channel rather than the facility drain to enhance homing to the facility. Nordlund asked if, when using a chemical anesthetic such as tricaine methane sulfonate (MS 222), the effluent will be isolated so as to not drain into the same channel as other effluent. Mackey said that waste water will drain to a settling pond, and he will check on having the effluent from chemical anesthetic tank(s) drain into the settling pond. Nordlund suggested rerouting MS 222 water to a holding area for evaporation.

Nordlund also cautioned that there can be a learning curve on how to properly use CO_2 for fish. Mackey said that, realizing the EN unit is not optimal for some tasks, such as spawning or surplusing fish, the CO_2 tank can be used instead. However, CO_2 is not intended to be used on fish prior to being identified as broodstock. In other words, trapped wild fish or other non-target fish would be sorted using EN and sent to the proper destination with as little effect on the fish as possible. He added that separate recovery tanks can also be installed, if needed, or one tank can be used as a recovery tank while the other is in use as an aesthetic tank. Nordlund agreed that 2-step anesthesia is a good idea. He then asked how many and what species of fish typically enter the volunteer channel, noting that he is curious about capacity issues. Mackey said that the surplus pond, which would be one of the largest holding ponds depicted on page 1 of Attachment B, is designed to hold at least 600 fish at one time. He added that there is a fair amount of free board within each pond, so they can be filled deeper to increase capacity, if needed. Nordlund asked if fish from the west ladder trap will be metered so as to not overfill Pond 6, and Mackey replied that they will be. Mackey added that Pond 6 is designed to hold at least 200 fish, which is more than the number that would be trapped at the west ladder in any one day. He also added that if, somehow, Pond 6 does become full, trapping would be halted. He explained that trapping typically ends at 8:00 p.m., the next day trapped fish are sorted, and then trapping does not commence until the following day.

Jeff Korth asked if Douglas PUD has considered building additional rearing ponds on the other side of the site. Mackey said that there will already be one extra pond; however, there is not enough room to build any more ponds. He said that Douglas PUD originally planned to construct the new Adult Handling Facility closer to the dam; however, this was not possible due to dam safety considerations. He added that locations that allowed linking the new Adult Handling Facility into the volunteer channel were constrained and there would be no space to add more ponds.

Korth also suggested considering the recent upgrades at Priest Rapids Dam, including the complications that arose from those modifications. Mackey said that Douglas PUD and Wells Hatchery WDFW staff toured the Priest Rapids facility, noting the upgrades, and pros and cons of these upgrades. He also added that much of the Adult handling Facility design was based on upgrades at Winthrop NFH, which work very well. Mackey said that the fish and staff flow in the Wells design have been carefully thought out in collaboration with the WDFW staff. He also noted that the design team is aware of the issues encountered with the crowders at the Priest Rapids Hatchery.

Nordlund asked how many staff will be required to crowd fish out of the holding ponds and then also crowd them into the appropriate tank. Mackey said that only one staff person will be needed to operate the crowders to move fish into the building. Nordlund also asked about the Y-pipe that is depicted in the handling area of page 2 of Attachment B, and Mackey clarified that this pipe allows fish to be sent back to the river from two locations within the facility, with the two pipes joining in a "Y."

Mackey asked that the Coordinating Committees contact him or Kahler with questions as they arise. He added that no additional workshops are planned for the HCP Hatchery Committees; however, Mike Schiewe reminded the Coordinating Committees that the HCP

Hatchery Committees have already thoroughly reviewed the hatchery components of the design at the Master Plan stage and the 30% design stage.

List of Attachments

Attachment A	List of Attendees
Attachment B	Draft Wells Hatchery Adult Handling Facility 60% Design Site Plans
Attachment C	Draft Wells Hatchery Adult Handling Facility 60% Design Overview Drawing

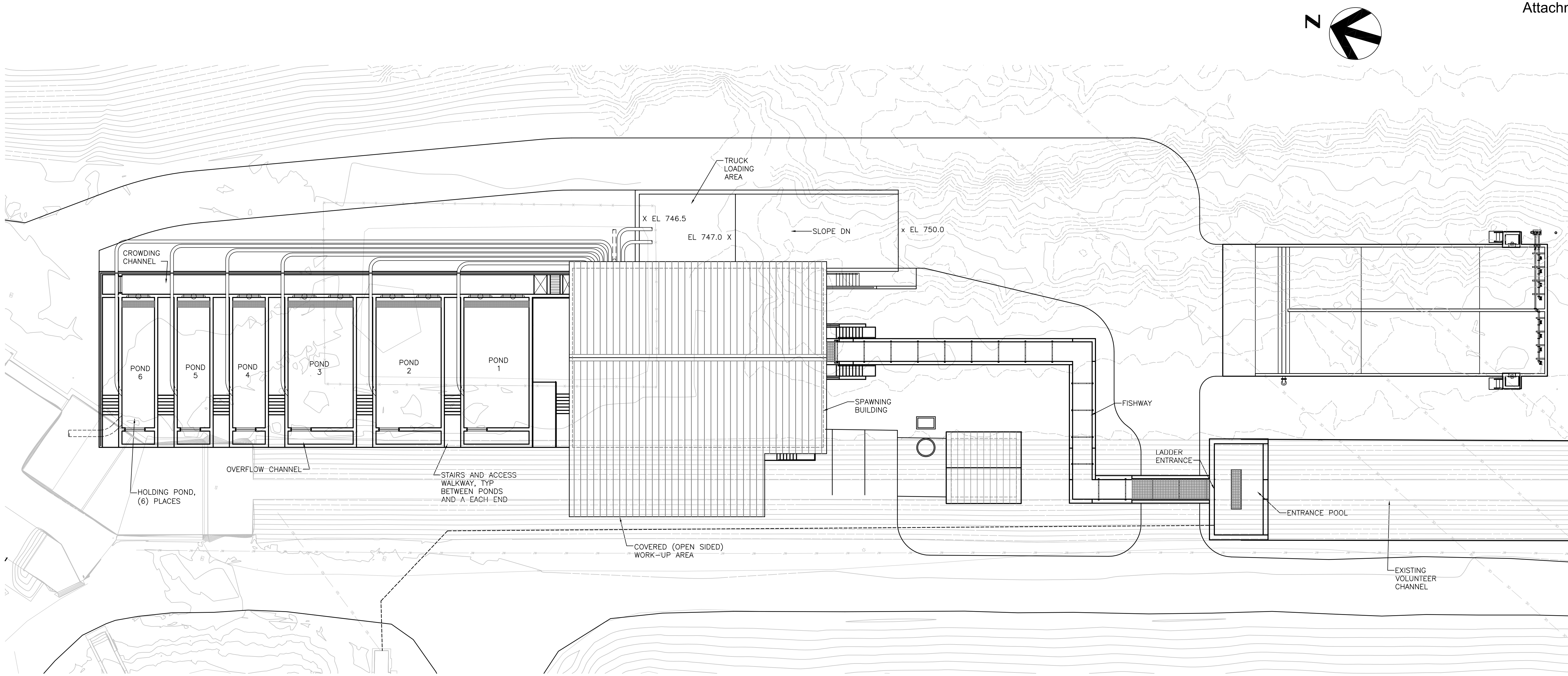
Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Tom Schadt	Anchor QEA, LLC
Lance Keller*	Chelan PUD
Alene Underwood	Chelan PUD
Catherine Willard	Chelan PUD
Tom Kahler*	Douglas PUD
Greg Mackey	Douglas PUD
Jim Craig*	U.S. Fish and Wildlife Service
Bryan Nordlund*	National Marine Fisheries Service
Scott Carlon*	National Marine Fisheries Service
Aaron Beavers	National Marine Fisheries Service
Jeff Korth*	Washington Department of Fish and Wildlife

Notes:

* Denotes Coordinating Committees member or alternate

Attachment B



1 OVERALL PLAN
SCALE: 1/6" = 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	ACB
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

ADULT HANDLING FACILITY

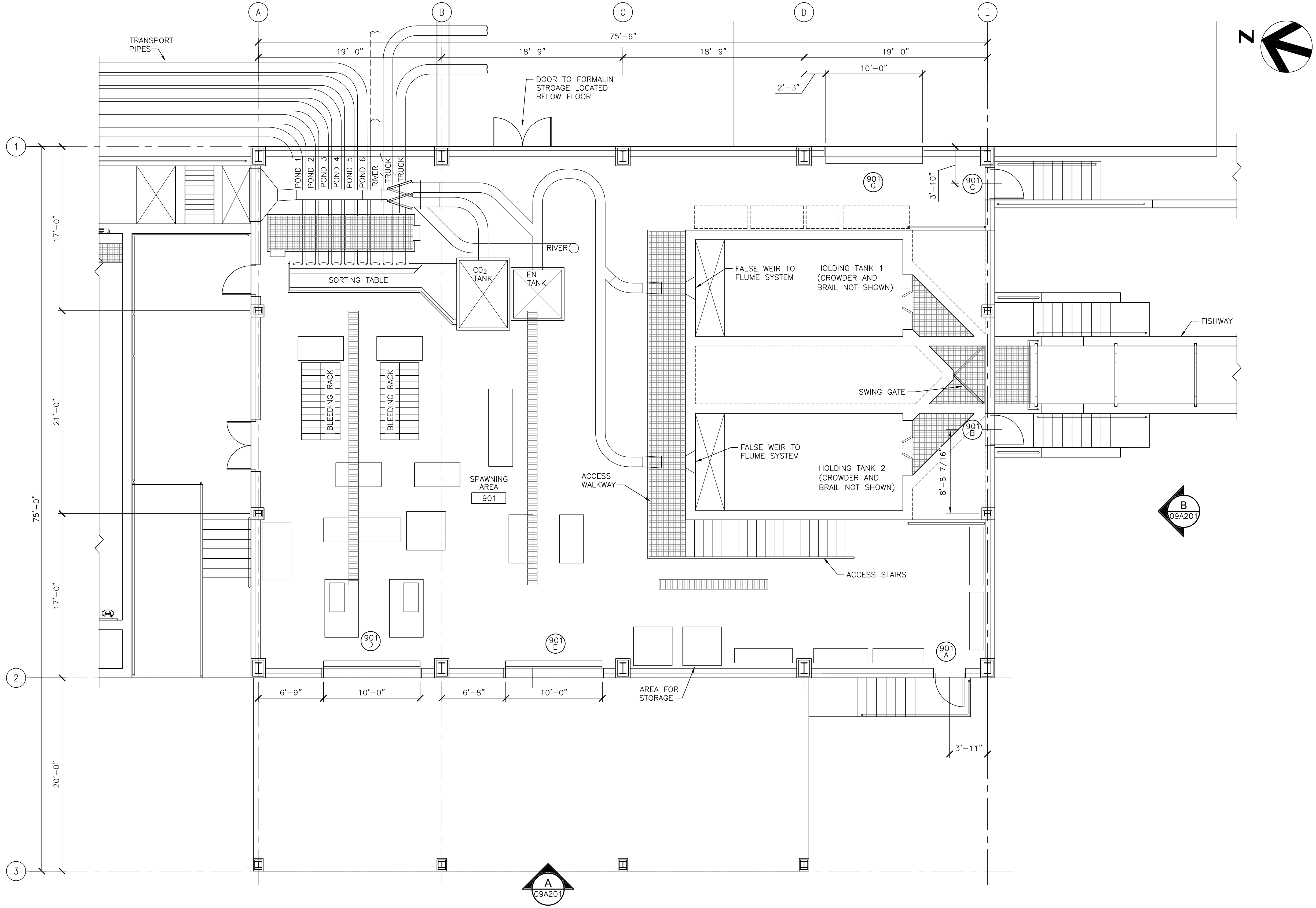
OVERALL PLAN

0 1" 2"

FILENAME	09G101.dwg
SCALE	AS NOTED

SHEET **09G101**

Attachment B



1 FLOOR PLAN - SPAWNING BUILDING

SCALE: 3/16" = 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	ACB
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

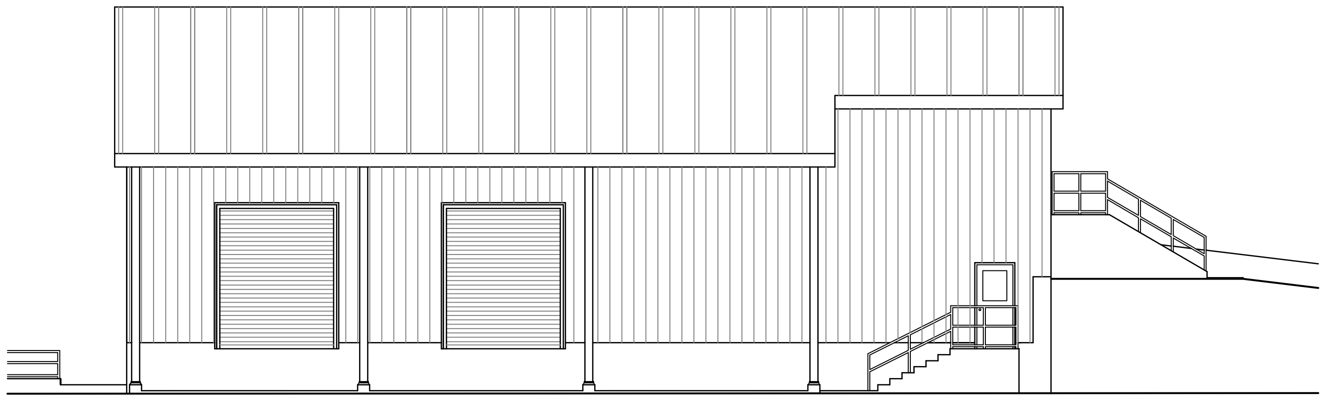
WELLS HATCHERY MODERNIZATION

ADULT HANDLING FACILITY

SPAWNING BUILDING PLAN

FILENAME	09A101.dwg
SCALE	AS NOTED
SHEET	09A101

Attachment B



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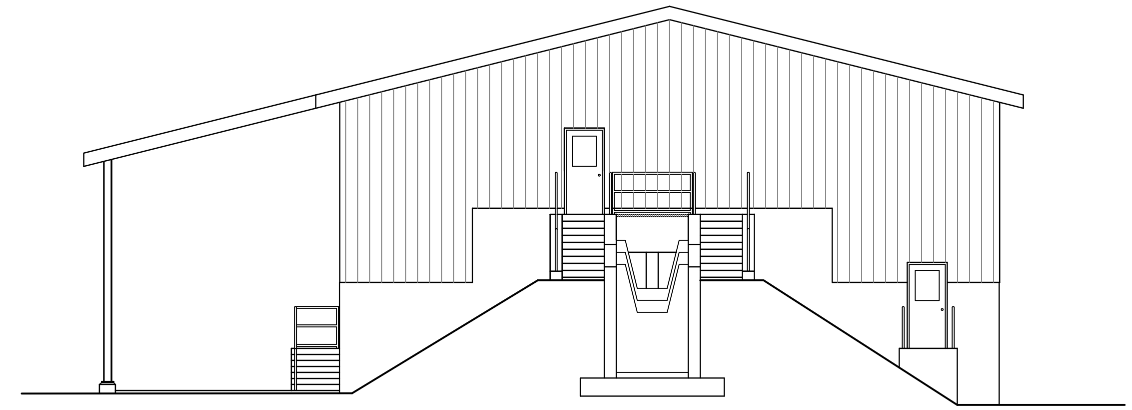
SCALE: 1/8" = 1'-0"



B ELEVATION
SCALE: 1/8" = 1'-0"

HDR Fisheries
DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	ELE
DESIGNER 1:	EEO
DESIGNER 2:	ACB
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

ADULT HANDLING FACILITY

SPAWNING BUILDING ELEVATIONS 1

0 1" 2"

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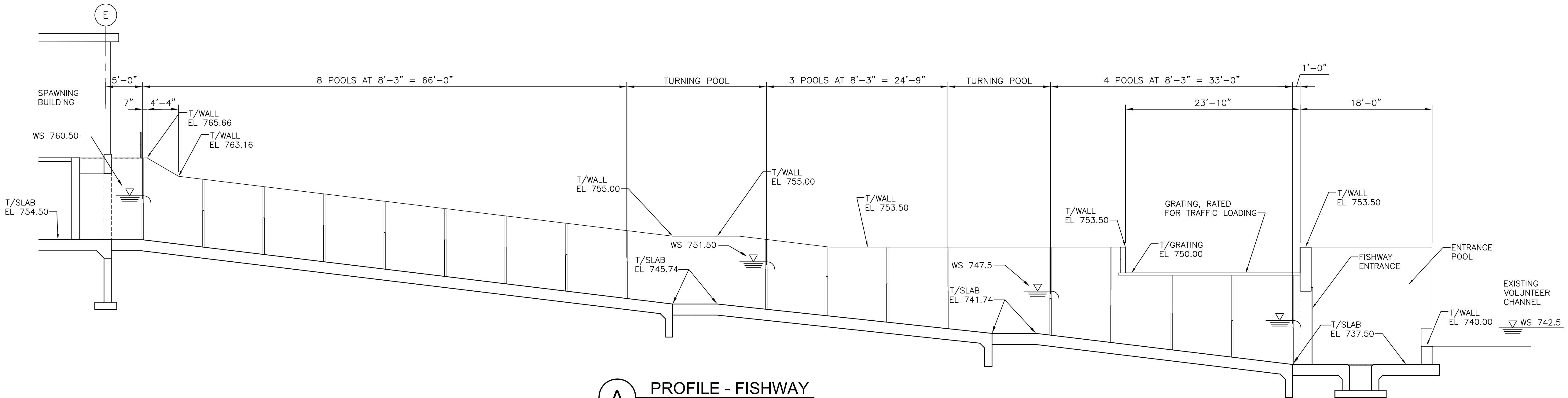
SCALE	AS NOTED

SHEET
09A201

Attachment B



A PROFILE - FISHWAY
SCALE: 1/8" = 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	ACB
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

ADULT HANDLING FACILITY

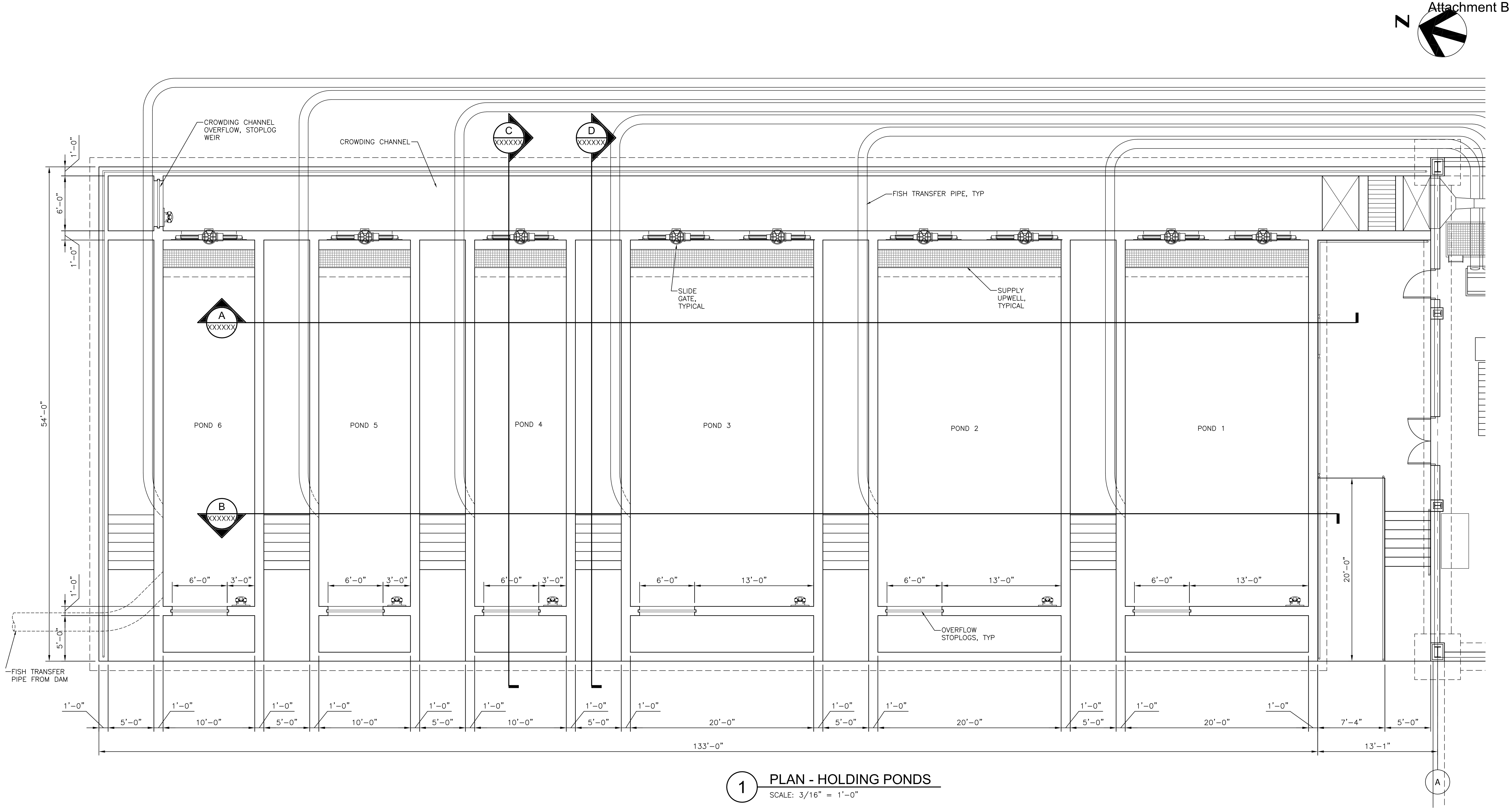
STRUCTURAL SECTIONS 1

0 1" 2"

FILENAME	09S301.dwg
SCALE	AS NOTED

SHEET 09S301

Attachment B



1 PLAN - HOLDING PONDS
SCALE: 3/16" = 1'-0"

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	ACB
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

ISSUE	DATE	DESCRIPTION

HDR Fisheries DESIGN CENTER

Public Utility District No. 1 of Douglas County

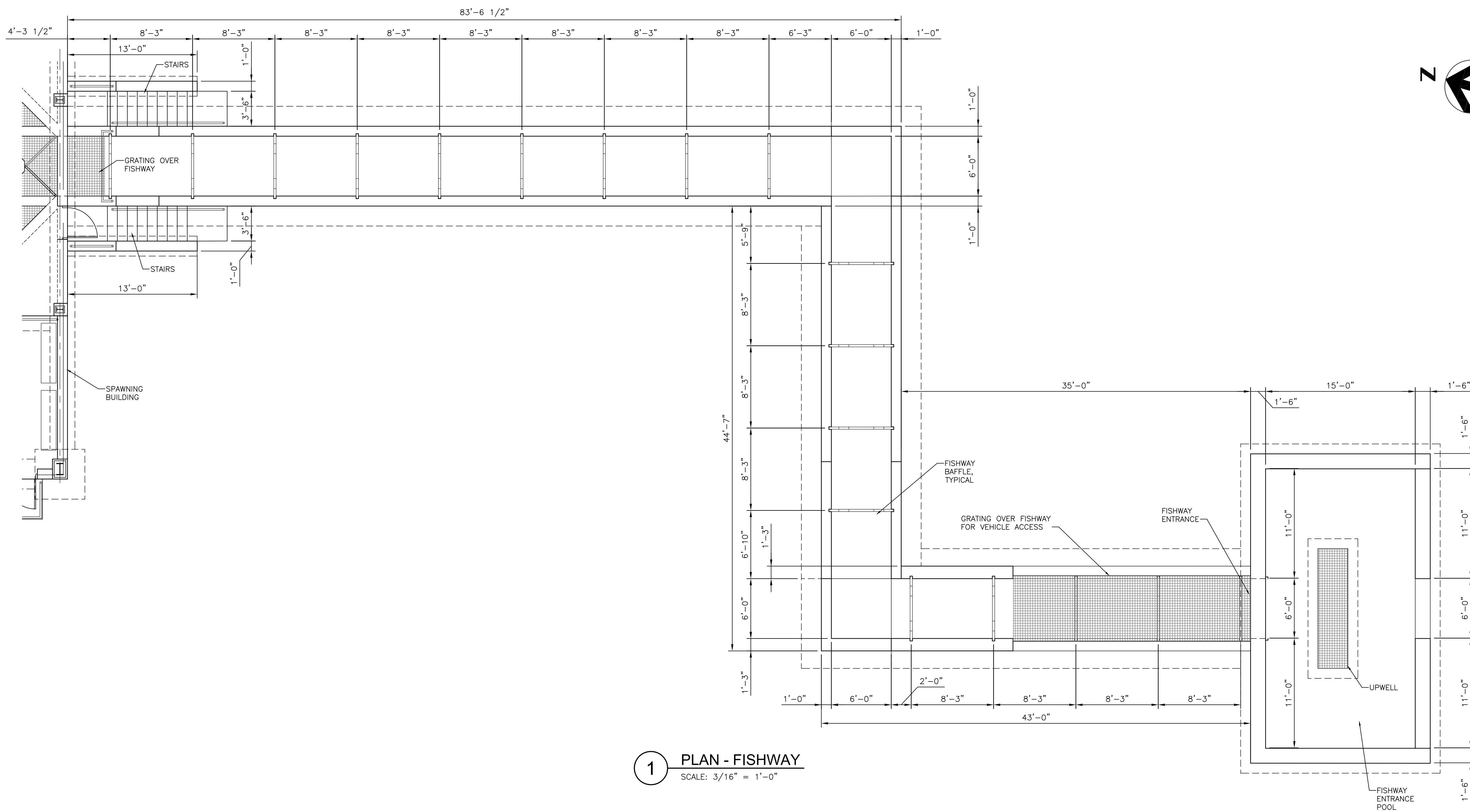
WELLS HATCHERY MODERNIZATION

ADULT HANDLING FACILITY

STRUCTURAL PARTIAL PLAN HOLDING PONDS

FILENAME 09S401.dwg
SCALE AS NOTED
SHEET 09S401

Attachment B



1 PLAN - FISHWAY

SCALE: 3/16" = 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	ACB
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

ADULT HANDLING FACILITY

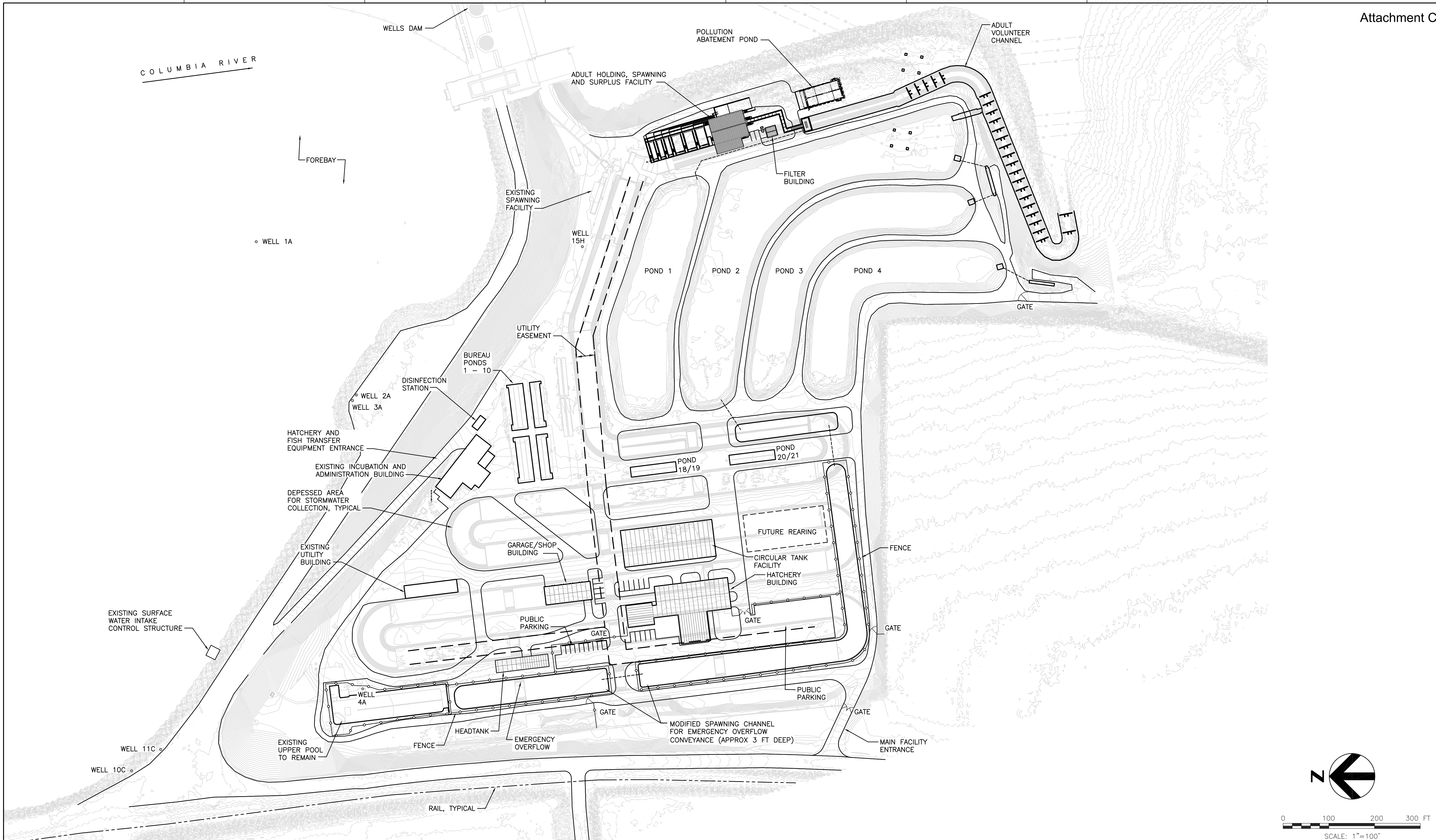
STRUCTURAL PARTIAL PLAN FISHWAY

0 1" 2"

FILENAME	09S403.dwg
SCALE	AS NOTED

SHEET **09S403**

Attachment C



HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

SITE

OVERALL PLAN

0 1" 2"

FILENAME	03C102.dwg
SCALE	SCALE AS NOTED

SHEET **03C102**

ANCHOR QEA

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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Coordinating Committees	**Date:**	August 26, 2014
From:	Michael Schiewe, Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the July 22, 2014 HCPs Coordinating Committees Conference Call		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met by conference call on Tuesday, July 22, 2014, from 9:30 am to 11:00 am. Attendees are listed in Attachment A of these conference call minutes.

ACTION ITEM SUMMARY

- Kristi Geris will coordinate with Alene Underwood (Chelan PUD) to resolve the National Marine Fisheries Service (NMFS) pending comments on the revised draft Coordinating Committees June 24, 2014 meeting minutes (Item I-A). *(Note: Underwood provided clarification to Nordlund on July 24, 2014.)*
- Kristi Geris will contact Julene McGregor (Douglas PUD Information System Staff) to request read-only access to the final document library on the HCP Hatchery Committees Extranet site for Jayson Wahls (Washington Department of Fish and Wildlife [WDFW], Wells Complex Manager), as approved by the Coordinating Committees (Item I-C). *(Note: Geris sent an email to McGregor on July 22, 2014, requesting access for Wahls, as discussed.)*
- Chelan PUD will evaluate how the increased production and early release of hatchery subyearling Chinook salmon may affect the timing of achieving 95% spill coverage at Rocky Reach and Rock Island dams (Item II-A).
- Tom Kahler will confirm with Tracy Hillman (BioAnalysts) the current account balance for the Wells Plan Species Account (Item IV). *(Note: Kahler contacted Hillman following the meeting on July 22, 2014, and determined that the current account balance for the Wells Plan Species Account is $1,228,313—not $253,775, as reflected in the July 2014 Progress Report from the Tributary Committees. Hillman*

provided a revised July 2014 Progress Report from the Tributary Committees to Kristi Geris on July 22, 2014, which Geris distributed to the Coordinating Committees that same day.)

DECISION SUMMARY

- The Wells HCP Coordinating Committees representatives approved via email the request of the Wells Aquatic Settlement Work Group for reduction of the Wells Dam collection gallery head-differentials from the normal operating level of 1.5 foot, to a reduced operating level of 1.0 foot ("lamprey operations"), from 17:00 to 00:59 daily during the 2014 lamprey migration, to start immediately and terminate on September 30, 2014. Email approvals were received from the U.S. Fish and Wildlife Service (USFWS) and NMFS on July 28, 2014, and the Yakama Nation (YN), the Colville Confederated Tribes (CCT), WDFW, and Douglas PUD on July 29, 2014.

AGREEMENTS

- Coordinating Committees representatives present agreed to provide Jayson Wahls read-only access to the final document library on the HCP Hatchery Committees Extranet site (Item I-C).

REVIEW ITEMS

- Kristi Geris sent an email to the Coordinating Committees on June 20, 2014, notifying them that the draft Wells Hatchery Adult Handling Facility 60% Design documents are out for a 60-day review period, with comments due to Tom Kahler and Greg Mackey by Monday, August 18, 2014.

DOCUMENTS FINALIZED

- There are no documents that have been recently finalized.

I. Welcome

Mike Schiewe welcomed the Coordinating Committees and asked for any additions or other changes to the agenda. The following revisions were requested:

- Lance Keller added: 1) Rocky Reach Dam bypass system incident; and 2) Rock Island Dam right bank adult fishway passive integrated transponder (PIT)-tag antenna update.
- Tom Kahler said that Douglas PUD's updates will include: 1) subyearling sampling; and 2) Wells Dam fish counts.

A. Meeting Minutes Approval (Mike Schiewe)

The Coordinating Committees reviewed the revised draft June 24, 2014 meeting minutes. Kristi Geris said that there were two items remaining to be discussed, as follows:

- Regarding the NMFS discussion on Tumwater trap operations, Bryan Nordlund requested clarification of the objectives of the 2015 Chelan PUD facilities study at Tumwater Dam. The Coordinating Committees agreed to leave the meeting minutes as written, as they accurately reflected the discussion. Geris will send Nordlund's question to Alene Underwood for further clarification. *(Note: Underwood provided clarification to Nordlund on July 24, 2014.)*
- Regarding Chelan PUD's Rocky Reach 2013 broodstock collection update, Nordlund noted that his observation of the fish injury data collected at Wells Dam did not coincide with Chelan PUD's comments about possible fish injuries caused by the Rocky Reach Trap (i.e., Alene Underwood's comment was reflected in the minutes as stating that "…most fish injuries were observed much later than when the trap was being operated…"). The Coordinating Committees agreed to have Geris verify with Underwood that the meeting minutes accurately reflect what was discussed, or if needed, revise the discussion accordingly. *(Note: Underwood clarified that her comment was that "…a large number of fish injuries persisted after Chelan PUD ceased operating the trap…," as was corrected in the final meeting minutes, as distributed to the Coordinating Committees on July 29, 2014.)*

Geris said that other all comments and revisions received from members of the Committees were incorporated in the revised minutes. Coordinating Committees members present approved the June 24, 2014 meeting minutes, as revised.

The Coordinating Committees reviewed the revised draft Wells Hatchery Modernization 60% Design Adult Handling Facility Workshop meeting minutes. Geris said that all comments and revisions received from members of the Committees were incorporated in the revised minutes, and that there were no outstanding edits or questions to discuss. Coordinating Committees members present approved the Wells Hatchery Modernization 60% Design Adult Handling Facility Workshop meeting minutes, as revised. Geris will finalize the meeting minutes and distribute them to the Committees.

B. Last Meeting's Action Items (Mike Schiewe)

Action items from the Coordinating Committees meeting on June 24, 2014, and follow-up discussions, were as follows: *(Note: italicized item numbers below correspond to agenda items from the June 24, 2014 meeting.)*

- *Lance Keller will obtain clarification from Brett Bickford (Chelan PUD) about statements attributed to Bickford in the draft May 27, 2014, Coordinating Committees meeting minutes, regarding Chelan PUD's Rock Island Powerhouse 2 Unit Efficiency Curve; Kristi Geris will incorporate any necessary revisions and will distribute the meeting minutes as final (Item II-A).*
  Bickford provided clarification of his statements via email on June 25, 2014, which Geris incorporated into the draft May 27, 2014 meeting minutes and distributed to the Coordinating Committees that same day.
- *Kristi Geris will contact Julene McGregor (Douglas PUD Information Systems Staff) to request read-only access to the final document library on the HCP Coordinating Committees Extranet site for Aaron Beavers (NMFS), as approved by the Coordinating Committees (Item II-C).*
  Geris sent an email to McGregor on June 25, 2014, requesting access for Beavers, as discussed.

- *Lance Keller will provide Kristi Geris with key dates and values regarding the Rocky Reach Turbine Unit 2 (C2) rotor crack repair for incorporation into the meeting minutes (Item V-B).*
  Keller provided Geris with this information on June 26, 2014.
- *Lance Keller will provide Chelan PUD draft comments on the Entiat Pilot Milfoil Control Project to Kristi Geris for distribution to the Coordinating Committees (Item V-C).*
  Keller provided these comments to Geris on June 25, 2014, which Geris distributed to the Coordinating Committees that same day.

C. HCP-CC Distribution List and Extranet Site Access Approval (Mike Schiewe)

Mike Schiewe said that Jeff Korth requested, via email, Coordinating Committees approval to provide Jayson Wahls, Wells Complex Manager, access to the HCP Hatchery Committees Extranet site. Schiewe recalled that the Coordinating Committees have recently transitioned to a SharePoint file sharing system, and Korth's request follows the formal process that was agreed upon by the Coordinating Committees to keep track of which non-HCP representatives have access to the HCP Extranet sites. Coordinating Committees representatives present agreed to provide Wahls read-only access to the final document library on the HCP Hatchery Committees Extranet site. Kristi Geris said that she will contact Julene McGregor (Douglas PUD Information System Staff) to request read-only access to the final document library on the HCP Hatchery Committees Extranet site for Wahls, as approved by the Coordinating Committees. *(Note: Geris sent an email to McGregor on July 22, 2014, requesting access for Wahls, as discussed.)*

II. Chelan PUD

A. Rocky Reach and Rock Island Subyearling Chinook Salmon Run-Timing (Lance Keller and Steve Hemstrom)

Lance Keller said that Steve Hemstrom has been monitoring spill and reviewing daily data and index counts for subyearling Chinook salmon at Rocky Reach and Rock Island dams. Hemstrom noted that this year, there is a change in subyearling distribution based on the timing of hatchery releases. He said that as of today, July 22, 2014, the program RealTime (developed by John Skalski and the University of Washington) estimates that 96.7% of the run has passed Rocky Reach Dam; although, that percentage also includes a wide confidence interval (19 days). Hemstrom said that there are still relatively high numbers of subyearling Chinook salmon passing Rocky Reach Dam, noting that yesterday, July 21, 2014, a total of 269 subyearlings passed the dam. He said that spill will not be modified at Rocky Reach Dam until those counts substantially decrease. He said that for Rock Island Dam, the program RealTime estimates that about 78% of the subyearling run is complete. He added that the total expected passage index count at Rock Island Dam is 24,962 subyearlings, and that 21,713 are currently indexed. He said that more than 500 subyearlings are still passing Rock Island Dam daily, and he believes they are mostly wild.

Hemstrom recalled, as discussed at the Coordinating Committees meeting on February 25, 2014, the Rocky Reach and Rock Island HCPs requirement to verify every 10 years that the operations established by the Coordinating Committee are adequately protecting 95% of the spring and summer migrations of juvenile Plan Species. He raised the question of how hatchery releases may affect run-time distribution, noting the large releases of subyearlings in early-May combined with Chief Joseph Hatchery's subyearling releases, which could result in reaching the 95th percentile sooner and may ultimately make the September proportion of the run appear smaller overall. Kirk Truscott noted that the program used to calculate 95% passage is based on a running 10-year average and should account for any increases in hatchery subyearling releases. Hemstrom agreed but added that if a large enough proportion of the run shifts to earlier passage, then the fish passing later in the outmigration season (late August and September) would be a smaller percentage of the total. Truscott said that a reduction in spill coverage in late July and August could jeopardize passage of natural-origin subyearlings. Hemstrom suggested requesting that Dr. Skalski evaluate the sensitivity of the model to shifting migration timing resulting from large hatchery subyearling releases earlier during the subyearling migration season. Truscott suggested conducting a retrospective analysis using passage counts from previous years and current Chief Joseph Hatchery release numbers to estimate the potential effect on spill shutoff date.

Mike Schiewe summarized that this discussion has raised a number of important questions, including what the distribution of hatchery versus wild subyearling Chinook salmon is in terms of passage timing, and if a shift of peak run-timing to earlier in the migration season might affect the proportions of hatchery and wild outmigrants covered by spill. He asked if there are data that indicate how wild fish are distributed throughout the run. Keller replied that Chelan PUD monitors adipose fin (ad)-present and ad-clipped passage data, and that typically, the proportions change throughout the year. He added that more ad-present fish pass later in the season as the outmigration progresses.

Jim Craig asked when 95% coverage has typically been met at Rocky Reach and Rock Island dams in previous years, and Keller replied that the earliest it has been met is July 27, 2011. Keller added that in 2011, he recalls quite a few subyearlings passing earlier in the season, including fish that were escaping from Wells Hatchery. Tom Kahler agreed, explaining that a gate was not flush with the raceway and about 11,000 subyearlings escaped. He added that Douglas PUD previously released their subyearlings in June; however, they switched to a May release date when they discovered that this resulted in higher smolt-to-adult returns. He also added that this switch occurred around the same timeframe when the fish escaped from the hatchery. Hemstrom also noted that the latest date that 95% coverage has been met at Rocky Reach and Rock Island dams was August 24, 2009.

Chelan PUD agreed to evaluate how the increased production and early release of hatchery subyearling Chinook salmon may affect the timing of achieving 95% spill coverage at Rocky Reach and Rock Island dams.

B. Rocky Reach Dam Bypass System Incident (Lance Keller)

Lance Keller reported that on Saturday, July 19, 2014, at 9:00 a.m., the Rocky Reach surface collector of the bypass system was shut down to address the appearance of oil in the water near the pump station. He explained that the low level oil alarm on the high pressure pumps sounded, and when a bypass attendant opened the door to the hydraulic power unit (HPU) pump cabinet, he discovered that an oil hose had come loose, filling the HPU pump cabinet with oil. He said that when the door was opened, the oil in the cabinet spilled over the containment area and into the pump station area of the bypass area. He said that the pumps were shut down and the area was skimmed; however, at sunrise, additional oil was observed in the dead-water space behind the dewatering screens and forebay, where the oil appeared to be contained. Cleaners performed a thorough cleanup of the oil spill, and at 3:50 p.m., the pump station was restarted and the system was back in full operation. In response to this incident, Keller said that Chelan PUD is developing a hose inspection to help prevent a similar situation from occurring in the future.

Mike Schiewe asked if the bypass was completely shut down. Keller replied that yes, the bypass was briefly shut down in the early morning and then again at 9:00 a.m. He added that the Columbia River Data Access in Real Time (DART) database indicated that one index count was conducted the day of the spill, which indicated that seven fish passed the dam. He said that no additional sampling was conducted due to the pump station being shut down.

C. Rock Island Dam Right Bank Adult Fishway PIT-Tag Antenna Update (Lance Keller)

Lance Keller said that it had come to Chelan PUD's attention that PIT-tagged sockeye salmon passing via the Rock Island Dam Right Bank Adult Fishway were not being detected. He said that Biomark tested the right bank PIT-tag antenna and it registered 100% noise, so they are now working on site trying to determine the origin of the noise. Keller said that at the same time, Biomark found that the detection equipment associated with Powerhouse 2 is also not working properly. He said that Biomark is fabricating a new combination half- and full-duplex PIT-tag antenna array to install upstream of the count window where the fishway exit meets the forebay, which is a much quieter location than at Powerhouse 2. Keller said that Chelan PUD has asked Biomark to expedite the process, which should be complete by August 4, 2014.

D. Wanapum Drawdown Update (Lance Keller)

Lance Keller said that not much has changed and Chelan PUD is continuing to monitor flow. He said that the fishway attendants are now fully trained and are on station 24 hours per day, 7 days per week. He said that the attendants are making sure that the fishways are in tune with changing elevations, and are ready to optimize conditions for use of the denils if needed. He said that currently, river flow is about 151,000 cubic feet per second (151 kcfs), which translates into a tailwater elevation of 566 feet. He added that river flow is expected to remain high this week, and may drop later in August.

Keller said that as of July 20, 2014, a total of 513,612 sockeye have passed Rock Island Dam. He said that the peak total count at the right bank fishway was 27,115 sockeye passing on July 14, 2014, and including the other ladder, around 30,000 passed Rock Island Dam for the day. He said that both entrances are operating in a low flow configuration.

Keller said that Chelan PUD is currently preparing their monthly Interim Fish Passage Plan Report to submit to the Federal Energy Regulatory Commission; once finalized, the report will be distributed to the Coordinating Committees. Keller said that the report will summarize Rock Island Dam activities during the month of July, and should be ready by the end of August.

III. Douglas PUD

A. Subyearling Sampling (Tom Kahler)

Tom Kahler said that Douglas PUD continued weekly seine sampling for subyearling Chinook in May and June 2014 in Wells Reservoir using the methods they implemented as part of their 3-year subyearling sampling study. Kahler said that the weekly sampling provides data on presence, abundance, size, and availability of subyearlings to beach-seining gear and was originally intended to inform the commencement of tagging, during the three years of subyearling tagging. He added that a written summary of the data from this year is not yet available, but would be incorporated into the summary report of the larger study. He indicated that the purpose of current efforts is to gain a better understanding of when fish are available in the Wells Reservoir and when fish reach a size where they can be PIT-tagged.

Kahler said that between May 7 and June 23, 2014, Douglas PUD conducted seven weekly sampling trips. He said that the same two, productive sites located in the upper reservoir that were sampled in 2011-2013 were seined again this year: one site located downstream of the mouth of the Okanogan River, and the other located at the downstream end of Washburn Island. He said that fish at the Washburn location are assumed to be progeny of mainstem spawners, and fish at the Okanogan mouth are the progeny of both mainstem and Okanogan spawners. He said that the fish were generally very small and taggable-sized fish were not encountered in any significant numbers until mid-June. He said that the mean fish-size target for tagging is 60 millimeters (mm), and during the sampling event on June 23, 2014, 53% of the fish were greater than 60 mm fork length. He also said that throughout May and June 2014, Douglas PUD communicated the results of the weekly sampling to the CCT, so that the CCT seining crews would know when to begin their PIT-tagging efforts. He added that the CCT commenced their seining and tagging operation on June 30, 2014; and that Douglas PUD did not sample after June 23, 2014, since the CCT seining would generate the desired data.

Kahler said that the CCT started releasing their subyearling Chinook salmon production from Chief Joseph Hatchery on May 21, 2014, and on May 30, 2014, Douglas PUD started catching significant numbers of Chief Joseph Hatchery subyearlings at Gebbers Landing, the site located near the mouth of the Okanogan. He added that the number of clipped subyearlings greatly exceeded the number of natural-origin recruits (NORs), and that was also the case in the catches on June 6, 2014. He said that hatchery subyearlings persisted in the catches until the June 23, 2014 sampling event, when only two clipped subyearlings were captured indicating that most hatchery-origin fish had moved out of the system.

Kahler said that Douglas PUD plans to evaluate these new data in an overall summary report of the 3-year tagging study. He added that Douglas PUD also intends to continue early-season sampling to obtain more information on variability in the size of fish on sampling dates, and timing of fish availability. Mike Schiewe asked if Douglas PUD plans to continue the study, or if this is just an effort to get additional PIT-tagged fish into the system. Kahler said that no additional PIT-tagging is being done by Douglas PUD; Douglas PUD is only collecting information on fish presence, size, and availability. He added that one assumption of the survival study model is that the population at large is represented in the tagged population, and he noted two possible concerns: 1) fish obtained earlier are too small to tag; and 2) later in the season, fish of taggable size are less available.

B. Wells Dam Fish Counts (Tom Kahler)

Tom Kahler said that an email outlining the current fish count issues at Wells Dam was distributed to the Coordinating Committees by Kristi Geris on Friday, July 18, 2014. He said that two fish counters are unable to report to their Wells Dam work stations due to the nearby wildfires, and that the other fish counters are working overtime; he noted that the latter is not sustainable without a full crew to allow rotating overtime schedules. Kahler noted that the peak of the run is still strong, so there is a lot of catching up to do. Mike Schiewe said that the Coordinating Committees, among others, understand the problems caused by the wildfires, and that everyone's efforts are appreciated.

IV. Hatchery and Tributary Committees Update (Mike Schiewe)

Mike Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the last HCP Tributary Committees meeting on July 18, 2014:

- *General Salmon Habitat Program Proposals*: The Tributary Committees received five full proposals to the 2014 General Salmon Habitat Program, three of which received combined Tributary Committees contributions amounting to more than $400,000 (all of which were also matching funds). Those projects include the Methow Watershed Beaver Reintroduction, Barkley Irrigation Company – Under Pressure (the largest of the three with $300,000 in contributions), and Icicle Irrigation District Flow Control Structure. Currently, there is about $4,074,020 in the Rock Island Plan Species Account, $1,745,241 in the Rocky Reach Plan Species Account, and about $253,775 in the Wells Plan Species Account. Tom Kahler said that the Wells Account information may be incorrect, and that he will confirm with Tracy Hillman (BioAnalysts) the current account balance for the Wells Plan Species Account. *(Note: Kahler contacted Hillman following the meeting on July 22, 2014, and determined that the current account balance for the Wells Plan Species Account is $1,228,313—not $253,775, as reflected in the July 2014 Progress Report from the Tributary Committees. Hillman provided a revised July 2014 Progress Report from the Tributary Committees to Kristi Geris on July 22, 2014, which Geris distributed to the Coordinating Committees that same day.)*
- *Budget Amendment: Entiat Stillwaters Gray Reach Acquisition*: The Rocky Reach Tributary Committee approved Chelan-Douglas Land Trust's request to move $36,000 from "land purchase" to "sponsor salaries and benefits" in order to develop Stewardship Plans. This budget amendment does not change the total budget amount for the project.

- *Approved Appraisers*: Based on recommendations from Larry Rees (the Tributaries Committees' approved appraiser) and Chelan-Douglas Land Trust, the Tributaries Committees approved Tom Walters as an additional appraiser.
- *Next Steps*: The next Tributary Committees meeting will be held on Thursday, August 14, 2014.

Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the last HCP Hatchery Committees meeting on July 16, 2014:

- *DECISION: Grant PUD Access to Use Excess Production Capacity at Douglas PUD Facilities to Produce Steelhead and Spring Chinook Salmon:* The Wells Hatchery Committee approved a Statement of Agreement (SOA) for the next 10-year period in which Grant PUD will be rearing part of their settlement agreement for steelhead and spring Chinook salmon at Douglas PUD facilities. Similar requests have been approved annually after confirming that the production did not affect any existing sharing agreements or mitigation production; however, because the request is the same each year, the Wells Hatchery Committee agreed to extend the term of the approval to cover a 10-year period.
- *PRESENTATION: Ecological Risk Assessment of Upper-Columbia Hatchery Programs on Non-Target Taxa of Concern (NTTOC):* Greg Mackey presented on the NTTOC effort that has been ongoing for several years. The modeling results indicate that adverse effects of Hatchery programs on NTTOC are minimal. These findings were based on a risk model which showed that Hatchery programs did not exceed selected containment levels. Completing this NTTOC modeling effort partially fulfilled Objective 10 of the Hatchery Monitoring and Evaluation (M&E) Plan.
- *DISCUSSION: NTTOC Objective Finalization:* A SOA is being developed for Hatchery Committees review that documents partial fulfillment of Objective 10 of the Hatchery M&E Plan (Objective 12 in the updated Hatchery M&E Plan).
- *Tangle Netting in the Chewuch:* Chelan PUD reported on the tangle netting efforts in the Chewuch, indicating that three fish have been captured to date. Lance Keller updated this information adding that the current count is now up to 16 fish.
- *CCT's Okanogan Section 10(j) Permit:* The CCT reported that the Okanogan Section 10(j) permit has been published in the Federal Register, establishing experimental

status of spring Chinook salmon that are introduced into the Okanogan. Kirk Truscott noted that the permit becomes effective 30 days after publication. He added that fish raised at Winthrop National Fish Hatchery will be transferred to an acclimation facility in the Okanogan in late-October or early-November.

- *Rearing Coho at Wells Hatchery for the YN's Coho Reintroduction Program:* The YN and Douglas PUD are discussing a potential proposal to rear coho at Wells Hatchery. Some yet-to-be-determined proportion of the production would be funded by the YN's Coho Reintroduction Program and some proportion could be Douglas PUD's HCP production requirement. Tom Kahler said that initial discussions are still underway, and another meeting is planned in the next couple of weeks. He said that the proposal includes about 450,000 coho, 50,000 of which could be for Douglas PUD's No-Net-Impact contribution.
- *Proposed Modification to Tumwater Dam Operation:* On Friday, July 11, 2014, as sockeye numbers increased at Tumwater Dam, WDFW modified the trapping schedule to avoid delays to spring Chinook salmon. WDFW had yet to obtain USFWS approval for the modified schedule, and anticipates receiving approval by Thursday, July 17, 2014. Mike Tonseth recently distributed an email indicating that trapping operations at Tumwater Dam shut down last week due to several major wildfires in the vicinity of Tumwater Dam; and that beginning today, July 22, 2014, the trap will operate Monday through Friday from 6:00 a.m. to 3:00 p.m. (9 hours per day or 45 cumulative hours per week), and not exceed 48 hours per week permit limits.

V. HCP Committees Administration

A. Next Meetings (Mike Schiewe)

Mike Schiewe said that the next scheduled Coordinating Committees meeting is August 26, 2014, to be held in person at the Radisson Hotel in SeaTac, Washington. The September 23, 2014 and October 28, 2014 meetings will be held either by conference call or in person at the Radisson Hotel in SeaTac, Washington, as is yet to be determined.

List of Attachments

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Lance Keller*	Chelan PUD
Steve Hemstrom*	Chelan PUD
Tom Kahler*	Douglas PUD
Jim Craig*	U.S. Fish and Wildlife Service
Scott Carlon*	National Marine Fisheries Service
Jeff Korth*	Washington Department of Fish and Wildlife
Bob Rose*	Yakama Nation
Kirk Truscott*	Colville Confederated Tribes

Notes:
* Denotes Coordinating Committees member or alternate

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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Coordinating Committees	**Date:**	September 23, 2014
From:	Michael Schiewe, Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the August 26, 2014 HCPs Coordinating Committees Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Radisson Gateway Hotel, in SeaTac, Washington, on Tuesday, August 26, 2014, from 9:30 am to 11:30 am. Attendees are listed in Attachment A of these meeting minutes.

ACTION ITEM SUMMARY

- Tom Kahler will review past Coordinating Committees meeting minutes regarding the Yakama Nation's (YN's) original proposal to extend Coho trapping activities at Wells Dam and will coordinate with the YN and Kirk Truscott to verify that the Colville Confederated Tribes' (CCT's) concerns have been addressed (Item II-A).
- Tom Kahler will ask Bryan Nordlund to provide a brief history summarizing the operation and decommissioning of the low-level side entrance at Wells Dam, including fish use of the entrance and behavior in the area around the entrance (Item III-A).
- Ritchie Graves (National Marine Fisheries Service [NMFS]) will internally discuss NMFS' willingness to delegate approval of the annual Broodstock Collection Protocols to their HCP Hatchery Committees and Coordinating Committees representatives (Item III-D).
- Cory Kamphaus (YN) will provide Dr. John Skalski and Dr. Richard Townsend's memorandum on the comparison of juvenile survivals of spring Chinook salmon, Coho, and steelhead released from Winthrop National Fish Hatchery (NFH) to Kristi Geris for distribution to the Coordinating Committees (Item III-E). *(Note: Kamphaus provided this memorandum to Geris following the meeting on August 26, 2014, which Geris distributed to the Coordinating Committees that same day.)*

- Douglas PUD will develop a draft Statement of Agreement (SOA) seeking approval of designating Coho as a Plan Species meeting the Phase III (Standard Achieved) for passage at Wells Dam based on similar survival of studied yearling spring migrants consistent with the assumption of similarity in Section 8.4.5.1 of the Wells HCP and the results of survival comparisons performed by Skalski and Townsend; Douglas PUD will request Coordinating Committees approval of this SOA during the Coordinating Committees meeting on September 23, 2014 (Item III-E).
- Chelan PUD will provide a status update on the Rock Island Dam right bank adult fishway passive integrated transponder (PIT)-tag detection system during the Coordinating Committees meeting on September 23, 2014 (Item IV-E).

DECISION SUMMARY

- The Rocky Reach and Rock Island Coordinating Committees representatives approved via email Chelan PUD's request to end juvenile bypass operations at both the Rocky Reach and Rock Island juvenile bypasses on September 15, 2014 at midnight, as follows: U.S. Fish and Wildlife Service (USFWS), the YN, and Washington Department of Fish and Wildlife (WDFW) approved the request on September 12, 2014, and the CCT, NMFS, and Chelan PUD approved the request on September 15, 2014, as distributed to the Coordinating Committees by Kristi Geris that same day.

AGREEMENTS

- Coordinating Committees representatives present agreed to consider approval of the end of the Rocky Reach and Rock Island extended juvenile bypass operations in mid-September 2014 via email (Item IV-C).

REVIEW ITEMS

- Kristi Geris sent an email to the Coordinating Committees on September 4, 2014, notifying them that the Bailey Douglas PUD Land Use Permit Application is out for a

60-day review period, with comments due to Tom Kahler no later than Wednesday, November 5, 2014.

DOCUMENTS FINALIZED

- Kristi Geris sent an email to the Coordinating Committees on September 2, 2014, notifying them that the Wells Hatchery Adult Handling Facility 60% Design documents were finalized following a 60-day review period, which ended on August 18, 2014. As noted in the email, no comments were received from Coordinating Committees members on the draft documents.

I. Welcome

Mike Schiewe welcomed the Coordinating Committees and asked for any additions or other changes to the agenda. The following revisions were requested:

- Tom Kahler said that Douglas PUD's general updates and additional items include: 1) Wells Dam bypass operations; 2) Wells Dam fish counts; 3) Coordinating Committees approval of the annual Broodstock Collection Protocols; and 4) Coho NNI.
- Lance Keller added updates on: 1) the Entiat Pilot Milfoil Control Project; and 2) the Rock Island Dam right bank adult fishway PIT-tag detection system.

A. Meeting Minutes Approval (Mike Schiewe)

The Coordinating Committees reviewed the revised draft July 22, 2014 conference call minutes. Kristi Geris said that all comments and revisions received from members of the Committees were incorporated in the revised minutes and there were no outstanding edits or questions to discuss. Mike Schiewe said that Kirk Truscott had provided him with the CCT's approval of the revised draft meeting minutes. Tom Kahler added one last revision regarding the location of Douglas PUD subyearling sampling, noting that one location was located at the downstream—not upstream—end of Washburn Island. Coordinating Committees members present approved the July 22, 2014 conference call minutes, as revised. Geris will finalize the minutes and distribute them to the Committees.

B. Last Meeting's Action Items (Mike Schiewe)

Action items from the Coordinating Committees conference call on July 22, 2014, and follow-up discussions were as follows: *(Note: italicized item numbers below correspond to agenda items from the July 22, 2014 meeting.)*

- *Kristi Geris will coordinate with Alene Underwood (Chelan PUD) to resolve NMFS' pending comments on the revised draft Coordinating Committees June 24, 2014 meeting minutes (Item I-A).*
  Underwood provided clarification to Bryan Nordlund on July 24, 2014.
- *Kristi Geris will contact Julene McGregor (Douglas PUD Information System Staff) to request read-only access to the final document library on the HCP Hatchery Committees Extranet site for Jayson Wahls (WDFW, Wells Complex Manager), as approved by the Coordinating Committees (Item I-C).*
  Geris sent an email to McGregor on July 22, 2014, requesting access for Wahls, as discussed.
- *Chelan PUD will evaluate how the increased production and early release of hatchery subyearling Chinook salmon may affect the timing of achieving 95% spill coverage at Rocky Reach and Rock Island dams (Item II-A).*
  This will be discussed during today's meeting.
- *Tom Kahler will confirm with Tracy Hillman (BioAnalysts) the current account balance for the Wells Plan Species Account (Item IV).*
  Kahler contacted Hillman following the meeting on July 22, 2014, and determined the current account balance for the Wells Plan Species Account is $1,228,313—not $253,775, as reflected in the July 2014 Progress Report from the Tributary Committees. Hillman provided a revised July 2014 Progress Report from the Tributary Committees to Kristi Geris on July 22, 2014, which Geris distributed to the Coordinating Committees that same day.

II. Yakama Nation

A. Coho Trapping Update (Cory Kamphaus)

Cory Kamphaus said that the Coho trapping at Wells Dam has become an integral part of the YN's collection plan for Coho reintroduction in the Methow. He recalled the YN's proposal to extend Coho trapping activities at Wells Dam from the traditional 3 days per week, 16 hours per day, to a modified 5 days per week, 9 hours per day, beginning in late September and moving into October. He said that these modified trapping activities have been approved in their Coho Biological Opinion (BiOp); however, he said the BiOp also stipulates that the YN coordinate with the appropriate committees, which he said is the purpose for today's discussion. He said that the current plan is to begin trapping on September 2, 2014, but with limited effort, because historically, Coho do not arrive at Wells Dam until about the third week in September. He said that the modified trapping activities would begin in late September.

Tom Kahler recalled that when the YN originally presented this proposal to the Coordinating Committees, the Committees supported this proposal contingent upon ongoing monitoring of the passage of steelhead and fall Chinook salmon at Rocky Reach Dam and Wells Dam, as requested by Kirk Truscott. Kahler asked if this was completed. Kamphaus recalled that there were ample PIT-tagged steelhead to perform an analysis; however, there were not enough PIT-tagged fall Chinook salmon. He added that he does not know if the CCT's concern was resolved. Because Truscott did not attend today's meeting, Kahler suggested coordinating with Truscott and addressing his requests prior to the next Coordinating Committees meeting. Kahler also noted that a larger return of fall Chinook salmon is expected this year. He said that he will review previous meeting minutes and will coordinate with the YN and Truscott to verify that the CCT concerns have been addressed. Kamphaus said that he will also review a passage spreadsheet he compiled during trapping activities last year.

Kahler said that this year, WDFW and the Columbia River Inter-Tribal Fish Commission are trapping using only the west ladder at Wells Dam to minimize impacts. He asked, if the large run materializes and the YN are obtaining their needed broodstock, can the YN also use only the west ladder for trapping activities? Kamphaus said that the YN are evaluating hatchery-to-wild proportions per ladder because there is concern that the west ladder is predominantly used by hatchery fish. He said that if there are adequate numbers of both hatchery and wild fish using only the west ladder, there should be no problem with not using the east ladder. Jim Craig asked what the YN's goal is for hatchery-to-wild proportions in their broodstock. Kamphaus said that for a program of 1 million smolts, they would need about 950 brood fish, of which their ultimate goal is 60% to 70% natural-origin recruits (NORs). He added that, however, at this point, the YN are just trying to trap as many NORs as possible.

III. Douglas PUD

A. Reopening the Low-Level Fishway Entrance at Wells Dam for Lamprey Passage (Tom Kahler)

Tom Kahler said that a figure depicting the low-level fishway entrance at the Wells Dam west fishway (Attachment B) was distributed to the Coordinating Committees by Kristi Geris on August 25, 2014. Kahler explained that the top-left corner of Attachment B depicts a view from the tailrace looking at the wall of the west fishway. He noted the red oval, which circles both the side entrance and the low-level entrance of the fishway. The low-level entrance, he said, is associated with the collection channel that runs along the face of the spillway and powerhouse (which is referred to as the "c-channel"). He said that the c-channel leads to the collection gallery immediately below the entrance to Weir 1 (as depicted in the lower-right corner of Attachment B). Ritchie Graves asked about the dimensions of the low-level entrance. Kahler said that he does not have the specific dimensions available right now, but he estimated that the entrance is roughly 6 feet to 8 feet square.

Kahler said that radio-telemetry studies conducted in the 1990s found that summer Chinook salmon, Sockeye Salmon, and steelhead would enter the collection galleries of the fishways via the end entrances (illustrated in Attachment B), and then some would exit the collection galleries via the side entrances. Kahler said that based on these findings, Bryan Nordlund believed the side entrances were nuisances and recommended closing them. Kahler said that as a result, the side entrances were bulkheaded shut, as recommended by NMFS. He said that the low-level entrances have also been closed; however, the exact closure date is unknown, but possibly they were closed even before the telemetry investigations that led to the closure of the side entrances.

Kahler said that the Aquatic Settlement Work Group (SWG) has been discussing the possibility of reopening the low-level entrances to improve lamprey passage. He said that this would entail considering any impacts reopening the entrances might have on HCP Plan and permit species. He added that grating is also installed on the collection-gallery end of the low-level entrances, which prevents larger fish from accessing the low-level entrance chamber via the collection galleries, and those entrances may possibly be operated with grating on both ends to exclude salmonids. He also suggested contacting Nordlund regarding this matter before he retires at the end of September 2014.

Jim Craig asked if reopening the low-level entrances is based on direct observation of lamprey in the area. Mike Schiewe noted that reopening the entrance has not yet been formally requested by the Aquatic SWG. Craig asked if there is documentation of Plan Species passing through the low-level entrance and Kahler said he is not sure. Graves speculated that the entrance had already been grated off before the studies of the side entrances, and Kahler agreed. Kahler also questioned the likelihood that a fish approaching Weir 1 would turn and enter a hole in the floor (to exit the collection gallery), as opposed to up and over the weir.

Bob Rose said that because of declining returns of lamprey in recent years, it is important to evaluate all possible options for improving passage. Kahler agreed and said that reopening the low-level entrances seems to be one such option for lamprey, noting that the area is darker, quieter, and has attraction flow.

Kahler said that in preparation for reopening the low-level entrances, contract divers will be on site at the end of September and will reattach the chains used to hoist the gates on those entrances. Kahler added that the entrances will be ready for reopening if approved by the Coordinating Committees. Kahler also said he will ask Nordlund to provide a brief history summarizing the operation and decommissioning of the low-level entrances at Wells Dam, including fish use of those entrances and behavior in the area around the entrances.

Graves said that NMFS also supports efforts to improve lamprey passage while also protecting salmonid passage. He asked, if this entrance is reopened, are there plans to conduct another lamprey study? Schiewe said that the Aquatic SWG is currently developing a lamprey study plan for 2015, which will be discussed at the Aquatic SWG meeting on September 10, 2014. Craig also suggested installation of a PIT-tag array to monitor passage through the area.

Kahler said that depending on space, it may be possible to install a 2020 reader with both full-duplex and half-duplex PIT detection. Graves also suggested installation of lamprey ramps to assist with passage over the weirs, noting that lamprey have historically displayed difficulties negotiating conventional weir systems.

B. Wells Dam Bypass Operations (Tom Kahler)

Tom Kahler said that bypass operations at Wells Dam were terminated on August 19, 2014, per the Douglas PUD 2014 Bypass Operations Plan.

C. Wells Dam Fish Counts (Tom Kahler)

Tom Kahler said that fish counts at Wells Dam are now up to date. He said that after working overtime for a month and a half, fish counters caught up with counts mid-last week. He said they are now reviewing video from early May 2014 to catch up on documenting injury data.

D. Coordinating Committees Approval of the Annual Broodstock Collection Protocols (Tom Kahler)

Tom Kahler said that historically, Endangered Species Act (ESA) permits for hatchery programs have stipulated that the annual Broodstock Collection Protocols will be developed by WDFW in coordination with the HCP Hatchery Committees and will be submitted to NMFS by April 15. Kahler said that the HCP Hatchery Committees have recently expressed interest in formalizing a requirement for the HCP Hatchery Committees to formally approve the annual protocols prior to their submission to NMFS. He said that at the last HCP Hatchery Committees meeting on August 20, 2014, Lynn Hatcher, NMFS HCP Hatchery Committees Representative, introduced a draft SOA that would formalize this requirement. He indicated that NMFS wanted to include this requirement for Hatchery Committees approval in all new ESA hatchery permits.

Kahler said that while he was researching this topic, he found that the Adult Passage Plan portion of the Wells HCP stipulates "…Broodstock Collection Protocols are developed by WDFW and are annually submitted to the Wells HCP Coordinating Committee and NMFS Hydro Program for annual approval prior to trapping at the Dam…" Kahler said that

Douglas PUD has not been following through on this requirement, but in the last two years, has at least been presenting to the Coordinating Committees a trapping plan for review and comment. He has since notified the HCP Hatchery Committees of this requirement and from this time forward Coordinating Committees review and approval of the annual Broodstock Collection Protocols will now be incorporated in the review process prior to their submission to NMFS on April 15. Ritchie Graves said that NMFS is internally discussing the potential delegation of NMFS' approval of the annual Broodstock Collection Protocols jointly to the NMFS HCP Hatchery Committees and Coordinating Committees representatives.

E. Coho NNI (Tom Kahler)

Tom Kahler recalled that when the HCP was originally negotiated, Coho reintroduction was still in a feasibility phase. Accordingly, he said that language was included in the HCPs deferring a decision on whether to include Coho as a Plan Species requiring hatchery compensation until 2006. He said that following review of progress of the reintroduction in 2007, the HCP Committees did add Coho as a Plan Species requiring mitigation. He said that to initially compensate for unavoidable losses of Coho, Douglas PUD and the YN agreed on, and the Hatchery Committees approved, a lump sum payment for infrastructure needs in lieu of supplemental fish production through early 2018. He said that Douglas PUD and the YN are currently working on a new agreement for implementation in 2018. He said that as part of their preliminary discussions, Douglas PUD notified the YN of their intent to produce Coho smolts as NNI hatchery compensation, and the YN have expressed interest in additional Coho smolt production (not associated with Douglas PUD's NNI obligation) and use of acclimation facilities associated with the Methow and Wells hatcheries. He said that Douglas PUD and the YN have notified the HCP Hatchery Committees that they are working on developing this agreement that extends beyond 2018.

Kahler said that when it was originally agreed Coho should be a Plan Species requiring hatchery compensation, the Coordinating Committees accepted the assumption in Section 8.4.5.1 of the Wells HCP that Coho likely survived passage at Wells Dam similar to other yearling spring migrants; therefore, it was agreed Coho would be initially designated in Phase III (Additional Juvenile Studies). In 2007, Coho returns were not adequate to provide survival study fish and meet broodstock numbers for the reintroduction program in the Methow Basin. That situation continues, and is likely to remain the case for the foreseeable future, as the YN reintroduction program moves into the next phases where they seek to release all smolt production to the Methow Basin, rather than from the Wells Project. Nevertheless, the end of the current 10-year agreement for Coho mitigation and the development of a new agreement necessitate the establishment of a compensation rate. The rate established in Wells HCP Section 8.4.5.1 is based on the survival rate of the yearling spring migrants that had been studied prior to the signing of the Wells HCP. Kahler said that, as a new mitigation program is negotiated, Douglas PUD wants to determine whether the surrogacy assumption of Wells HCP Section 8.4.5.1 among Coho and other spring migrants is valid and agreeable to the Coordinating Committees. Accordingly, Douglas PUD asked Dr. John Skalski and Dr. Richard Townsend to analyze and compare juvenile survival of spring Chinook salmon, Coho, and steelhead released from Winthrop NFH. Kahler said that Coho survival estimates were separately compared for Coho and spring Chinook and Coho and steelhead for two reaches (Rocky Reach to McNary and McNary to John Day). He said that Coho survival estimates from Rocky Reach to McNary were not significantly different from survival estimates for spring Chinook in 3 of the 4 years evaluated, and likewise were not significantly different from survival estimates for steelhead in 3 of the 4 years evaluated. He added that Coho survival estimates from McNary to John Day were not significantly different from those of other species during any of the years analyzed. Kahler said that based on these findings, the assumption of equivalent survival among yearling spring migrants is supported. Cory Kamphaus said that he will provide Dr. Skalski's and Dr. Townsend's memorandum on the comparison of juvenile survivals of spring Chinook, Coho, and steelhead released from Winthrop NFH to Kristi Geris for distribution to the Coordinating Committees. *(Note: Kamphaus provided the memorandum to Geris following the meeting on August 26, which Geris distributed to the Coordinating Committees that same day.)*

Kahler said that Douglas PUD will seek Coordinating Committees approval of designating Coho as a Plan Species meeting the Phase III (Standard Achieved) for passage at Wells Dam based on similar survival of studied yearling migrants, and thus establishing a survival rate upon which to base the level of NNI hatchery compensation. He said that Douglas PUD will develop a draft SOA for Coordinating Committees approval at the September 23, 2014 meeting.

IV. Chelan PUD

A. Entiat Pilot Milfoil Control Project (Keith Truscott)

Keith Truscott said that on August 19, 2014, Chelan PUD attended a Chelan County Board of Commissioners meeting to discuss Chelan PUD's comment letter to the Washington State Department of Ecology (Ecology) regarding the Entiat Pilot Milfoil Control Project, which included comments from the Coordinating Committees members, the CCT, and WDFW, and also included an official comment letter from USFWS. Truscott said that Chelan PUD still has questions regarding the compounds being used; however, it appears there is still quite a bit of momentum to move forward with the pilot project. He said that the comment period is now closed, and Chelan PUD wanted to thank the Coordinating Committees for their efforts on submitting comments. He added that Ecology is still considering a miscommunication involving concerns expressed by NMFS at the national level for lack of consultation that were not communicated at the NMFS regional office in Wenatchee, Washington, which Chelan County interpreted as NMFS having no issues with the compound.

Ritchie Graves asked which body of water will be treated. Truscott replied that in the Rocky Reach Reservoir, about 26 acres adjacent to Entiat Park is proposed to be treated. Graves said that NMFS and the U.S. Environmental Protection Agency (USEPA) have recently been discussing how pesticide use is managed, including how chemicals affect fish. He added that historically, USEPA did not consider the cumulative effects of pesticides, but now they are. Truscott said that Chelan PUD's final comment during the public forum on August 19, 2014, was a precautionary note, recommending a full evaluation of effects prior to conducting a pilot project.

B. Wanapum Drawdown Update (Lance Keller)

Lance Keller said that river flow is beginning to decrease, and use of the denil structures for adult fish passage at Rock Island Dam is now on a daily basis for about 10 to 12 hours each day. He added, however, that when the tailrace elevation increases, fish passage is via the normal passage routes. He said that during periods of decreased river flow, it is not uncharacteristic to experience zero power generation. He said that when river flow past Rock Island Dam reaches 89,000 cubic feet per second (89 kcfs), there is no generation out of Powerhouse 1; however, all eight units at Powerhouse 2 are still operating. He said that this causes a discrepancy in the tailrace elevation, where the Douglas County side is at 557 feet and the Chelan County side is at 560 feet. He said that based on those numbers, the denil structures would be operational on the left bank fishway, but not on the right bank fishway. He said that the Rock Island Dam fishway attendants are fully aware of this, and are dialing in operation of the denils, as appropriate.

Keller recalled a discussion from the Coordinating Committees meeting on May 27, 2014, when Chelan PUD described operating Powerhouse 2 at a higher configuration (i.e., higher head but same power output). He said that further analyses indicated that running Powerhouse 2 at a higher configuration could cause increased wear and tear on the blades. He said that based on these findings, Chelan PUD has elected not to operate Powerhouse 2 at the higher head as described in May 2014. He said that this means as river flow declines to 70 kcfs (or head elevation at Powerhouse 2 exceeds 51.5 feet), Powerhouse 2 must be taken offline; therefore, at 70 kcfs and below, there will be no power generation at Rock Island Dam, and all flow will be transferred to the spillway, per the Rock Island Dam 2014 Fish Spill Plan.

Keller said that fish are still passing Rock Island Dam via all three fish ladders. He said that fishway attendants have observed lamprey moving up the ramps of the lamprey passage system located at the right bank tailrace entrance. He added that 1,126 lamprey have passed the count windows to date, and steelhead, Chinook salmon, and sockeye salmon passage has been high.

Jim Craig asked if the lack of flow through Powerhouse 2 might cause fish passage problems. Keller replied that flow will be so low the attraction pumps will not be operating on the left bank; rather, there will be only gravity flow, which is what the denils were designed for. Keller added that about 1 week ago, operators at Wanapum Dam conducted a low flow test at 45 kcfs, which provided an opportunity to test the denils at Rock Island Dam, which had been engineered to operate at even lower flows. He said that a full inspection on the left powerhouse entrance and a visual inspection of all denils were completed at different velocities, and everything was operating as expected. Tom Kahler noted that the Bonneville Power Administration (BPA) indicated they would send out a notification regarding when they plan to fill Grand Coulee Dam (sometime in September 2014), because exceptionally low flows are expected during that time. Keller added that BPA had agreed to minimum flow of at least 45 kcfs through October 2014.

Mike Schiewe asked if spilling all that water at Rock Island Dam once generation is stopped may cause total dissolved gas (TDG) problems. Keller replied that water will be spilled through selected gates to minimize TDG, and monitoring will also be ongoing. Jeff Korth asked if the discrepancy in tailrace elevation may have something to do with the large rock formation located in the middle of the spillway. Keller said that he is not sure if that has an effect on the tailrace elevation.

Cory Kamphaus requested that Chelan PUD contact the YN if they foresee any passage issues. He added that if passage becomes a significant issue with Coho, the YN may change their overall brood operations for obtaining fish. Keller said that he will do that, and added that staff is monitoring hourly data and no passage issues have been detected to date. He also added that the left bank denil has been in operation more than the right bank, and both are documenting passage as expected.

Ritchie Graves said that NMFS greatly appreciates all that Chelan PUD and Grant PUD have been doing regarding the Wanapum Dam issue. He recalled when this issue first began and how disastrous everyone thought it would be, but how everything has worked out quite well. He said this speaks very highly of the efforts put into resolving this issue.

C. Rocky Reach and Rock Island September 2014 Juvenile Bypass Operations (Lance Keller)

Lance Keller recalled that both the Rocky Reach and Rock Island HCPs include a requirement that additional run-timing information and species composition monitoring shall be conducted once every 10 years to verify that a significant component (greater than 5%) of the juvenile emigration is not present outside the normal bypass operating period

(April 1 through August 31), and to verify that the operations established by the Coordinating Committees are adequately protecting 95% of the spring and summer migrations of juvenile Plan Species (Rocky Reach HCP Section 5.4.1b, Rock Island HCP Section 5.4.1a). Keller said that at Rocky Reach Dam, a worst-case scenario with low head water was tested, to evaluate whether the sampling facility could be operated in September, and it was confirmed that it can be operated. He also noted that testing at Rock Island Dam revealed anywhere from 2 to 3 hours of non-operation in the powerhouse gatewell collection system. He said that, subsequently, an expansion would need to be applied to the trap (i.e., expand the total flow at Rock Island Dam for that time period); which, he noted the Columbia River Data Access in Real Time (DART) database can calculate on a daily basis. He said that Chelan PUD is proposing to continue collecting data as planned and evaluate results. He added, however, that Chelan PUD wanted the Coordinating Committees to be aware that this bias exists. He also said that if non-operation of Powerhouse 2 increases to more than just a few hours, Chelan PUD may propose postponing the analysis until 2015.

Keller said that regarding how long to run the extended analysis, Chelan PUD expects to be able to determine whether a proportion of the run still exists within the first 15 days of the extended operation; therefore, Chelan PUD proposes to operate through September 15, 2014, and at that point, evaluate what has been collected to date and proceed as appropriate.

Mike Schiewe asked about the process for shutting down bypass operations. Keller explained that Chelan PUD would run the analysis on September 15, 2014, and then determine how to proceed. He said that if there are low numbers in late-August 2014, Chelan PUD will be confident in shutting down on September 15, 2014; however, if there are high numbers, they will seek a recommendation from the Coordinating Committees. He added that once the system shuts down, maintenance will need to start right away.

Coordinating Committees representatives present agreed to consider approval of the end of the Rocky Reach and Rock Island extended juvenile bypass operations in mid-September 2014 via email. Keller said that Chelan PUD will keep the Coordinating Committees informed up until September 15, 2014, and Schiewe said that a call can also be arranged if needed.

D. Rocky Reach and Rock Island Spill and Subyearling Chinook Salmon Run-Timing Update (Lance Keller)

Lance Keller said that fish spill was terminated at Rocky Reach and Rock Island dams on Sunday, August 24, 2014, at midnight. He said that terminating spill was based on juvenile bypass counts of subyearling Chinook salmon at both Rocky Reach and Rock Island dams achieving their third day of counts less than or equal to 0.3% of their 2014 cumulative index counts in a consecutive 5-day block. He said that passage percentage estimations from DART were also in excess of 95% at Rocky Reach (99.7%) and Rock Island (99.0%) dams. Keller noted, however, that DART constantly updates as new data are collected, and now, DART indicates that end of spill was achieved on August 16, 2014.

Keller recalled a concern expressed by the Coordinating Committees that increased production and early release of hatchery subyearling Chinook salmon may affect the timing of achieving 95% spill coverage at Rocky Reach and Rock Island dams. He said that according to DART, increased production and early release of hatchery subyearling Chinook salmon had no effect on achieving 95% spill coverage. Keller said that regarding Chelan PUD's action item to discuss this potential effect with Dr. John Skalski, Keller recommended the Coordinating Committees refer to the annual DART report Skalski produces; which, Keller added, will be available by the end of the year. He added that graphs comparing Rocky Reach adipose fin (ad)-clipped and ad-present juvenile Chinook salmon in 2013 and 2014 (Attachment C) were also distributed to the Coordinating Committees by Kristi Geris on August 25, 2014. Keller said that the graphs show how the front end of the run is dominated by ad-clipped fish and ad-present fish tend to pass later in the run. He also noted that the 2014 hatchery component was larger and less compact, but more stretched out than 2013.

E. Rock Island Dam Right Bank Adult Fishway PIT-Tag Detection System Update (Lance Keller)

Lance Keller recalled the noise issues that were discovered a couple of months ago in the Rock Island Dam right bank PIT-tag detection system. He said that Biomark installed a temporary half-duplex PIT-tag antenna array upstream of the count window, about 5 feet from the fishway exit, while a new combination half- and full-duplex PIT-tag antenna array is fabricated. He added that the new PIT-tag array will be installed at a different, less "noisy" location during the right bank maintenance period. Keller said that Chelan PUD also found that the detection equipment associated with Powerhouse 2 units is also not working properly. He said that the cause of the noise is still unknown, but he will keep the Coordinating Committees up to date as additional information becomes available.

Ritchie Graves asked if Chelan PUD has experienced this level of noise in past. Keller said that they have experienced noise in the past; however, it has typically been fixed by moving the ground or using a different breaker. He added that on one occasion, the noise interference was tracked to a parking light, which is indicative of how sensitive these systems can be. He said, however, that they have not experienced 100% noise situation in the past; and added that even after shutting down the attraction water system, there is still 100% noise. He said Chelan PUD is reviewing the logs to determine if anything has been recently installed that could be causing the noise, and added that Chelan PUD will provide a status update on the Rock Island Dam right bank adult fishway PIT-tag detection system during the Coordinating Committees meeting on September 23, 2014.

V. Hatchery and Tributary Committees Update (Mike Schiewe)

Mike Schiewe reported that the HCP Tributary Committees did not meet in August; however, the Rock Island Tributary Committee did approve the following budget amendment during August:

- *Wenatchee Nutrient Assessment – Treatment Design*: The Rock Island Tributary Committee approved the Cascade Columbia Fisheries Enhancement Group's request to move $9,606.52 from Salaries and Benefits to Professional Services at no cost to the project.
- *Next Steps*: The next Tributary Committees meeting will be held on Thursday, September 11, 2014. Tom Kahler said that the Chelan County Natural Resources Department will give a presentation to the Tributary Committees the Upper White Pine project in the Nason Creek drainage, which includes moving a power line to allow full access to floodplain habitat.

Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the last HCP Hatchery Committees meeting on August 20, 2014:

- *USFWS HCP-HC Alternate Representative Change:* Bill Gale, USFWS HCP Hatchery Committees Representative, introduced Matt Cooper as Jim Craig's replacement as the USFWS HCP Hatchery Committees Alternate Representative.
- *DECISION: Draft Broodstock Collection Protocols SOA:* As discussed earlier today.
- *Hatchery and Genetic Management Plan (HGMP) Update:* Steve Lewis (USFWS) agreed to check on the status of USFWS Wenatchee bull trout Section 7 consultation, and he reported that consultation is still ongoing.
- *Incidental Take Discussion:* Steve Lewis attended the HCP Hatchery Committees meeting to address questions about how incidental take is assigned. The concern was how incidental take is assigned when the operators are not owners of the facility. Lewis recommended that the facility owner require the operator to have their own permits in place to cover their actions; then incidental take will be assigned to the operator, and not the facility owner.
- *Draft 2015 Chelan PUD Hatchery Monitoring and Evaluation (M&E) Implementation Plan:* Chelan PUD distributed their draft 2015 Hatchery M&E Plan that will be up for approval at the HCP Hatchery Committees meeting on September 17, 2014.
- *Spring Chinook Salmon Surveys and Wildfire Closures:* Chelan PUD completed their broodstock collection efforts in the Chewuch, collecting 49 fish via tangle netting.
- *Hatchery M&E Plan Objective 12 (formerly Objective 10) Non-Target Taxa of Concern (NTTOC) SOA:* This draft SOA memorializes partial fulfillment of Hatchery M&E Plan Objective 12 (formerly Objective 10), and also stipulates future NTTOC evaluations may be conducted, if needed, and may be conducted using different methodologies. The draft SOA will be up for approval at the HCP Hatchery Committees meeting on September 17, 2014.

VI. HCP Committees Administration

A. Next Meetings (Mike Schiewe)

Mike Schiewe said that the next scheduled Coordinating Committees meeting is September 23, 2014, to be held by conference call. The October 28 and November 25, 2014, meetings will be held either by conference call or in person at the Radisson Hotel in SeaTac, Washington, as is yet to be determined.

List of Attachments

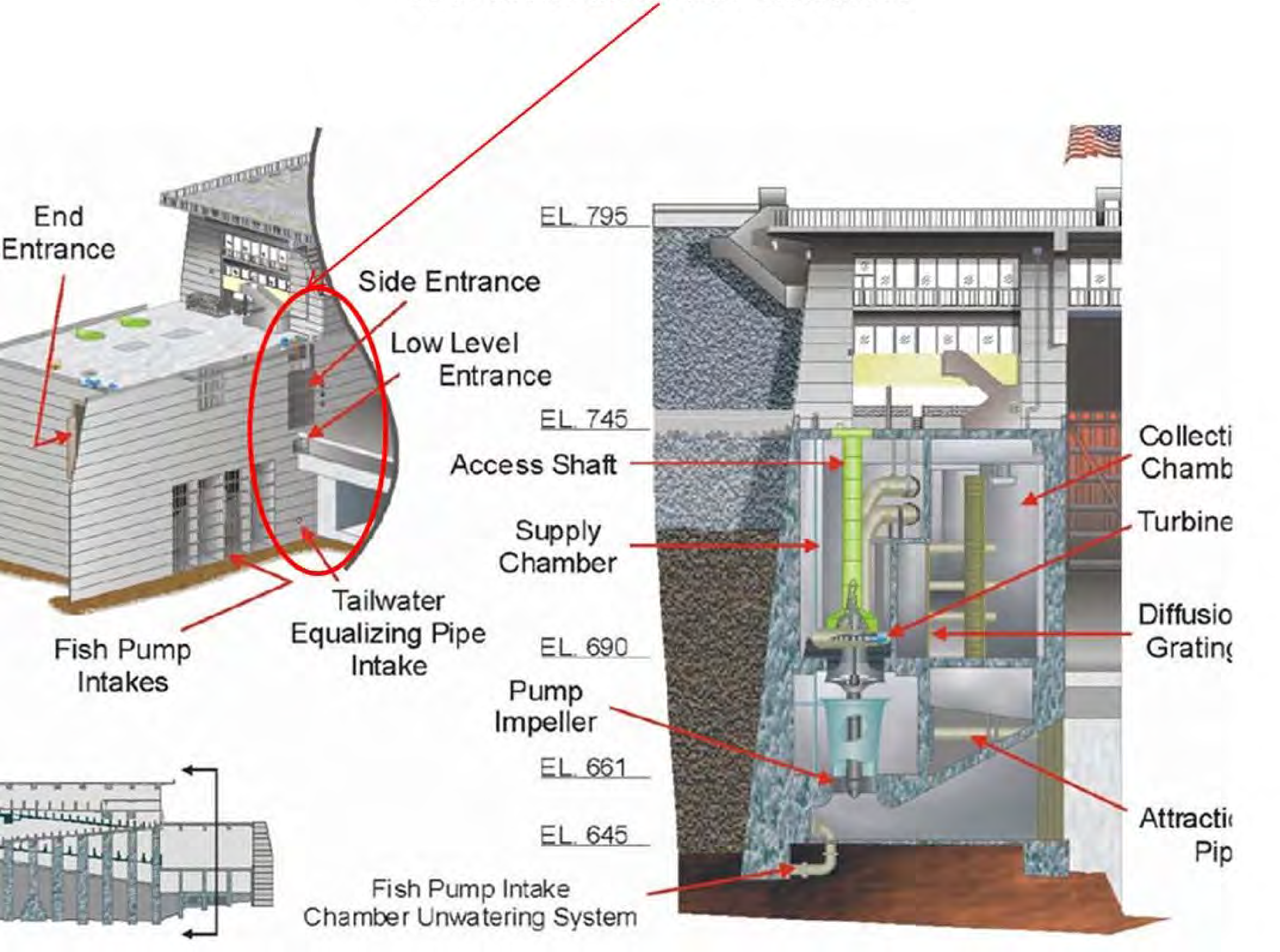
Attachment A	List of Attendees
Attachment B	Figure depicting the Low-Level Fishway Entrance at the Wells Dam West Fishway
Attachment C	Graphs Comparing Rocky Reach Adipose Fin (Ad)-Clipped and Ad-Present Juvenile Chinook Salmon in 2013 and 2014

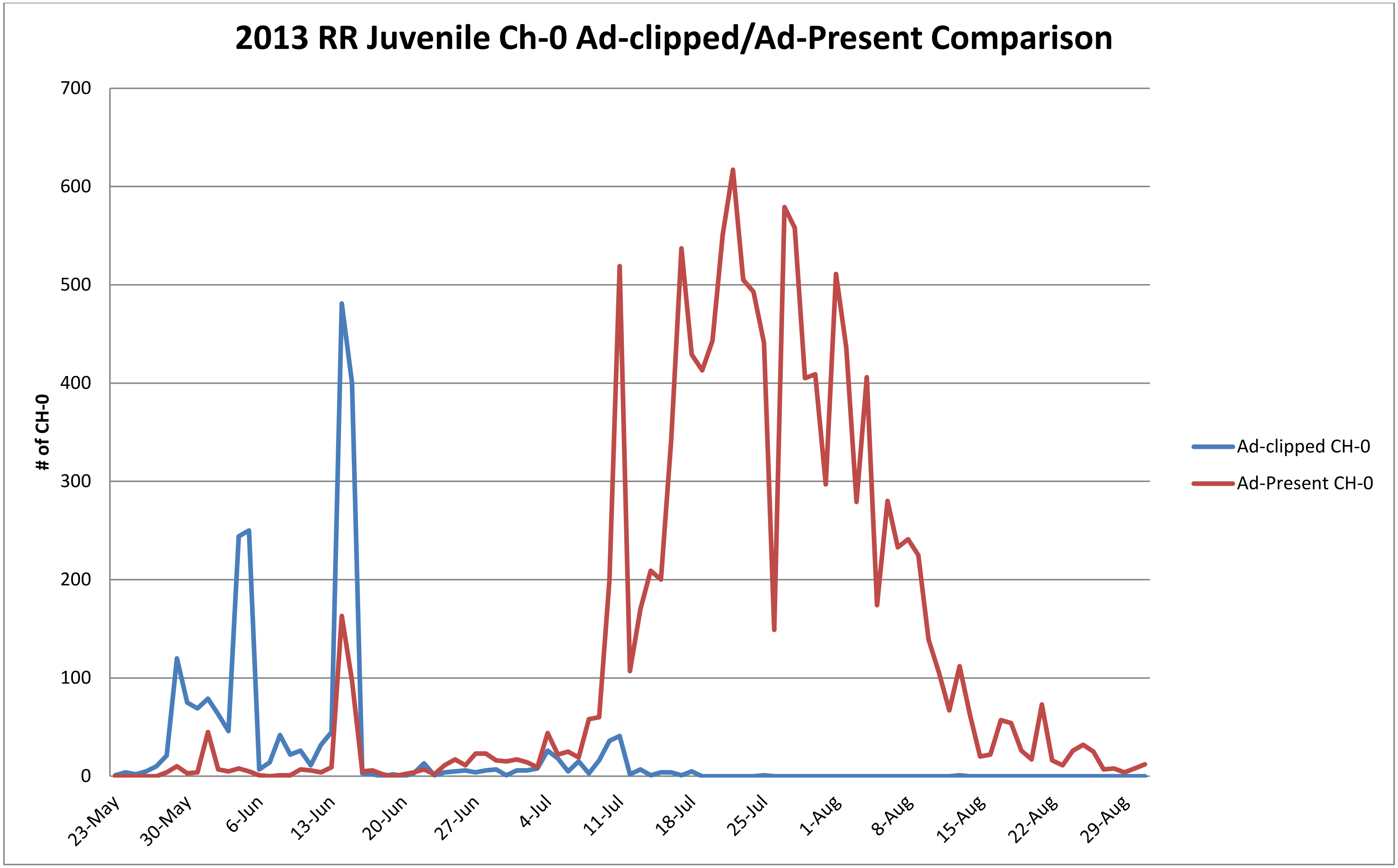
Attachment A
List of Attendees

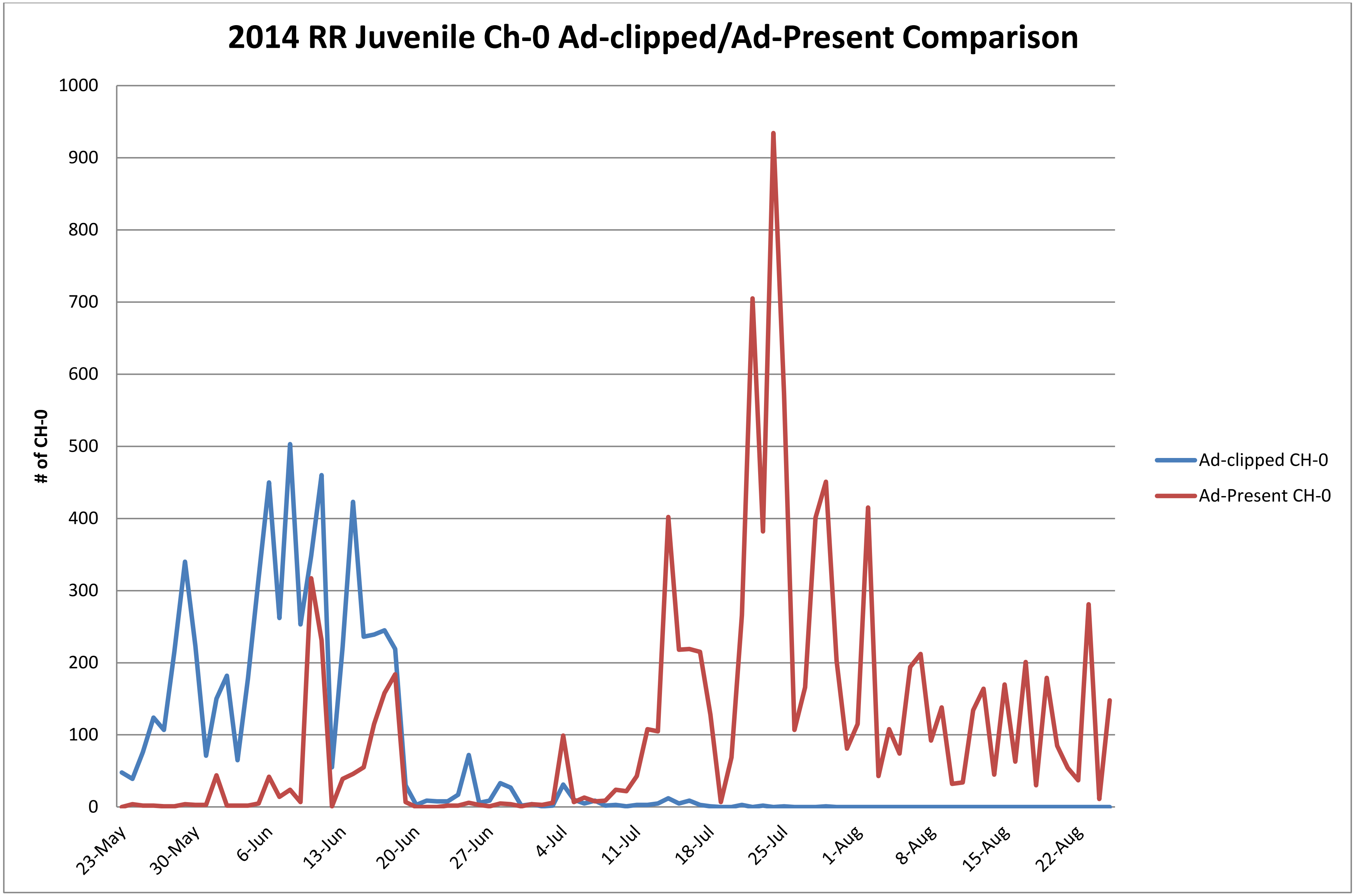
Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Lance Keller*	Chelan PUD
Keith Truscott†	Chelan PUD
Tom Kahler*	Douglas PUD
Jim Craig*	U.S. Fish and Wildlife Service
Ritchie Graves†	National Marine Fisheries Service
Jeff Korth*	Washington Department of Fish and Wildlife
Bob Rose*†	Yakama Nation
Cory Kamphaus†	Yakama Nation

Notes:
* Denotes Coordinating Committees member or alternate
† Joined by phone

Low level and Side Entrance




2013 RR Juvenile Ch-0 Ad-clipped/Ad-Present Comparison
# of CH-0
700
600
500
400
300
200
100
0
23-May
30-May
6-Jun
13-Jun
20-Jun
27-Jun
4-Jul
11-Jul
18-Jul
25-Jul
1-Aug
8-Aug
15-Aug
22-Aug
29-Aug
Ad-clipped CH-0
Ad-Present CH-0


2014 RR Juvenile Ch-0 Ad-clipped/Ad-Present Comparison
# of CH-0
1000
900
800
700
600
500
400
300
200
100
0
23-May
30-May
6-Jun
13-Jun
20-Jun
27-Jun
4-Jul
11-Jul
18-Jul
25-Jul
1-Aug
8-Aug
15-Aug
22-Aug
Ad-clipped CH-0
Ad-Present CH-0

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FINAL MEMORANDUM

To:	Rock Island HCP Coordinating Committee	**Date:**	October 28, 2014
From:	Michael Schiewe, Chair		
Cc:	Kristi Geris, Tom Kahler		
Re:	Final Minutes of the September 22, 2014 Rock Island HCP Coordinating Committee Conference Call		

The Rock Island Hydroelectric Projects Habitat Conservation Plan (HCP) Coordinating Committee met by conference call on Monday, September 22, 2014, from 8:30 am to 9:00 am. Attendees are listed in Attachment A of these meeting minutes.

ACTION ITEM SUMMARY

- Chelan PUD will contact Washington Department of Fish and Wildlife (WDFW) and the Colville Confederated Tribes (CCT) to review and request approval of Chelan PUD's request to modify one of the middle adult fishway side-entrances at Rock Island Dam to provide an additional fish passage route into the middle fishway at low tailwater elevations (Item II-A). *(Note: Chelan PUD contacted WDFW and the CCT, and they approved the request via email on September 22 and 23, 2014, respectively.)*

DECISION SUMMARY

- The Rock Island Coordinating Committee representatives approved Chelan PUD's request to modify one of the middle adult fishway side-entrances at Rock Island Dam to provide an additional fish passage route into the middle fishway at low tailwater elevations, as follows: U.S. Fish and Wildlife Service (USFWS) approved the request via telephone on September 18, 2014; the Yakama Nation (YN), National Marine Fisheries Service (NMFS), and Chelan PUD approved the request during the conference call on September 22, 2014; and WDFW and the CCT approved the request via email on September 22 and 23, 2014, respectively, as distributed to the Coordinating Committees by Kristi Geris those same days (Item II-A).

AGREEMENTS

- There were no agreements discussed during today's conference call.

I. Welcome

Mike Schiewe welcomed the Rock Island HCP Coordinating Committee. He said the purpose of this call is to consider approval to modify one of the middle adult fishway side-entrances at Rock Island Dam to provide an additional fish passage route into the middle fishway at low tailwater elevations.

II. Chelan PUD

A. Modification to one of the Middle Adult Fishway Side-Entrances at Rock Island Dam (Lance Keller)

Lance Keller said that an email containing Chelan PUD's request to modify one of the middle adult fishway side-entrances at Rock Island Dam and associated photographs was distributed to the Rock Island HCP Coordinating Committee by Kristi Geris on September 19, 2014.

Keller said that during periods of non-generation at Rock Island Dam, spill is used to provide additional attraction flow to draw fish to the denil structures. He said that during these periods of low tailwater elevation, Chelan PUD fishway attendants have observed fish congregating in a natural downstream channel that is present during low tailwater conditions due to exposed bedrock near the side entrance to the middle fishway. He said that the photograph titled "RI Middle FW MO5 pics" (Attachment B), which was taken from the middle ladder facing the Douglas County side of the river, shows this natural downstream channel that is present during low tailwater conditions.

Keller said that Chelan PUD fishway attendants and biologists have coordinated with engineering staff to develop a modification to one of the middle adult fishway side-entrances that would provide an entrance route into the middle fishway during periods of non-generation. He said that the photograph titled "Center Fishway Concrete Modification" (Attachment C) depicts the proposed modifications to the concrete pad at the side entrance.

He explained that Chelan PUD is proposing to extend the existing channel, keeping the same width, at a 45 degree angle through the bedrock, as depicted by the red lines in Attachment C. He said that the proposal does not involve adding anything—just removing concrete. He said that Chelan PUD engineers have confirmed that removing this concrete will not compromise the structural integrity of the structure; and he added that if approved, removal of the concrete can start as soon as tomorrow.

Bob Rose asked about the dimensions of the cutout. Keller replied that the cutout will be 4 feet wide and as deep as possible. He added that the more material that can be removed, the longer this passage route can be available during low tailwater elevations. He also added that per the Endangered Species Act Emergency Consultation process, Chelan PUD has already discussed these modifications and obtained approval from Scott Carlon and Steve Lewis (USFWS). Keller said that Lewis' only concern was if the tailrace elevation rises and strands fish on the concrete pad. Keller said the only time he foresees this possibly being an issue is when transitioning from a non-generation to a generation configuration, when there is a lot of spill to raise the tailrace elevation; once a certain head differential is reached, spill is stopped to bring units on. He said that Chelan PUD fishway attendants will be closely monitoring during this time, and if stranding becomes an issue, the passage route will be closed.

Carlon asked how long Chelan PUD expects tailrace elevations to remain at this level. Keller replied that he is unsure; however, without a Wanapum pool raise, these conditions could last into November 2014.

Rose asked if there is a way to remedy Lewis' concerns via additional modifications. Keller replied that Chelan PUD prefers to only remove concrete—not add. He explained that the plan is to use expanding grout in the cracks and drill additional holes to remove material. He said that Chelan PUD also plans to use the same contractor that was hired to install the denil structures, so they will already be familiar with the infrastructure at Rock Island Dam. He said Chelan PUD hopes to have this project completed by the end of the week.

Rock Island Coordinating Committee representatives present approved Chelan PUD's request to modify one of the middle adult fishway side-entrances at Rock Island Dam to provide an additional fish passage route into the middle fishway at low tailwater elevations. Keller said that he will contact WDFW and the CCT to review and request approval of Chelan PUD's request. *(Note: Chelan PUD contacted WDFW and the CCT, and they approved the request via email on September 22 and 23, 2014, respectively.)*

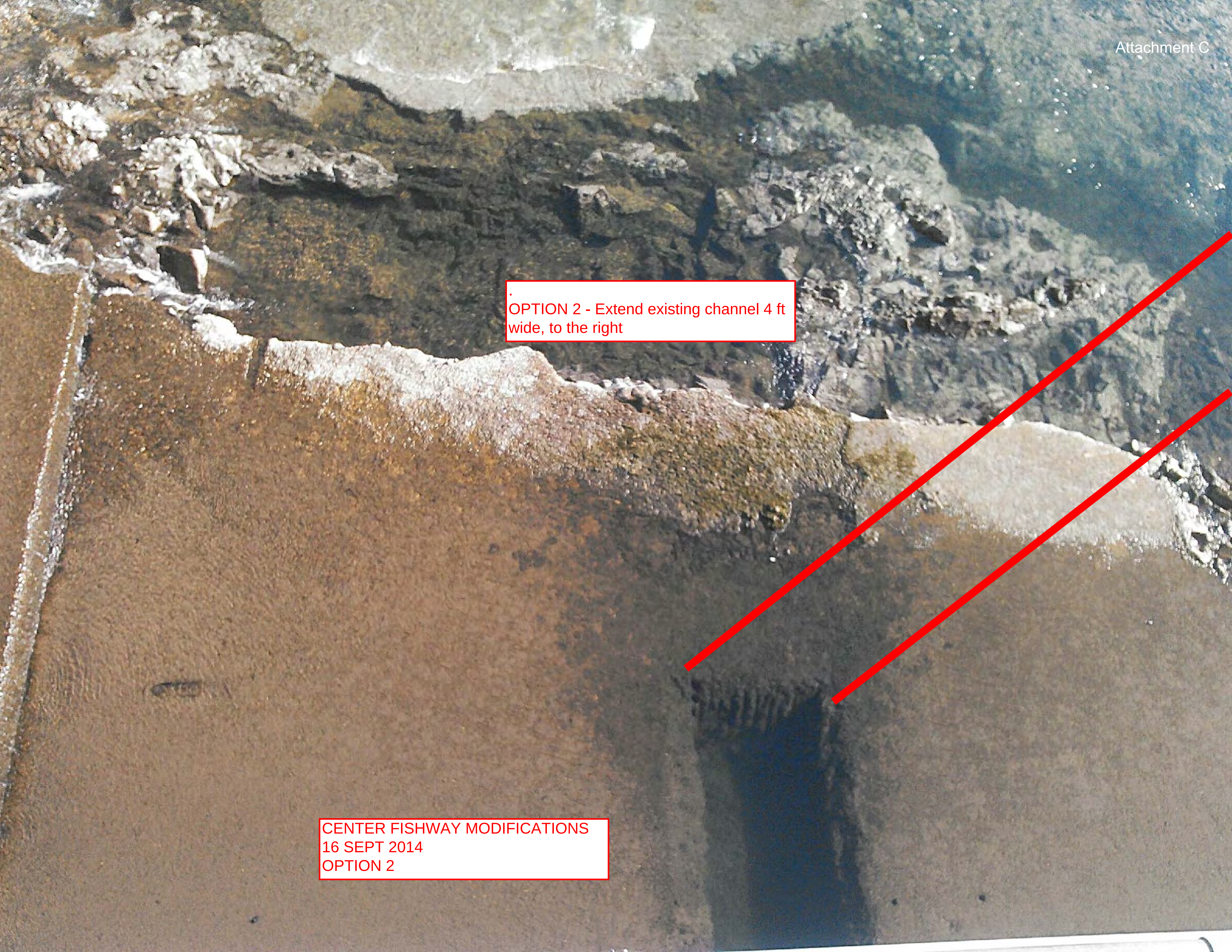
List of Attachments

Attachment A	List of Attendees
Attachment B	Photograph depicting the downstream channel that is present due to the bedrock and the side entrance to the middle fishway
Attachment C	Photograph depicting modifications to the concrete pad at the side entrance

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA
Kristi Geris	Anchor QEA
Lance Keller*	Chelan PUD
Scott Carlon*	National Marine Fisheries Service
Bob Rose*	Yakama Nation

Notes:
* Denotes Rock Island Coordinating Committee member or alternate


Attachment C
.
OPTION 2 - Extend existing channel 4 ft wide, to the right
CENTER FISHWAY MODIFICATIONS
16 SEPT 2014
OPTION 2

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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Coordinating Committees	**Date:**	October 28, 2014
From:	Michael Schiewe, Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the September 23, 2014 HCPs Coordinating Committees Conference Call		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met by conference call, on Tuesday, September 23, 2014, from 9:30 am to 12:00 pm. Attendees are listed in Attachment A of these meeting minutes.

ACTION ITEM SUMMARY

- Tom Kahler will provide Cory Kamphaus (Yakama Nation [YN]) with excerpts from the Coordinating Committees January 28, 2014 meeting minutes regarding the YN's original proposal to extend Coho trapping activities at Wells Dam, and Bob Rose will review with Kamphaus the Coordinating Committees' approval and contingencies for approval of the YN Coho trapping request (Item I-C). *(Note: Kahler provided Kamphaus with these excerpts following the meeting on September 23, 2014.)*
- Tom Kahler will contact Cory Kamphaus to remind him that the Coordinating Committees' approval of extended Coho trapping at Wells Dam stipulated that the YN would monitor detection times of steelhead and fall Chinook salmon at Rocky Reach Dam and Wells Dam. Kahler will also confirm that Kamphaus is aware that both summer and fall Chinook salmon that were passive integrated transponder (PIT)-tagged in the Wells Reservoir will be reported in the PIT-Tag Information System (PTAGIS) as summer Chinook salmon only (Item I-C). *(Note: Kahler notified Kamphaus of this information via email following the meeting on September 23, 2014.)*
- Scott Carlon will discuss internally with NMFS the delegation of approval of the annual Broodstock Collection Protocols to their HCP Coordinating Committees representative (Item I-D).

- Coordinating Committees representatives will submit comments, or an email confirming "no comments," on the Bailey Douglas PUD Land Use Permit Application to Tom Kahler no later than November 5, 2014 (Item II-B).
- Chelan PUD will develop a memorandum summarizing Rock Island Dam and Rocky Reach Dam 2014 summer bypass operations, specifically the extended operations in September, for discussion at the Coordinating Committees meeting on October 28, 2014 (Item III-A).
- Tom Kahler will provide HCP Coordinating Committees Chair position documents to Kristi Geris for distribution to the Coordinating Committees (Item V-A). *(Note: Kahler provided a list of qualifications, Scope of Work, and potential candidate résumés and curriculum vitaes [CVs] to Geris following the meeting on September 23, 2014, which Geris distributed to the Coordinating Committees representatives and alternates that same day.)*
- Coordinating Committees representatives will review the HCP Coordinating Committees Chair position documents and will: 1) contact qualified candidates to gauge interest in the position; 2) have interested candidates contact Mike Schiewe to discuss the responsibilities of the position; and 3) provide a résumé or CV from interested candidates to Tom Kahler, Lance Keller, and Kristi Geris (Item V-A).

DECISION SUMMARY

- There were no decisions approved during today's meeting.

AGREEMENTS

- There were no agreements discussed during today's conference call.

REVIEW ITEMS

- Kristi Geris sent an email to the Coordinating Committees on September 4, 2014, notifying them that the Bailey Douglas PUD Land Use Permit Application is out for a 60-day review period, with comments due to Tom Kahler no later than Wednesday, November 5, 2014 (Item II-B).

- Kristi Geris sent an email to the Coordinating Committees on September 19, 2014, notifying them that the HCP Hatchery Committees approved Broodstock Collection Protocol Statement of Agreement (SOA) is out for review. Approval of this SOA will be requested at the Coordinating Committees meeting on October 28, 2014 (Item I-C).

DOCUMENTS FINALIZED

- There are no documents that have been recently finalized.

I. Welcome

A. Review Agenda (Mike Schiewe)

Mike Schiewe welcomed the Coordinating Committees and asked for any additions or other changes to the agenda. Tom Kahler added a discussion on the HCP Chair position.

B. Meeting Minutes Approval (Mike Schiewe)

The Coordinating Committees reviewed the revised draft August 26, 2014 meeting minutes. Kristi Geris said that all comments and revisions received from members of the Coordinating Committees were incorporated into the revised minutes, and there were no outstanding edits or questions to discuss. Coordinating Committees members present approved the August 26, 2014 meeting minutes, as revised. Geris will finalize the minutes and distribute them to the Coordinating Committees.

C. Last Meeting's Action Items (Mike Schiewe)

Action items from the Coordinating Committees conference call on August 26, 2014, and follow-up discussions were as follows: *(Note: italicized item numbers below correspond to agenda items from the August 26, 2014 meeting.)*

- *Tom Kahler will review past Coordinating Committees meeting minutes regarding the YN's original proposal to extend Coho trapping activities at Wells Dam and will coordinate with the YN and Kirk Truscott to verify that the Colville Confederated Tribes' (CCT's) concerns have been addressed (Item II-A).*

Kahler said that following review of the Coordinating Committees January 28, 2014 meeting minutes, it was realized that Jeff Korth—not Truscott—was the one who suggested that the YN monitor PIT-tags and travel times at Rocky Reach Dam and Wells Dam with regard to extended Coho trapping at Wells Dam. Kahler added that the suggestion was to monitor while the modified trapping schedule is being implemented, which he noted that Cory Kamphaus was already planning to do. Kahler said, therefore, he believes that this action item has been addressed. He then asked if there was interest in Kamphaus reviewing data from previous years and recalled that, as discussed during the Coordinating Committees meeting on August 26, 2014, Kamphaus said that there were ample PIT-tagged steelhead to perform an analysis but not enough PIT-tagged fall Chinook salmon. Kahler added that Kamphaus indicated that he found nothing of concern based on available data. Kahler said that, regarding Korth's request to monitor moving forward, Douglas PUD PIT-tagged some fall Chinook salmon but most were summer Chinook salmon.

Mike Schiewe asked if Kamphaus' plan to monitor this year meets the intent of the agreement reached in January or if there is something more that the Coordinating Committees want to request regarding previous data. Kahler recalled the agreement reached in January, as follows: "The Coordinating Committees representatives present supported the YN's proposal to extend Coho trapping activities at Wells Dam from the traditional 3 days per week, 16 hours per day, to a modified 5 days per week, 9 hours per day, beginning September 27, 2014, and ending October 10, 2014, contingent upon: 1) ongoing monitoring of detection times of steelhead and fall Chinook salmon at Rocky Reach Dam and Wells Dam; 2) an annual re-evaluation by the Coordinating Committees of the modified trapping operations during the initial years of implementation; and 3) the YN providing a report to the Coordinating Committees summarizing trapping efforts with the modified operations."

Truscott said that he thought there was also discussion about previous trapping efforts at Wells Dam and whether there were any impacts to steelhead and summer and fall Chinook salmon. He said, however, because this was not incorporated in the agreement as reflected in the meeting minutes, he agrees this action item has been addressed. Schiewe suggested reviewing available steelhead and summer and fall Chinook salmon data following this monitoring effort and Truscott agreed.

Kahler said that he will provide Kamphaus with excerpts from the Coordinating Committees January 28, 2014 meeting minutes regarding the YN's original proposal to extend Coho trapping activities at Wells Dam, and Bob Rose will review with Kamphaus the Coordinating Committees approval and contingencies for approval of the YN Coho trapping request. *(Note: Kahler provided Kamphaus with these excerpts following the meeting on September 23, 2014.)* Kahler said that he will also contact Kamphaus to remind him that the Coordinating Committees' approval of extended Coho trapping at Wells Dam stipulated that the YN would monitor detection times of steelhead and fall Chinook salmon at Rocky Reach Dam and Wells Dam and that he will also confirm that Kamphaus is aware that both summer and fall Chinook salmon that were PIT-tagged in the Wells Reservoir will be reported in PTAGIS as summer Chinook salmon only. *(Note: Kahler notified Kamphaus of this information via email following the meeting on September 23, 2014.)*

- *Tom Kahler will ask Bryan Nordlund to provide a brief history summarizing the operation and decommissioning of the low-level side entrance at Wells Dam, including fish use of the entrance and behavior in the area around the entrance (Item III-A).*
  Kahler provided an email from Nordlund to Kristi Geris on September 12, 2014, which Geris distributed to the Coordinating Committees that same day. Kahler said that Nordlund could not recall the timing when the low level entrances were closed. Mike Schiewe noted that the Aquatic Settlement Work Group (SWG) has not yet made a decision to request reopening those entrances. Kahler said that Douglas PUD has contracted divers to reattach chains to hoist the gates on those entrances in preparation for reopening the entrances, if requested by the Aquatic SWG and approved by the Coordinating Committees. He added that Douglas PUD is still discussing reopening the entrances with Nordlund and other engineers. Kahler said that Nordlund does not want salmonids using the entrances—only lamprey. Kahler explained that Nordlund's concern with reopening these entrances was about

potentially recreating conditions that were present prior to closing the entrances. Auxiliary water supply (AWS) flow required to achieve the required head differential between the collection gallery and the tailrace was greater with multiple fishway entrances open, which increased pressure and exacerbated debris loading on the wall and floor diffusers, resulting in: 1) diffuser grating failures that allowed fish into the AWS chambers; and 2) delays to fish passage because during low flow periods, fish in the collection gallery jumped at water cascading from the debris-fouled wall diffusers, rather than ascending the ladder. Schiewe said that if the Aquatic SWG requests approval to reopen the low level entrances, the Coordinating Committees will need to review information pertinent to these concerns.

- *Ritchie Graves (NMFS) will internally discuss NMFS' willingness to delegate approval of the annual Broodstock Collection Protocols to their HCP Hatchery Committees and Coordinating Committees representatives (Item III-D).*
  This will be discussed further during today's conference call.
- *Cory Kamphaus will provide Dr. John Skalski and Dr. Richard Townsend's memorandum on the comparison of juvenile survivals of spring Chinook salmon, Coho, and steelhead released from Winthrop National Fish Hatchery (NFH) to Kristi Geris for distribution to the Coordinating Committees (Item III-E).*
  Kamphaus provided this memorandum to Geris following the meeting on August 26, 2014, which Geris distributed to the Coordinating Committees that same day.
- *Douglas PUD will develop a draft SOA seeking approval of designating Coho as a Plan Species meeting the Phase III (Standard Achieved) for passage at Wells Dam based on similar survival of studied yearling spring migrants consistent with the assumption of similarity in Section 8.4.5.1 of the Wells HCP and the results of survival comparisons performed by Skalski and Townsend; Douglas PUD will request Coordinating Committees approval of this SOA during the Coordinating Committees meeting on September 23, 2014 (Item III-E).*
  This will be discussed further during today's conference call.
- *Chelan PUD will provide a status update on the Rock Island Dam right bank adult fishway PIT-tag detection system during the Coordinating Committees meeting on September 23, 2014 (Item IV-E).*

This will be discussed further during today's conference call.

D. HCP Hatchery Committees Approved Broodstock Collection Protocols SOA (Mike Schiewe, Scott Carlon, and Tom Kahler)

Mike Schiewe said that the Broodstock Collection Protocols that are prepared annually by WDFW and submitted to NMFS by April 15 have become more complicated over the years. He said that the HCP Hatchery Committees have been discussing streamlining the process, making the protocols an HCP Hatchery Committees approval document and also down-sizing the document to be more useful. He said that Lynn Hatcher (NMFS HCP Hatchery Committees Representative) developed a draft Broodstock Collection Protocols SOA, which was ultimately revised into a simpler document. Schiewe said that the final SOA also incorporates a footnote that addresses a clause in the Wells HCP, which states that the annual protocols are submitted to the Wells HCP Coordinating Committee and NMFS Hydro Program for annual approval prior to trapping at Wells Dam. Schiewe noted that the NMFS Hydro Program no longer exists; however, the clause still requires NMFS and Wells HCP Coordinating Committee approval in some form. He added that, interestingly, the same requirement was not included in the Rock Island and Rocky Reach HCPs, so the footnote is specific to the Wells Project at this time.

Schiewe said that the HCP Hatchery Committees approved Broodstock Collection Protocols SOA was distributed to the Coordinating Committees by Kristi Geris on September 19, 2014. Schiewe noted that the SOA indicates that the annual protocols will be approved by the HCP Hatchery Committees, will be submitted to NMFS by April 15, and outline a review and approval timeline beginning in February. He said that the SOA also stipulates that rather than burdening only WDFW, it also holds Permit Holders accountable to develop these protocols. He said that Mike Tonseth (WDFW HCP Hatchery Committees Representative) is coordinating with NMFS and U.S. Fish and Wildlife Service (USFWS) to determine how the annual protocols can be streamlined into a shorter, more concise document. Schiewe said that this might also be an opportunity for NMFS to delegate approval of the protocols to their HCP Hatchery Committees and Coordinating Committees representatives (i.e., participation and approval in the respective Committees would constitute NMFS approval of the document). Schiewe said that Hatcher already indicated that Bob Turner (Northwest Region Salmon Management Division) has approved the delegation for the HCP Hatchery Committees Representative. Schiewe asked Scott Carlon if he knew if these same discussions have taken place regarding the NMFS Coordinating Committees representative. Carlon said that he is not aware of Ritchie Graves discussing this with Craig Busack, and he added that he will discuss internally with NMFS the delegation of approval of the annual Broodstock Collection Protocols to their HCP Coordinating Committees representative.

Schiewe said that Coordinating Committees approval of this SOA is required; however, he noted that there is no urgency. He suggested carrying this item forward to the next Coordinating Committees meeting on October 28, 2014, if needed, and asked if there are comments on the SOA at this time.

Kirk Truscott noted that the footnote in the SOA, as revised, addresses a comment that he made during the HCP Hatchery Committees meeting. He explained that the footnote, as formerly written, seemed to limit Coordinating Committees approval of the SOA to the Wells Coordinating Committee. He said that the revised language clarifies that Coordinating Committees approval satisfies the Wells HCP—it does not limit approval to the Wells Coordinating Committee. Schiewe asked if language should be added to the SOA that explicitly requires Coordinating Committees review and approval for all trapping operations. Jeff Korth suggested that the Coordinating Committees just address certain actions, as needed, and Truscott said that no additional language is needed on his behalf.

Schiewe said that the SOA, as distributed to the Coordinating Committees by Geris on September 19, 2014, will be considered for approval at the Coordinating Committees meeting on October 28, 2014.

II. Douglas PUD

A. DECISION: Phase Designation for Methow Coho at Wells Dam (Tom Kahler)

Tom Kahler said that he intended to have a draft SOA available for Coordinating Committees review; however, the draft is still in internal review. Kahler said that for now, he will provide background and an overview of the SOA so that any issues may be addressed now.

Kahler explained that because Coho reintroduction was still in a feasibility phase when the HCP was originally negotiated, language was included in the HCPs deferring until 2006 a decision on whether hatchery compensation was required for Coho. He said that in 2007, following review of progress of the Coho reintroduction, the HCP Committees decided that Douglas PUD must provide NNI hatchery compensation for Methow River Coho. He said at that point, Douglas PUD and the YN negotiated an agreement for mitigating for Coho in the Methow in the form of a lump sum payment for infrastructure needs *in lieu* of supplemental fish production through early 2018. He added that when it was originally agreed Coho required hatchery compensation, the Coordinating Committees accepted the assumption in Wells HCP Section 8.4.5.1 that Coho likely survived passage at Wells Dam similar to other yearling spring migrants; therefore, it was agreed Coho would be initially designated as Phase III (Additional Juvenile Studies). He said that, in anticipation of the need in 2018 for a new multi-year agreement between Douglas PUD and the YN for Coho hatchery compensation, Douglas PUD wanted to determine whether the surrogacy assumption made in the original HCP was valid; therefore, Douglas PUD asked Drs. John Skalski and Richard Townsend to conduct an analysis comparing hydrosystem survival of juvenile spring Chinook salmon, Coho, and steelhead from the same release location. Kahler said that, as reported in Drs. Skalski and Townsend's memorandum that was distributed to the Coordinating Committees by Kristi Geris on August 26, 2014, the analysis concluded that survival rates for Coho were statistically comparable to spring Chinook and steelhead in all but 1 of the 4 years evaluated, which validated the assumption of equivalent survival among yearling spring migrants.

Kahler said that the draft SOA seeks Coordinating Committees approval that, through the life of the HCP, Coho survive at rates statistically similar to the current 4-year average Juvenile Project Survival value measured for yearling Chinook salmon and steelhead, which would be subject to review and adjustment every 10 years. He added that an extension of that surrogacy would apply to phase designation, as well.

Kirk Truscott asked what "through the life of the HCP" means. He asked if on 10-year intervals, would Coho be included in additional verification studies or would yearling

Chinook salmon and steelhead continue to be used as surrogates. Kahler said that once a species is designated as Phase III (Standard Achieved), the Coordinating Committees must decide which species will be used in each subsequent verification study that would apply to all Plan Species within Phase III (Standard Achieved) per Section 4.2.5.1 of the Wells HCP. He added that any species in that phase designation can be selected by the Coordinating Committees for a verification study, so Coho could be selected for a verification study. Truscott asked if "through the life of the HCP" does not mean that the current 3.7% average Juvenile Project Survival value is standard for the life of the HCP. Kahler replied no, and said that every 10 years there will be a survival study to verify phase designation and that survival value will be included in the new average value; just as the 2010 survival verification study added a fourth year to the previous 3-year average survival value, the 2020 survival verification study would result in a new 5-year average. He added that all species would have hatchery compensation values adjusted as necessary.

Kahler asked if there are any issues or comments at this time. No issues or comments were expressed by the Coordinating Committees representatives present. Mike Schiewe said that this will be on the agenda for approval at the next Coordinating Committees meeting on October 28, 2014.

B. Request for Comments on Pending Land-Use Decision—Replacement Dock on Wells Reservoir (Tom Kahler)

Tom Kahler said that Kristi Geris sent an email to the Coordinating Committees on September 4, 2014, notifying them that the Bailey Douglas PUD Land Use Permit Application is out for a 60-day review period, with comments due to him no later than Wednesday, November 5, 2014. Kahler explained that in 2010, Douglas PUD offered owners of existing, dilapidated docks within the Wells Project a one-time opportunity to remove their dilapidated structures and apply for permits to install a conforming dock, and Mrs. Bailey was the only dock owner to pursue this opportunity. Kahler said that Section 5 of the Wells HCP requires Coordinating Committees review of this application.

Scott Carlon asked if all other necessary permits have been cleared, and Kahler replied that they have been. Coordinating Committees representatives agreed to submit comments, or an email confirming "no comments," on the Bailey Douglas PUD Land Use Permit Application to Kahler no later than November 5, 2014.

III. Chelan PUD

A. Rocky Reach and Rock Island September 2014 Juvenile Bypass Operations Results (Lance Keller)

Lance Keller said that Rocky Reach and Rock Island Coordinating Committees representatives approved Chelan PUD's request via email to end juvenile bypass operations at both the Rocky Reach and Rock Island juvenile bypasses on September 15, 2014, at midnight, as follows: USFWS, the YN, and WDFW approved the request on September 12, 2014, and the CCT, NMFS, and Chelan PUD approved the request on September 15, 2014, as distributed to the Coordinating Committees by Kristi Geris that same day. Keller thanked the Coordinating Committees for their prompt responses and coordination to end juvenile bypass operations at Rocky Reach and Rock Island dams.

Keller summarized that from September 1 to 15, 2014, a total of 76 summer Chinook salmon were collected at Rocky Reach Dam, which compared to the overall cumulative index as of August 31, 2014, was equal to 0.36% of the total run. He said that, per the language in the Rocky Reach HCP, there does not appear to be a significant component (greater than 5%) of the juvenile emigration present outside the normal bypass operating period.

Keller summarized that from September 1 to 15, 2014, a total of 227 juvenile subyearling Chinook salmon were collected at Rock Island Dam. He recalled that at Rock Island Dam, subyearling counts are only representative of Powerhouse 2 flows and that the Columbia River Data Access in Real Time (DART) database applies an expansion algorithm to include total project flow experienced for that sampling period. He said that through the DART algorithm, 227 Chinook salmon expanded to 474 subyearling Chinook salmon, which compared to the overall cumulative index as of August 31, 2014 (i.e., 34,165 subyearlings), equals 1.39% of the total run. He said that once again, per the language in the Rock Island HCP, there does not appear to be a significant component (greater than 5%) of the juvenile emigration present outside the normal bypass operating period.

Keller said that Kirk Truscott had asked, considering the low river flow due to the Wanapum drawdown, how September river flow this year compared to last year. Keller said that from September 1 to 11 the average daily river flow in 2013 and 2014 was 71,900 cubic feet per second (71.9 thousand cubic feet per second [kcfs]) and 67.7 kcfs, respectively, so they were quite comparable. Keller said that Chelan PUD will develop a memorandum summarizing Rock Island Dam and Rocky Reach Dam 2014 summer bypass operations, specifically the extended operations in September, for discussion at the Coordinating Committees meeting on October 28, 2014.

B. Wanapum Drawdown Update (Lance Keller)

Lance Keller said that the last Wanapum briefing was held yesterday, September 22, 2014. He said that a second call was convened with the Rock Island Coordinating Committee where Rock Island Coordinating Committee representatives approved Chelan PUD's request to modify one of the middle adult fishway side entrances at Rock Island Dam to provide an additional fish passage route into the middle fishway at low tailwater elevations. Keller thanked the Rock Island Coordinating Committee for their prompt responses and coordination, and he added that the approved modifications should be complete by early next week.

Jeff Korth said that he missed yesterday's Wanapum briefing, and he asked if the denils have been operating as expected. Keller replied that they have been. He explained that Rock Island Dam is currently operating in periods of generation and non-generation configurations, and a minimum spill of 45 kcfs is being managed to maintain a tailwater elevation to keep the denil structures in operation (the invert of the denil structures was designed for 38 kcfs). He said that additional spill is also being routed to provide more flow through the Powerhouse 2 tailrace so that approaching fish will be drawn to the right bank entrance and pass via the denils. He said that once the modifications are complete on the middle ladder, Rock Island operators will also investigate options for increasing attraction flow through the newly modified middle entrance.

Lastly, Keller said that Chelan PUD will file the monthly Rock Island Interim Fish Passage Plan Report for September 2014 with the Federal Energy Regulatory Commission on October 1, 2014.

C. Rock Island Dam Right Bank Adult Fishway PIT-Tag Detection System Update (Lance Keller)

Lance Keller said that the temporary half-duplex PIT-tag antenna array is installed upstream of the count window, about 5 feet from the fishway exit, and that the new combination half- and full-duplex PIT-tag antenna array will be installed during the 2014/2015 winter maintenance period at Rock Island Dam. Keller said that the source of the noise has not yet been determined; however, one possible source could be related to a wild fire that was started by lightning striking a power pole, which shut down power to the right bank side of the dam. He said that the date and time of the wild fire and beginning of the noise coincide, but there is still uncertainty about the exact cause; the noise is still continuing.

IV. Hatchery and Tributary Committees Update (Mike Schiewe)

Mike Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the last HCP Tributary Committees meeting on September 11, 2014:

- *Silver Protection Project*: The Tributary Committees are considering a conservation easement on the Methow River. Part of the easement will allow limited livestock grazing on a portion of the property, which raised concerns about maintaining the appropriate amount of fencing to keep livestock from grazing in sensitive areas. Acquisition is also being explored, but if not possible, the Tributary Committees may include stewardship money as part of the conservation easement to help maintain the fence. Tom Kahler noted the range of this project; it has been ongoing since 2011.
- *Small Projects Program Application: Post-Fire Landowner Assistance/Habitat Protection in Beaver and Frazer Creeks*: The Rock Island Tributary Committee approved a request from the Methow Salmon Recovery Foundation for $57,328 from HCP Tributary Funds to repair damages associated to wild fires in Beaver and Frazer creeks. Proposed actions include removing woody materials, mud, and debris, as well as other actions. The total cost of the project was $100,000.

- *Okanagan Project Tours*: The Tributary Committees October 2014 meeting will be a tour of habitat restoration projects in Canada and will occur on October 8 and 9, 2014. The tour will include Okanagan River Restoration Initiatives 1 and 2, Vertical Drop Structure 13, McIntyre Dam, Shuttleworth Creek, Skaha Dam, Shingle Creek Dam, the Penticton Channel, and Trout Creek.
- *Plan Species Account Auditing*: The Wells Plan Species account is now under full control of Douglas PUD, as requested by the State Auditor. The account will be audited annually by the State Auditor, so the Wells Committee will not need to conduct independent audits every 5 years. Douglas PUD Board of Commissioners' approval of the annual contributions to the account will constitute approval of the Tributary Committee's discretion in the use of the account. The Tributary Committees will see no changes in the way the Tributary Committees do business. The State Auditor will ask for the same changes by Chelan PUD regarding the Rock Island and Rocky Reach accounts.
- *Upper White Pine Presentation*: The Chelan County Natural Resources Department and Bureau of Reclamation (sponsors) provided a presentation on the Upper White Pine Project. Tom Kahler explained that the project involves an old section of floodplain on Nason Creek, located near a point where Nason Creek moves from a constrained reach into an unconstrained reach. Kahler said that, a long time ago, a large section of this floodplain was cut off by a levee and railroad tracks constructed by Burlington Northern. He said the project proposes removing the levee, while keeping the railroad tracks, so that the river can access the cut off section of floodplain. He said that based on studies, a channel would also need to be designed to keep the river from moving back into its straight line course. He said that this channel design would also need to be completed in such a way as to not disturb existing wetland and resources. He said the project also proposed to relocate a Chelan PUD power line. He said that this is a big project with high potential for benefits to Plan Species.
- *Next Steps*: The next Tributary Committees meeting will be held on November 13, 2014.

Schiewe said that the HCP Hatchery Committees convened at the Grant PUD office in Wenatchee, Washington, and a Priest Rapids Coordinating Committee Habitat Sub-Committee (PRCC HSC) meeting followed directly after, which included an Okanagan Nation Alliance (ONA) update. Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the last HCP Hatchery Committees meeting on September 17, 2014:

- *DECISION: Revised Draft 2015 Chelan PUD Hatchery M&E Implementation Plan:* The Rocky Reach and Rock Island Hatchery Committees approved the 2015 Chelan PUD Hatchery M&E Implementation Plan, as revised.
- *DECISION: Hatchery M&E Plan Objective 12 (Formerly Objective 10) Non-Target Taxa of Concern (NTTOC) SOA:* The Hatchery Committees approved the SOA finalizing the NTTOC Objective (Hatchery M&E Plan Objective 12 [Formerly Objective 10]), as revised, which memorialized the completion of this task that began in 2009. The task involved a risk model and selecting a suite of not-target species and evaluating whether they would be affected by hatchery species. Greg Mackey (Douglas PUD HCP Hatchery Committees Representative) developed a final report, which indicated that in general, the risk of hatchery fish on NTTOC was low. The approved SOA also included an acknowledgment that further NTTOC evaluations may be conducted via a different approach if additional data become available.
- *DECISION: Broodstock Collection Protocols SOA:* The Hatchery Committees approved the Broodstock Collection Protocols SOA, as revised, as discussed earlier.
- *Draft 2013 Wells and Methow Hatchery M&E Report for Hatchery Committees Review:* The draft Douglas PUD 2013 Hatchery M&E Annual Report is available for a 60-day review period, with comments due to Greg Mackey no later than November 3, 2014.
- *Draft 2015 Douglas PUD Hatchery M&E Implementation Plan:* The draft 2015 Douglas PUD Hatchery M&E Implementation Plan is available for a 60-day review period, with comments due to Greg Mackey no later than November 24, 2014.
- *Methow River Conditions and Implications for Populations and Hatchery Program Management:* Greg Mackey raised the issue that the large mudslide that occurred near Carlton on the Methow River following this summer's wild fires could have significant consequences during runoff this winter in terms of mobilizing sediment

loads. He questioned whether there are management actions that should be taken to help mitigate possible effects. Mackey and Catherine Willard (Chelan PUD HCP Hatchery Committees Alternate) offered to collect additional information for further discussion.

- *Columnaris Outbreak at Chief Joseph Hatchery (CJH):* Kirk Truscott reported a loss of Leavenworth spring Chinook salmon adult broodstock to a Columnaris outbreak at CJH. He said that the loss was reported to cost share partners and the HCP Hatchery Committees. He said that the fish were transferred in late June 2014, and prior to August 2014, only five fish died. He said, however, that ultimately, about 65% of the broodstock was lost, including more than 70% of the females. He said that the CCT contacted USFWS as soon as mortalities started increasing, and through monitoring and assessment, USFWS identified the bacterium Columnaris as the cause of gill infection (external—not internal). He said that bath and drip treatments with chloramine-T did not stop the mortalities. He noted that the same rearing and holding protocols were used that were implemented the previous year when there were close to zero mortalities. He added that the summer Chinook salmon on station showed no signs of Columnaris and that they were on the same water source. He said that the CCT are discussing internally how to minimize risk in future years. He added that Leavenworth NFH may have additional spring Chinook salmon eggs to help the CCT reach production goals despite the loss to the outbreak.
- *HCP Hatchery Committees Chair Position:* The HCP Hatchery Committees discussed the HCP Chair position, as discussed today.
- *ONA Update:* An ONA update was provided, which addresses projects that are co-founded by Grant PUD and Chelan PUD to meet No Net Impact production for sockeye mitigation. Douglas PUD also contributes funds to the Fish and Water Management Tool, which is used by fish and water managers to manage redd scouring and desiccation of salmon redds.

V. HCP Committees Administration

A. HCP Chair Position (Mike Schiewe and Tom Kahler)

Mike Schiewe said that last month, he conveyed to Chelan PUD and Douglas PUD his plans to retire at the end of April 2015, and the PUDs have now started discussing selecting new chairs for the HCP Committees and Douglas PUD Aquatic SWG. Schiewe noted that the last time this process was completed was when the HCPs were signed in 2004.

Tom Kahler said that Douglas PUD and Chelan PUD have reviewed how this process was originally completed in 2004. He said that the process was quite lengthy but also noted how pleased the Committees have been under Schiewe's leadership. Kahler said that the PUDs have already begun considering possible candidates to fill the HCP Chair positions and also the timeline going forward. He said that ideally, the new HCP Chair(s) will be under contract by January 2015, in order to start shadowing Schiewe by February 2015. Kahler said that Ritchie Graves, Shane Bickford, and Bryan Nordlund all participated in the original hiring process; however, the remaining current HCP Committees representatives and alternates did not. Kahler said that a list of qualifications and the Scope of Work that were used during the original process in 2004 will be modified as necessary and used for this hiring process. He noted that the two documents have been modified to make them current. He said that a list of selected potential candidates has also been compiled, including résumés and CVs. Kahler said that he will provide these HCP Coordinating Committees Chair position documents to Kristi Geris for distribution to the Coordinating Committees). *(Note: Kahler provided a list of qualifications [Attachment B], Scope of Work [Attachment C], and potential candidate résumés and CVs [Attachments D, E, F and G] to Geris following the meeting on September 23, 2014, which Geris distributed to the Coordinating Committees representatives and alternates that same day.)*

Kahler said that in 2004, the Mid-Columbia Coordinating Committee, chaired by Denny Rohr (DRohr and Associates), and the HCP Policy Committees participated in the HCP Chair selection. Kahler said that it made sense to have the same group participate in this selection process, since the HCPs specify that "The Parties" choose the committee chairs, so the PUDs asked Schiewe to convene an HCP Policy Committees meeting via conference call, which is being arranged now, to be held in October 2014.

Kahler said that because Schiewe's experience and background has worked well for the HCP Chair position, he would advocate hiring a Chair with similar experience and background (i.e., having experience in the Mid-Columbia hydrosystem, experience as a neutral facilitator, and a technical background). Kahler also suggested that, considering the nature of the work, the Chair be a consultant or retired from agency work. He briefly reviewed the current candidates, including Dr. John Ferguson (Anchor QEA, and formerly NMFS), Geoffrey McMichael (Mainstem Fish Research, and formerly Battelle), Bill Muir (retired NMFS), and Bryan Nordlund (NMFS). Kahler said that the PUDs would also be interested in considering additional qualified candidates. Lance Keller agreed and added that Chelan PUD and Douglas PUD have been in communication regarding the HCP Chair position and that they are both in agreement on the process proposed thus far.

Kahler said that this same information was presented to the HCP Hatchery Committees last week, only their list of candidates is slightly different than the Coordinating Committees list. He added that the PUDs see value in having the same Chair for both the Hatchery and Coordinating Committees; however, this would not be a requirement. Schiewe suggested that Coordinating Committees representatives consider additional candidates, and he added that he is willing to discuss the position with any candidates. He added that candidates should also be aware that the Chair position is much larger than facilitating monthly meetings—it also includes the associated administrative responsibilities. He said that although it is possible for a Chair to handle all the responsibilities of the position, it really is important to have a strong support team. He added that when he started, he did not realize how much work the position entailed, and he was fortune enough to have a strong support team. Kahler said that he has discussed and understands the amount of time that Schiewe, Geris, and the rest of the Anchor QEA team dedicates to maintain the administrative record, and he has conveyed this to the possible candidates. He added that he has also assured each candidate that the contract can support this need.

Bob Rose asked if Geris will continue as technical and administrative support for the HCPs. Schiewe indicated that Geris supports the Chair, and her continued work with the Committees would depend on whether a new Chair(s) is an Anchor QEA employee.

Kirk Truscott noted that Grant PUD has voiced interest in coordinating the PRCC HSC and HCP Hatchery Committees Chair selections. Kahler said that he spoke with Todd Pearsons (Grant PUD); however, Grant PUD cannot participate in the selection of the HCP Chairs because they are separate agreements and contracts. Kahler added that he is aware of Grant PUDs interests, but their process and ultimate selection is independent of the HCP Chair selection process.

Schiewe said that he is currently working toward scheduling an HCP Policy Committees meeting, as requested by the PUDs. He said that Coordinating Committees representatives will also be included on the meeting invite, which is tentatively set for some time in October 2014. He said that he is in the process of tracking down each signatory's HCP Policy Representative.

Kahler said that one additional item that Douglas PUD has requested is regarding documentation of this process. He said that documentation of the process in 2004 was not very complete and thought it would be beneficial for Schiewe and Geris to shepherd the process similar to regular HCP meetings in order to develop a detailed track record for future reference.

Coordinating Committees representatives agreed to review the HCP Coordinating Committees Chair position documents and will: 1) contact qualified candidates to gauge interest in the position; 2) have interested candidates contact Schiewe to discuss the responsibilities of the position; and 3) provide a résumé or CV from interested candidates to Kahler, Keller, and Geris.

B. Next Meetings (Mike Schiewe)

Mike Schiewe said that the next scheduled Coordinating Committees meeting is October 28, 2014, to be held by conference call. The November 25 and December 23, 2014, meetings will be held either by conference call or in person at the Radisson Hotel in SeaTac, Washington, as is yet to be determined.

List of Attachments

Attachment A	List of Attendees
Attachment B	Position Qualifications for the HCP Chairs
Attachment C	Scope of Work for Selection of the HCP Chair

Attachment D	Bryan Nordlund CV
Attachment E	John Ferguson résumé
Attachment F	Geoffrey McMichael résumé
Attachment G	William Muir CV

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Lance Keller*	Chelan PUD
Tom Kahler*	Douglas PUD
Scott Carlon*	National Marine Fisheries Service
Jeff Korth*	Washington Department of Fish and Wildlife
Kirk Truscott*	Colville Confederated Tribes
Bob Rose*	Yakama Nation

Note:
* = Denotes Coordinating Committees member or alternate

Qualifications for HCP Coordinating Committees Chairperson

Applicants for HCP Coordinating Committees Chair must possess general knowledge and have working experience in at least one aspect of the scientific, engineering, and policy/legal issues within the Columbia Basin hydrosystem, and specifically understand the effects of hydroelectric projects on juvenile and adult salmonids and the various approaches to assessing those effects. Applicants must also demonstrate an understanding of the Endangered Species Act (ESA) and the purpose and function of a habitat conservation plan (HCP) in achieving compliance with the ESA. The successful applicant must have experience in productive participation in and/or (preferably) effectively facilitating multi-party dialog and decision-making on complicated and sometimes contentious technical and policy issues. The Chairperson must perform the duties and responsibilities specified in the Wells, Rocky Reach, and Rock Island Habitat Conservation Plans, and must obtain a thorough familiarity with those HCPs and serve as a defender of their integrity. Applicants must not have conflicts of interest that would compromise their ability to serve as a neutral facilitator of the HCP Coordinating Committees. Additional experience with and/or knowledge about the role of hatchery production in fisheries management, and salmonid habitat restoration and protection, is desired, but not required. Successful applicants must demonstrate the ability to provide substantial administrative assistance necessary to perform the following:

- Maintain the near-real-time flow of information between Coordinating Committees members and associated participants
- Schedule meetings and develop meeting agendas within the timeframe established in the HCPs
- Provide detailed draft meeting notes in a timely manner, and produce revised notes for Committees review prior to the next meeting
- Maintain the administrative record for the Coordinating Committees (resides on a web-accessible MS SharePoint site housed by Douglas PUD)
- Produce an annual report on activities of the Tributary Committees, Hatchery Committees, and Coordinating Committees for review by Douglas and Chelan PUD by early January of each year, respond to PUD edits/comments and provide to the respective Coordinating Committees for review and approval in time for submittal to the Federal Energy Regulatory Commission by the respective PUD deadlines

Scope of Work

Selected Candidate will provide facilitation services as Chairperson of the Wells, Rocky Reach, and Rock Island Habitat Conservation Plans (HCPs) Coordinating and Policy committees. Although each HCP has a corresponding Coordinating (and Policy) committee, these committees met collectively to minimize participant time-commitments and to facilitate coordinated implementation of overlapping obligations.

Services provided include the following.

- Schedule and arrange all meetings of the Coordinating Committee (CC) in accordance with the processes outlined in the HCPs
- Chair all meetings of the CC. The CC chair also serves as the alternate chair for the HCPs Hatchery and Tributary committees
- Facilitate the flow of information among parties between meetings
- Work between meetings to understand all of the parties concerns and close gaps on issues so that decisions can be made at the meetings
- Provide neutral facilitation services for all meetings while maintaining the integrity of the HCPs
- Assist the committees in the maintenance of established rules of process, and development of additional rules as necessary
- Preparation of meeting agendas, meeting minutes, and meeting "action items" lists
- Preparation of annual reports to the Federal Energy Regulatory Commission for each HCP describing the progress toward achieving HCP standards, incorporating annual reports from the Hatchery and Tributary Committees
- Develop schedules for, and ensure that all reports are approved and finalized by required dates
- Facilitate the flow of information between all three HCP committees – the Coordinating, Hatchery, and the Tributary committees.
- Chair all meetings of the Policy Committee for dispute resolution in accordance with the processes established in the HCPs
- Attend regional meetings as appropriate and agreed to by the CC
- Maintain the administrative record of HCP implementation by ensuring the archiving of CC and Policy Committees files (and the Hatchery and Tributary committees as appropriate) in the HCP Extranet (housed and maintained by Douglas PUD)
- Facilitate the decision-making processes established in the HCPs and subsequent CC agreements regarding the following CC responsibilities (and other issues):
    - Achievement of survival standards for plan species
    - Approval of studies prior to their implementation
    - Review of study results and determinations regarding their applicability
    - Development of an annual list of understandings
    - Development of schedules and dates of performance (including spill/bypass timing and duration)
    - Resolution of disputes brought forward by the Tributary and Hatchery committees

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Education:

- **Colorado School of Mines, BS Civil Engineering, 1988 with minor in Alternate Energy**
- **Graduate studies in hydraulics and hydrology (28 credit hours), Portland State University 1990-1995**

Instruction:

- **Fish passage design instruction for the U.S. Fish and Wildlife Service Fisheries Academy (1993-1999).**
- **Fish Screen and Bypass design course for the Fish Screen Oversight Committee (1992-2012)**
- **Fish passage design course for Bonneville Power Administration (2000, 2006)**
- **Fish passage design course for the Federal Energy Regulatory Commission (2007, 2011)**

Publications:

- **Small fish screen and bypass criteria (NMFS, 1993)**
- **Design guidelines and criteria for fish screens and bypass systems (NMFS 1995, updated in 2001, 2008 and 2011)**
- **Pump intake screen design criteria (NMFS 1996)**
- **Surface collection design development in the Columbia and Snake Rivers (in Odeh et al, AFS Bioengineering Section publications, 1996)**
- **Design of upstream passage systems (NMFS, 2009)**
- **Anadromous Salmonid Fish Passage Designs (NMFS 2008, update in 2011). Primary author for sections detailing design criteria and guidelines for: fish ladders and upstream passage systems; trap/haul/handling/holding facilities; culvert designs; juvenile fish screen and bypass systems; exclusion barriers; temporary passage facilities; evaluation of passage facilities; operation and maintenance of passage facilities; and upstream juvenile passage facilities**
- **Trapping Effects and Fisheries Research: A Case Study of Sockeye Salmon in the Wenatchee River, USA, AFS Fisheries magazine, Vol 39 No 8, August 2014 (in press) (Murauskas, Fryer, Nordlund, Miller)**

Presentation Topics and Forums:

- **Fish Screen Oversight Committee Workshop – screen design development (1992-2012)**
- **AFS Conference - Surface collection design development in the Columbia and Snake Rivers (AFS, 1996)**
- **Mandatory conditions review process (AFS, 2001)**

- **Development of the Rocky Reach surface collector prototype (NMFS, 2004)**
- **Development of the Wanapum surface bypass (NMFS, 2006)**
- **Fish passage design criteria development (USFWS, Hadley, Mass., 2004)**
- **Fish passage design (BPA, 2004, 2008, 2010)**
- **Fish Passage Design (NMFS FERC training, 2008)**
- **Revisions to NMFS fishway design criteria (2009)**
- **Upstream fish passage design (FERC, 2007, 2011)**
- **Design of water intakes for Fish Protection (AWWA, 2013)**
- **Off-ladder trap design development for Priest Rapids Dam (NMFS, 2007)**
- **HCP and salmon recovery (Mid-C Forum, 2006)**
- **Swift surface collection design process (NMFS, 2006)**
- **Contributions of the Fish Screen Oversight Committee in anadromous salmon restoration (NWPCC Briefing, 2014)**
- **Upstream Passage System Designs (Future of our Salmon Technical Workshop, 2014)**
- **Panel Member – Technical feasibility of restoration of fish passage above Chief Joseph and Grand Coulee dams (Future of our Salmon Conference, 2014)**

Awards:

- **NOAA Bronze Metal – Development of gas abatement structures at mainstem Columbia and Snake River dams – 2000**
- **NOAA Bronze metal – Restoration of fish passage and habitat in the White Salmon River Basin – 2000**
- **NOAA Administrator's Award – Wells, Rocky Reach and Rock Island Habitat Conservation Plans – 2004**
- **NOAA General Counsel's Award – Technical support for multiple FERC relicensings – 2005**
- **NOAA Bronze Metal – Fisheries improvements at 23 hydropower facilities in the Pacific Northwest – 2008**

Affiliated Experience and Projects:

McKenzie River, OR (1990-1998)

- **Leaburg screen and bypass system (design development)**
- **Walterville screen and bypass system (design development)**
- **Leaburg right bank ladder (conceptual design)**
- **Leaburg tailrace barrier (design development)**
- **Walterville powerhouse tailrace velocity barrier (design development)**
- **Settlement negotiations and agreement for FERC license**
- **Support for lawsuit establishing Section 18 fish passage prescriptive authority**

Idaho, Oregon and Washington small passage projects (1990-present)

- **Over a hundred small screen and bypass conceptual design development**

- **Numerous technical collaborative workgroups (USBR, BLM, water agencies, fisheries agencies, tribal agencies, landowners)**
- **Dam replacements with fish-friendly passage designs, dam removals, diversion consolidation, irrigation efficiency improvements, streamflow improvements**
- **Culvert replacements**
- **Stream simulations and roughened channels designs**

Fish Screen Oversight Committee (1992-present)
- **NMFS representative from 1992-2014**
- **FSOC Chair 2011 to present**
- **Achieved regional consensus for screen and bypass design criteria for anadromous salmon and bull trout**

White Salmon River, WA (1992-2011)
- **Condit Dam Screen and Bypass (section 18 conceptual design)**
- **Condit Dam Upstream Passage System (section 18 conceptual design)**
- **Condit Dam Removal (dam removal settlement negotiations and removal process design development)**

Sandy River, OR (1990 – 2009)
- **Marmot Dam construction (fish passage inspections during dam rebuild)**
- **Marmot Screen and Bypass System (design and operational adjustments)**
- **Marmot Upstream Passage System rehab (conceptual design for Section 18)**
- **Marmot Screen rehab (conceptual design for Section 18)**
- **Marmot and Little Sandy dam removals (tech support for negotiations and removal process design development)**
- **Witnessed construction and removal of Marmot dam**

Elwha River, WA (2005-present)
- **Roughened channel for new water intake (design development)**
- **Post-removal passage assessments for Elwha and Glines dam sites**
- **Intake screen rehabilitation**

Skokomish River, WA (2006-present)
- **Cushman relicensing (technical support for settlement negotiations and Section 18 fishway prescription)**
- **Cushman Dam – Surface Collector (design development)**
- **Lower Cushman Dam – Adult Passage, Handling and Transport System (design development)**
- **Lower Cushman Dam – tailrace barrier, trap and new powerhouse (design development)**
- **Little Falls channel improvements for fish passage (design development)**
- **Technical committee for license implementation**

Lewis River, WA (200-present)

- **Merwin Dam adult fish passage, handling and transport system (design development and hydraulic and fish passage evaluations)**
- **Swift Dam - surface collector (design development and hydraulic and fish passage evaluations)**
- **Lewis River relicensing (4 projects) (technical support for settlement negotiations and Section 18 fishway prescription)**

Wells Dam, Columbia River, WA (1995-present)

- **Assisted with final configuration of current surface collector**
- **HCP and relicensing negotiations (policy and technical support, Section 18 fishway prescription)**
- **HCP and Mid-Columbia Coordinating Committees (NMFS representative from 2006-2014, and technical support from 1995-2014)**
- **Upstream fishway operations and design modifications, including modifications for lamprey**
- **Gas Abatement Plan development**
- **Trap modifications**
- **Hatchery rebuild – design input**
- **Twisp weir and trap – design development**

Rocky Reach Dam, Columbia River, WA (1995-present)

- **Surface Collector design (prototype development, technical design team, conceptual designs, final designs, design evaluations, survival study development and review)**
- **HCP and relicensing negotiations (policy and technical support, Section 18 fishway prescription)**
- **HCP and Mid-Columbia Coordinating Committees (NMFS representative from 2006-2014, and technical support from 1995-2014)**
- **Upstream fishway operations and design modifications, including modifications for lamprey**
- **Gas Abatement Plan development**
- **Wrote most recent Biological Opinion for UCR Spring Chinook and Steelhead, assessing biological effects on composite licensing agreements**

Rock Island Dam, Columbia River, WA (1995-present)

- **Spillway gate configuration for juvenile surface passage (evaluations, fish routing, gate selection, survival study development and review)**
- **HCP negotiations (policy and technical support)**
- **HCP and Mid-Columbia Coordinating Committees (NMFS representative from 2006-2014, technical support from 1995-2014)**
- **Upstream fishway operations and design modifications**

- **Gas Abatement Plan development**
- **Emergency Wanapum pool drawdown – designs to reconnect tailrace with fish ladder entrances**
- **Tumwater Dam trap – collaborative solution for operational issues that led to passage delay and passage rejection**

Wanapum Dam, Columbia River, WA (1995-present)

- **Surface bypass design (prototype development, technical design team, conceptual designs, final designs, design evaluations, survival study development and review)**
- **Salmon and Steelhead Settlement Agreement and project relicensing (policy and technical support, negotiations, Section 18 fishway prescription)**
- **Upstream fishway inspections (1991-2008, 2014)**
- **Upstream fishway operational and design modifications, including modifications for lamprey**
- **Emergency Wanapum pool drawdown – designs to connect fish ladder exits with forebay**
- **Priest Rapids and Mid-Columbia Coordinating Committees (NMFS representative from 2005-2014, technical support from 1995-2014)**
- **Spillway Deflector designs**
- **Count station design development and modifications for lamprey passage**

Priest Rapids Dam, Columbia River, WA (1995-present)

- **Surface bypass design (prototype development, technical design team, conceptual designs, final designs, design evaluations, survival study development and review)**
- **Salmon and Steelhead Settlement Agreement and project relicensing (policy and technical support, negotiations, Section 18 fishway prescription)**
- **Upstream fishway inspections (1991-2008)**
- **Upstream fishway operational and design modifications, including modifications for lamprey**
- **Off-Ladder Adult Fish Trap (design development)**
- **Priest Rapids and Mid-Columbia Coordinating Committees (NMFS representative from 2005-2014, technical support from 1995-2014)**
- **Fishway entrance gate redesign**
- **Count station redesign and modifications for lamprey passage**

JOHN FERGUSON, PH.D.

Senior Fisheries Scientist

EDUCATION

Swedish University of Agricultural Sciences, Umeå, Sweden, Ph.D., Biology, 2008

University of California - Davis, M.S., Aquatic Ecology, 1976

University of California – Davis, B.S., Fish and Wildlife Biology, 1974

EMPLOYMENT HISTORY

Dr. John Ferguson has 38 years of experience evaluating the effects of dams and hydropower operations on fish behavior and survival in large river ecosystems and applying this information to water management decisions. He is recognized internationally as a fish passage expert and has authored or coauthored more than 45 peer-reviewed publications, National Oceanic and Atmospheric Administration (NOAA) Technical Memoranda, and contract reports. Dr. Ferguson is an affiliate faculty of the University of Washington's School of Aquatic and Fishery Sciences, and maintains an affiliation with the Department of Fish, Wildlife and Environmental Studies at the Swedish University of Agricultural Science in Umeå, Sweden.

Since 2011, Dr. Ferguson has worked at Anchor QEA as a senior fisheries scientist on a variety of projects described below. Common themes among these projects include: 1) their technical complexity; 2) his ability to organize and lead interdisciplinary teams to successfully complete the project; and 3) the projects require his interacting with diverse sets of independent scientists, state and federal agency representatives, and staff from tribal and non-governmental organizations (NGOs) during project implementation.

From 2003 to 2011, Dr. Ferguson directed the Fish Ecology Division of NOAA's Northwest Fisheries Science Center (NWC). Each year, he directed the development of more than 20 research proposals and managed $25 million in funding and 80 scientists. During 2010 and 2011, Dr. Ferguson also directed the NWC's Fishery Resource Analysis and Monitoring Division and helped implement a new harvest management program for west coast groundfish that was adopted by the Pacific Fishery Management Council. Dr. Ferguson solved numerous issues to successfully launch the program and was awarded Employee of the Year.

From 1999 to 2002, Dr. Ferguson managed the NWC's Fish Passage Program that researched systems to improve the survival of juvenile salmonids passing Columbia River dams, and provided information that was incorporated into multiple federal hydropower system Biological Opinions. From 1987 to 1999, Dr. Ferguson led the U.S. Army Corps of Engineers Portland District's Fish Passage Team that designed and directed studies of facilities to improve fish passage survival. From 1976 to 1987, he implemented water management programs to improve salmon survival while employed by the Bonneville Power Administration, managed a program to transport juvenile fish around Columbia River dams for the U.S. Army Corps of Engineers Walla Walla District, and surveyed salmonid habitat for the U.S. Forest Service and incorporated the findings into forest management plans.

JOHN FERGUSON, PH.D.

Senior Fisheries Scientist

CORE AREAS OF EXPERTISE

- Salmon ecology, life history diversity, and habitat requirements
- Working with interdisciplinary, inter-agency teams on complex management issues
- Effects of hydropower and flood control projects on migratory fishes
- Investigating salmon smolt behavior and survival using acoustic, radio, and passive integrated transponder (PIT) tags

CURRENT PROJECTS

Develop Salmon Survival Objectives for the San Joaquin River, Sacramento, California

Dr. Ferguson is assisting NOAA Fisheries' West Coast Region, Central Valley Office to develop juvenile and adult survival objectives for fall- and spring-run Chinook salmon and winter-run steelhead in the Stanislaus River. He is helping a group of state and federal agency representatives and staff from numerous NGOs to develop survival objectives that allow the fullest expression of salmon and steelhead life history diversity, to support increased population stability, resilience, and productivity. This includes river reaches below mainstem dams and potentially the need for passage facilities at these dams to reestablish access to historical habitats.

Develop Salmon MAST for the Central Valley California, Sacramento, California

Dr. Ferguson is assisting NOAA Fisheries' West Coast Region, Central Valley Office to develop a Salmon Management and Analysis Synthesis Team (MAST). MAST is a framework for establishing data gaps through life-cycle model studies and by analyzing existing information. The framework will be used to identify studies with high potential to inform key water management decisions in the Central Valley.

Trinity River Restoration Program Phase 2, Weaverville, California

From 2011 to 2014, Dr. Ferguson led a team of biologists and geomorphologists supporting a Science Advisory Board's (SAB) evaluation of the overall effectiveness of $200 million spent to rehabilitate the river channel and restore fisheries. The SAB was comprised of scientists from federal laboratories and academia. This "Phase 1" review assessed how the treatment reach responded to rehabilitation actions and made recommendations on how to improve a second phase of actions. Dr. Ferguson is currently managing a team of biometricians and GIS programmers who are using statistical approaches to combine detailed data developed through two-dimensional hydraulic modeling, key physical/ biological/ecological empirical data, and an integrated logic model to evaluate and prioritize the temporal and spatial sequencing of the remaining Phase 2 channel rehabilitation projects.

Aquatic Species Enhancement Plan (ASEP) for the Chehalis River, Washington

Since 2013, Dr. Ferguson has co-led a team of consultants and representatives from various state agency and tribal organizations who are implementing the ASEP. ASEP is a series of studies of the potential effects of water retention alternatives, future climate variability, habitat enhancement, and combinations of these scenarios on aquatic resources in the Chehalis Basin (salmon, native fishes, and amphibians). The ASEP is a component of the Chehalis Basin Strategy: Reducing Flood Damage and Enhancing Aquatic Species Project (Project). The Project is a feasibility-level study of the effects of flood reduction alternatives and habitat enhancement scenarios on key aquatic species in the Basin. Dr. Ferguson routinely presents study results to the Governor's Chehalis Work Group.

Design, Implementation, and Use of a Passive Integrated Transponder (PIT)-tag Detection System for Sacramento-San Joaquin for Salmonid Information Needs, Sacramento, California

In 2014, Dr. Ferguson collaborated with Dr. Mike Schiewe of Anchor QEA to develop a plan for installing PIT-tag detection systems in the Sacramento-San Joaquin Delta. The detection system is needed to gather life-stage specific survival and movement information, calibrate life-cycle models, and support water management decisions in the Delta.

Develop a 2015 Fish Passage Implementation Plan for Cowlitz Falls, Washington

Dr. Ferguson is working with Tacoma Power to develop a plan of activities at the Cowlitz Falls hydroelectric project in 2015. Developing the plan requires reviewing results of ongoing fish passage studies, identifying needed information and associated study designs, and identifying operations and maintenance activities required to support the studies. The plan will be reviewed by an oversight committee comprised of state and federal agency representatives and staff from the Lewis County Public Utility District (PUD).

Update NOAA Fisheries' Fish Passage Guidelines, Portland, Oregon (pending)

Pending a contract award, Dr. Ferguson will be working with Larry Swenson of Anchor QEA (retired NOAA fish passage engineer) to update the fish passage guidelines document and incorporate the potential effects of climate change on fish passage design criteria into the document.

RECENT PROJECTS (ANCHOR QEA)

Federal Columbia River Power System (FCRPS) Hydropower Synthesis Report, Portland, Oregon

In 2012, the Bonneville Power Administration contracted Dr. Ferguson and Dr. Al Giorgi (BioAnalysts, Inc.) to develop a report summarizing progress to date in achieving fish passage performance standards and improving salmon survival through the federal hydropower system. The report was used to inform the Federal District Court of Oregon on the progress and remaining areas of scientific uncertainties.

Restoring Atlantic Salmon in the Klarälven River, Karlstad, Sweden

In 2013, Dr. Ferguson reviewed fish passage conditions at multiple dams on the Klarälven River and worked with colleagues at Karlstad University to develop an approach for resolving issues at several locations. The approach included collecting hydraulic and biological information and testing design alternatives to aid development of effective passage systems for fish migrating downstream.

JOHN FERGUSON, PH.D.

Senior Fisheries Scientist

Fish Screen System Design for a Large Water Intake Structure on the Sacramento River, Sacramento, California

Starting in 2012, Dr. Ferguson has been retained to advise NOAA Fisheries West Coast Region's Central Valley Office on how to design a large (3,000 cubic feet per second) riverbank fish screen system as part of the North Delta Diversion. He authored a report for NOAA describing the history of fish passage screen design criteria development in the Pacific Northwest. The report provided the design team with an improved understanding of how the criteria were developed and evaluated.

Independent Review of White Sturgeon Indexing and Monitoring Proposals, Wenatchee, Washington

In 2011, Dr. Ferguson led an independent review of four proposals to conduct a study to index and monitor white sturgeon (*Acipenser transmontanus*) populations in the Rocky Reach Reservoir for the Chelan PUD. The reviewers included sturgeon experts from the U.S. Geologic Survey (Cook, Washington) and U. S. Fish and Wildlife Service (Bozeman, Montana).

REPRESENTATIVE PROJECTS (NOAA FISHERIES)

A Science Plan for California's Central Valley Project, Sacramento, California

In response to the National Research Council's review of the Bay Delta Conservation Plan, Dr. Ferguson led an effort within NOAA Fisheries to quickly develop a framework for resolving critical uncertainties surrounding balancing water management and recovering listed stocks in California's Central Valley. The framework identified the need to do the following: 1) reconstruct how salmon used habitats historically; 2) quantify the existing habitat capacity for each stock and identify limiting factors; 3) develop a monitoring plan for assessing production, migration timing, and responses to flow management scenarios; 4) test operational alternatives using a model-based decision framework; 5) adaptively manage the program; and 6) research key uncertainties (e.g., hatchery production, water quality, toxics, and variability in ocean productivity).

Fish Passage at Mekong River Dams, Vientiane, Laos

In 2008, Dr. Ferguson participated on a panel of fish passage experts from Europe, North America, South America, Australia, Asia, and Southeast Asia to assess Mekong River fish passage issues. He concluded that the Mekong River Commission had adopted a flawed approach for passing 125 species of fish at 11 proposed mainstem dams and presented an alternative approach.

International Expert Group, Stornorrfors Power Station, Umeå, Sweden

In 2008, Dr. Ferguson helped organize a group of international fish passage experts from the U.S., Canada, Norway, and Sweden to review conditions below a major hydropower station where only 40% of the adult fish were able to pass. The panel recommended several design options that are being considered by the Swedish Environmental Court.

JOHN FERGUSON, PH.D.

Senior Fisheries Scientist

NOAA Technical Memorandum in Support of the 2008 FCRPS Biological Opinion

In 2005, Dr. Ferguson led a team of scientists that synthesized a large amount of research information into the NOAA Technical Memorandum titled *Passage of adult and juvenile salmonids through federal Columbia River power system dams.*

PEER-REVIEWED PUBLICATIONS

Chamberlin, J.W., T.E. Essington, **J.W. Ferguson**, and T.P. Quinn, 2011. The influence of hatchery rearing practices on salmon migratory behavior: Is the tendency of Chinook salmon to remain within Puget Sound affected by size and date of release? *Trans. Am. Fish. Soc.* 140:1398-1408.

Ferguson, J., M. Healey, P. Dugan and C. Barlow, 2011. Potential effects of mainstem dams on Mekong River fisheries: lessons from water resource development in the Fraser and Columbia Rivers. *Environmental Management* 47:141-159.

Dugan, P., C. Barlow, A. Agostinho, E. Baran, G. Cada, D. Chen, I. Cowx, **J. Ferguson**, T. Jutagate, M. Mallen-Cooper, G. Marmulla, J. Nestler, M. Petrere, R. Welcomme, K. Winemiller, 2010. Fish migration, dams, and loss of ecosystem services in the Mekong basin. *Ambio* 39:344-348.

Lundqvist, H, K.Leonardsson, U. Carlsson, S. Larsson, J. Nilsso, J. Östergren, L. Karlsson, P. Rivinoja, I. Serrano, D. Palm, **J. Ferguson**, 2009. Monitoring of fish in running waters: the Sävarån case study on salmon and sea trout juveniles in northern Sweden. C. Hurford, M. Schneider & I. Cowx (eds.), *Conservation Monitoring in Freshwater Habitats, Springer, the Netherlands*.

Lindley S. (and 24 authors), 2009. "What caused the Sacramento River fall Chinook stock collapse?" Pre-publication report to the Pacific Fishery Management Council. Available at: http://swr.nmfs.noaa.gov/media/salmondeclinereport.pdf

Ferguson, J., G. Ploskey, K. Leonardsson, R. Zabel, and H. Lundqvist, 2008. Combining turbine blade-strike and life-cycle models to assess mitigation strategies for fish passing dams. *Can. J. Fish. Aquat. Sci.* 65:1568–1585.

Ferguson, J., B. Sandford, R. Reagan, L. Gilbreath, E. Meyer, R. Ledgerwood and N. Adams, 2007. Bypass system modification at Bonneville Dam on the Columbia River improved the survival of juvenile salmon. *Trans. Am. Fish. Soc.* 137:1487-1510.

Ferguson, J., R. Absolon, T. Carlson, B. Sandford, 2006. Evidence of delayed maturity in juvenile pacific salmon passing through Kaplan turbines Columbia River dams. *Trans. Am. Fish. Soc.* 135: 139-150.

Ferguson, J., G. Matthews, R. McComas, R. Absolon, D. Brege, M. Gessel, and L. Gilbreath, 2005. Passage of adult and juvenile salmonids through federal Columbia River power system dams. NOAA Tech. Memo. NMFS-NWFSC-64. 160 p.

Ryan, B., S. Smith, J. Butzerin, and **J. Ferguson**, 2003. Relative vulnerability to avian predation of PIT-tagged juvenile salmonids in the Columbia River estuary, 1998-2000. *Trans. Am. Fish. Soc.* 132: 275-288.

MISCELLANEOUS PUBLICATIONS, REPORTS, AND PROCEEDINGS

Effects of Flood Reduction Alternatives and Climate Change on Aquatic Species, 2014. Prepared by The Aquatic Species Enhancement Plan Technical Committee of the Chehalis Basin Strategy: Reducing Flood Damage and Enhancing Aquatic Species. Prepared for the Chehalis Basin Work Group. Draft report dated July 23, 2014. 117 p. plus 3 technical appendices.

Aquatic Species Enhancement Plan Draft Data Gaps Report, 2014. Prepared by The Aquatic Species Enhancement Plan Technical Committee of the Chehalis Basin Strategy: Reducing Flood Damage and Enhancing Aquatic Species. Prepared for the Chehalis Basin Work Group. Draft report dated July 18, 2014. 23 p.

Science Advisory Board (SAB) Trinity River Restoration Program, 2014. Review of the Trinity River Restoration Program Following Phase 1, with Emphasis on the Program's Channel Rehabilitation Strategy. Report prepared by the SAB with assistance from Anchor QEA LLC, Stillwater Sciences, BioAnalysts, Inc., and Hinrichsen Environmental Services. Report dated April 2014, 46 p. plus 8 technical appendices.

Anchor QEA, LLC, 2013. *Application of NMFS Fish Screening Criteria in Design of the North Delta Diversion Screened Intake System*. Report for the National Marine Fisheries Service. 50 p.

BioAnalysts, Inc. and Anchor QEA, LLC, 2013. *Federal Columbia River Power System Improvements and Operations Under the Endangered Species Act–A Progress Report*. Prepared for the Bonneville Power Administration. 58 p. plus 2 appendices.

Jacobson, K., B. Peterson, M. Trudel, **J. Ferguson**, D. Welch, A. Baptista, B. Beckman, R. Brodeur, E. Casillas, R. Emmett, J. Miller, C. Morgan, D. Teel, T. Wainwright, L. Weitkamp, J. Zamon and K. Fresh, 2012. The marine ecology of Columbia River Basin Salmonids: A synthesis of research 1998-2011. Report by NOAA Fisheries, Canada Dept. of Fisheries and Oceans, and Kintama Research to the Northwest Power and Conservation Council, Portland, Oregon. 97 p.

Ferguson, J and M. Healey, 2009. Hydropower in the Fraser and Columbia Rivers: a contrast in approaches to fisheries protection. *Mekong River Commission, Catch & Culture* 15(1): 4-11. Accessed online September 2009: http://www.mrcmekong.org

Ferguson, John W., 2008. Behavior and Survival of Fish Migrating Downstream in Regulated Rivers. Doctoral Thesis, Swedish University of Agricultural Sciences, Umeå, Sweden.

Ferguson, J., T. Forseth, R. Goosney, K Leonardsson, H. Lundqvist, S. Lundström, E. Meyer, P. Rivinoja, D. Scruton, and J. Williams, 2008. Preliminary recommendations for improving adult fish passage at the Stornorrfors Power Station on the River Umeälven, Sweden. Report by an International Expert Group on Fish Passage to the Stornorrfors Fish Passage Work Group, Umeå Sweden. 24 p.

Sheridan, P., **J. Ferguson**, and S. Downing (editors), 2007. *Report of the National Marine Fisheries Service Workshop on Advancing the State of Electronic Tag Technology and Use in Stock Assessments*. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-F/SPO.

Ferguson, J. W., T. Poe, T. Carlson. 1998. The design, development, and evaluation of surface oriented juvenile salmonid bypass systems on the Columbia River, USA In: Proceedings, International Conference on Fish Migration & Fish Bypass-Channels, Vienna, Austria. September 24-26, 1996.

Ferguson, J., R. Pearce, M. Lindgren, J. Nestler, 1995. Chapter 7: Fish Passage and Protection. In: *Guidelines for Design of Intakes for Hydroelectric Plants*. American Society of Civil Engineers, New York, New York

Turner, A.R. Jr., **J.W. Ferguson**, T.Y. Barila, M.F. Lindgren, 1993. Development and refinement of turbine intake screen technology on the Columbia River. In: Proceedings, Bioengineering Section Symposium. 123rd Annual Meeting, American Fisheries Society, Portland, Oregon. August 29 to September 2, 1993.

Ferguson, J., 1993. Relative survival of juvenile Chinook salmon (*Oncorhynchus tshawytscha)* through Bonneville Dam on the Columbia River. In: *Proceedings of the Workshop on Fish Passage at Hydroelectric Developments*. March 26 to 28, 1991. St. John's, Newfoundland. *Canadian Technical Report of Fisheries and Aquatic Sciences* No. 1905, February 1993.

GEOFFREY A. MCMICHAEL

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(509)531-8065

EDUCATION

Master of Science, Fish and Wildlife Management, Montana State University, Bozeman. June 1989.

Bachelor of Science, Biological Sciences, Fish and Wildlife Management option, Montana State University, Bozeman. June 1987.

EXPERIENCE

Geoff moved from the Pacific Northwest National Laboratory (PNNL) to private consulting in June 2014. Prior to forming Mainstem Fish Research, Mr. McMichael worked on a wide variety of aquatics projects at PNNL between September 1999 and May 2014. Most recently at PNNL, Geoff was working on the development and implementation of a new acoustic telemetry system for use on very small fish. Mr. McMichael has been a Project Manager and Principal Investigator for many acoustic telemetry projects using the newly-developed Juvenile Salmon Acoustic Telemetry System (JSATS). He was the PNNL Coordinator for the JSATS. These projects have addressed critical uncertainties regarding juvenile Chinook salmon and steelhead survival and passage behavior in the Snake and Columbia rivers and in the near shore Pacific Ocean. He has also been principle investigator in extensive evaluations of the effects of hydropower operations on the fall Chinook salmon populations in the mid-Columbia River. Other projects include ADCP survey of water velocities upstream of Grand Coulee Dam, movement and behavior of net-pen rainbow trout in Lake Rufus Woods, conducting evaluations of the effectiveness of fish screening facilities in the Yakima River basin and conducting investigations of smolt losses and low water evaluations at Chandler Canal in the Yakima River Basin. Geoff has also been active in other research areas including ecological interactions between hatchery and wild salmonids, behavioral ecology, fish population monitoring, fish capture methods development, input to Ecosystem Diagnosis and Treatment modeling efforts, predator-prey interactions, and electrofishing injury. He managed over $30M in research over the past 15 years and has published over 100 technical reports and papers, including the most cited paper in *Fisheries* for the past three years.

PRIOR EXPERIENCE

Dec. 1989 – Sept. 1999

Species Interactions/Ecological Risk Assessment Biologist, Ecological Interactions Team, Washington Department of Fish & Wildlife, Ellensburg, Washington. Designed and implemented experimental species interactions research. Research areas included hatchery-wild interactions, electrofishing injury and methods development, trapping of anadromous and resident fishes in fishways at dams and with mobile traps, and predator-prey relationships. Collected, entered, analyzed and interpreted data and presented results in annual reports, at technical and non-technical meetings, and in peer-reviewed publications. Supervised one to three biologists and up to five technicians. Prepared and refined project management plans, proposals and budgets. Involved in the hiring and evaluation of project personnel.

June 1989 - Nov. 1989

Fishery Biologist, Nature Conservancy, Montana Natural Heritage Program, Helena, Montana. Organized and conducted a study on the distribution, relative abundance, and habitat utilization of Montana Arctic grayling in the Big Hole River. Supervised two employees, operated and fabricated many electrofishing devices, collected and analyzed data and prepared a completion report. Presented findings at an annual AFS division meeting.

June 1987 - May 1989

Graduate Research Assistant, Montana State University, Bozeman, Montana. Performed extensive creel survey study on the Madison River, comparing angling success with stream temperature. Collected, analyzed, and interpreted field data, prepared a thesis, and presented results at an annual AFS meeting. Published a paper in a peer-reviewed journal.

PROFESSIONAL AFFILIATIONS

American Fisheries Society member since 1988

Editorial Board of *Animal Biotelemetry* since journal inception in 2013

AWARDS

1994 Outstanding Contribution Award for Research from Washington Trout

1999 Best Science Award, Washington Department of Fish and Wildlife

1999 Nominated for Best Paper Award, North American Journal of Fisheries Management

2000 Best Paper Award, Washington Department of Fish and Wildlife

2001-2013 Numerous PNNL Outstanding and Exceptional Performance Awards

2005 Business Achievement Award from Environmental Business Journal

PUBLICATIONS

McMichael, G.A., and C.M. Kaya. 1991. Relations among stream temperature, angling success for rainbow and brown trout, and fisherman satisfaction. North American Journal of Fisheries Management 11:190-199.

McMichael, G.A. 1993. Examination of electrofishing injury and short-term mortality in hatchery rainbow trout. North American Journal of Fisheries Management 13:229-233.

McMichael, G. A., C. S. Sharpe, and T. N. Pearsons. 1997. Effects of residual hatchery-reared steelhead on growth of wild rainbow trout and spring Chinook salmon. Transactions of the American Fisheries Society 126:230-239.

McMichael, G. A., and T. N. Pearsons. 1998. Effects of wild juvenile spring Chinook salmon on growth and abundance of wild rainbow trout. Transactions of the American Fisheries Society 127:261-274.

McMichael, G. A., A. L. Fritts, and T. N. Pearsons. 1998. Electrofishing injury to stream salmonids; injury assessment at the sample, reach, and stream scales. North American Journal of Fisheries Management 18:894-904.

McMichael, G. A., T. N. Pearsons, and S. A. Leider. 1999. Behavioral interactions among hatchery-reared steelhead smolts and wild *Oncorhynchus mykiss* in natural streams. North American Journal of Fisheries Management 19:948-956.

McMichael, G. A., T. N. Pearsons, and S. A. Leider. 2000. Minimizing ecological impacts of hatchery-reared juvenile steelhead on wild salmonids in a Yakima basin watershed. Pages 365-380 *in* E. E. Knudsen, and four co-editors, Sustainable fisheries management: Pacific salmon. CRC Press, Boca Raton, Florida.

McMichael, G. A., and T. N. Pearsons. 2001. Upstream movement of residual hatchery steelhead trout into areas containing bull trout and cutthroat trout. North American Journal of Fisheries Management 21:943-946.

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Perkins, W., M. Richmond, and G. McMichael, 2004. Two-Dimensional Modeling of Time-Varying Hydrodynamics and Juvenile Chinook Salmon Habitat in the Hanford Reach of the Columbia River. In Critical Transitions in Water and Environmental Resources Management, Proceedings of the 2004 World Water and Environmental Resources Congress, June 27-July 1, Salt Lake City, Utah, Sehlke, G., D. F. Hayes, and D. K. Stevens, eds. ASCE. Reston, Virginia.

McMichael, G. A., C. A. McKinstry, J. A. Vucelick, and J. A. Lukas. 2005. Fall Chinook salmon spawning activity versus daylight and flow in the tailrace of a large hydroelectric dam. North American Journal of Fisheries Management 25:573- 580.

McMichael, G.A., C. L. Rakowski, B. B. James, and J. A. Lukas. 2005. Estimated fall Chinook salmon survival to emergence in dewatered redds in a shallow side channel of the Columbia River. North American Journal of Fisheries Management 25:876-884.

Pearsons, T. N., S. R. Phelps, S. W. Martin, E. L. Bartrand, and G. A. McMichael. 2007. Gene flow between resident and anadromous rainbow trout in the Yakima Basin: Ecological and genetic evidence. I*n* P. Howell and D. Buchannan, editors, Redband Trout: Resilience and Challenge in a Changing Landscape. Oregon Chapter, American Fisheries Society.

Bellgraph, B. J., G. A. McMichael, R. P. Mueller, and J. L. Monroe. 2009. Behavioural response of juvenile Chinook salmon *Oncorhynchus tshawytscha* during a sudden temperature increase and implications for survival. Journal of Thermal Biology, doi:10.1016/j.jtherbio.2009.10.001

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Titzler, P. S., G. A. McMichael, and J. A. Carter. 2010. Autonomous acoustic receiver deployment and mooring techniques for use in large rivers and estuaries. North American Journal of Fisheries Management 30:853-859.

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McMichael, G. A., R. A. Harnish, M. A. Weiland, Z. Deng, and M. B. Eppard. 2011. Fish passage: A new tool to investigate fish movement: JSATS. Hydro Review 30:34-42.

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Harnish, R. A., G. E. Johnson, G. A. McMichael, M. S. Hughes, and B. D. Ebberts. 2012. Effect of migration pathway on survival and travel time of acoustic-tagged juvenile salmonids in the Columbia River estuary. Transactions of the American Fisheries Society 141:507-519.

McMichael, G. A., A. C. Hanson, R. A. Harnish, and D. M. Trott. 2013. Juvenile salmonid migratory behavior at the mouth of the Columbia River and within the plume. Animal Biotelemetry 2013 1:14. doi:10.1186/2050-3385-1-14

Harnish, R. A., R. Sharma, G. A. McMichael, R. B. Langshaw, and T. N. Pearsons. 2014. Effect of hydroelectric dam operations on the freshwater productivity of a Columbia River fall Chinook salmon population. Canadian Journal of Fisheries and Aquatic Sciences 71:1-14. doi:10.1139/cjfas-2013-0276.

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Curriculum Vitae William D. Muir

Current Occupation: Retired (October 2012).

Most Recent Employer: National Marine Fisheries Service, Northwest Fisheries Science Center, Fish Ecology Division, 5501 A Cook Underwood Rd., Cook, WA.

Last Position Held: Supervisory Fisheries Research Biologist (ZP04-05).

Education: M.S. Biology, Portland State University, 1991. B.S. Biology, Portland State University, 1977.

Professional experience: Worked as a Fisheries Research Biologist for the National Marine Fisheries Service for more than 30 years, working primarily on juvenile salmonid behavior and migration throughout the Columbia River Basin. Participated in juvenile salmonid research in the Columbia River estuary (distribution, movement, food habits, interactions with other species), at Snake and Columbia River Dams (fish guidance studies, bypass evaluations, behavioral and physiological status of smolts and their effects on fish guidance), at hatcheries (homing studies, photoperiod and temperature manipulation studies and their effect on migration and survival), and most recently on reach survival and fish transport studies.

Most recent assignments: At the time of retirement, was a Supervisory Fishery Research Biologist and Team Leader for staff conducting studies of fish transport and passage survival. Also was the principal investigator for survival studies of PIT-tagged juvenile salmonids migrating through the Snake and Columbia River hydropower system and a study that examined the relationship among time of ocean entry, physical and biological characteristics of the Columbia River estuary and plume environment, and adult return rates of spring Chinook salmon.

Duties included preparation of research proposals, study design, planning and execution of research, analysis of results, preparation of contract reports and papers for publication in peer-reviewed journals, presentations of results at policy and scientific meetings (local, national, and international), and attending meetings with state, tribal, and federal scientists for planning and coordination of research.

I also served as the NMFS Scientific Coordinator/Advisor for the Independent Scientific Advisory Board (ISAB) from its inception in 1995 until retirement in 2012.

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Publications:

Emmett, R.L., W.D. Muir, and R.D. Pettit. 1982. Device for injecting preservative into the stomach of fish. Progressive Fish-Culturist 44(2):107-108.

Emmett, R.L., G.T. McCabe Jr., and W.D. Muir. 1990. Observations on the effects of the 1980 Mount St. Helens eruption on Columbia River estuarine fishes: Implications for dredging in Northwest estuaries. Pages 74-91 **In** Effects of Dredging on Anadromous Pacific Coast Fishes, C.A. Simenstad (Ed), Univ. of Wash., Seattle.

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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Coordinating Committees	**Date:**	November 21, 2014
From:	Michael Schiewe, Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the October 28, 2014 HCPs Coordinating Committees Conference Call		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met by conference call, on Tuesday, October 28, 2014, from 9:30 am to 11:30 am. Attendees are listed in Attachment A of these meeting minutes.

ACTION ITEM SUMMARY

- Coordinating Committees representatives will submit comments or an email confirming "no comments" on the Bailey Douglas PUD Land Use Permit Application to Tom Kahler no later than November 5, 2014 (Item I-C).
- Douglas PUD will provide a revised Methow River Coho Salmon Phase Designation Statement of Agreement (SOA), with the Colville Confederated Tribes' (CCT's) edits incorporated, to Kristi Geris for distribution to the Coordinating Committees; Douglas PUD will request approval of the revised SOA during the Coordinating Committees meeting on November 18, 2014 (Item II-A).
- Douglas PUD will provide the draft 2014 Wells Post-Season Bypass Report for review to Kristi Geris for distribution to the Coordinating Committees (Item II-B).
- Douglas PUD will provide the draft conceptual box design for the Wells Dam low-level fishway entrances to Kristi Geris for distribution to the Coordinating Committees (Item II-D).
- Douglas PUD will provide the original HCP Chair position Scope of Work and Qualifications document to Kristi Geris for distribution to the Coordinating Committees (Item II-F).
- Douglas PUD will provide the current HCP Hatchery Committees and Coordinating Committees Chair candidate lists, including whether the respective

candidate is also an Aquatic Settlement Workgroup (SWG) Chair candidate, to Kristi Geris for distribution to the Coordinating Committees (Item II-F).

- Coordinating Committees representatives will review the HCP Coordinating Committees Chair position documents and will: 1) contact any additional qualified candidates to gauge interest in the position; 2) have interested candidates contact Mike Schiewe to discuss the responsibilities of the position; and 3) provide a résumé or curriculum vitae (CV) from interested candidates to Tom Kahler, Lance Keller, and Kristi Geris by November 4, 2014 (Item II-F).
- Chelan PUD will provide a draft SOA outlining completion of the Rocky Reach and Rock Island HCP requirements for conducting additional run-timing and species composition monitoring to verify that the normal bypass operating period (April 1 through August 31) is adequately protecting 95% of the spring and summer migrations of juvenile Plan Species (Item III-A).
- Kristi Geris will contact Julene McGregor (Douglas PUD Information System Staff) to request read-only access to the final document library on the HCP Hatchery Committees Extranet site for John Penny and Denise McCarver (Eastbank Hatchery Staff), as approved by the Coordinating Committees (Item IV-A). *(Note: Geris sent an email to McGregor following the meeting on October 28, 2014, requesting access for Penny and McCarver, as discussed, and McGregor set up access for Penny and McCarver on October 29, 2014, as requested.*)
- **The next Coordinating Committees meeting will be on November 18, 2014 and will be held by conference call (Item VI-A).**
- **The Coordinating Committees meeting scheduled for December 23, 2014, may be rescheduled to December 16, 2014, and may be held by conference call, which will be further discussed during the Coordinating Committees meeting on November 18, 2014 (Item VI-A).**

DECISION SUMMARY

- The Coordinating Committees representatives present approved the HCP Hatchery Committees Approved Broodstock Collection Protocols SOA, as revised (Item I-D).

(Note: Kirk Truscott provided the CCT's approval of the SOA via email on October 24, 2014.)

AGREEMENTS

- Coordinating Committees representatives present agreed to provide John Penny and Denise McCarver read-only access to the final document library on the HCP Hatchery Committees Extranet site (Item IV-A).
- Coordinating Committees representatives present agreed that once the Coordinating Committees approve HCP Extranet site access for a particular position (e.g., Hatchery Complex Manager or Hatchery Monitoring and Evaluation [M&E] Support Staff), succeeding staff filling those positions will be granted HCP Extranet site access without requiring an additional review and approval process (Item IV-A).

REVIEW ITEMS

- Kristi Geris sent an email to the Coordinating Committees on September 23, 2014, containing the HCP Chair position Scope of Work and Qualifications document for review. Edits and comments on these documents will be discussed during the joint HCP Policy Committee and Coordinating Committees on November 6, 2014 (Item II-F).
- Kristi Geris sent an email to the Coordinating Committees prior to the meeting on October 28, 2014, notifying them that the draft 2014 Rocky Reach and Rock Island Fish Spill Report is available for review. Edits and comments are due to Lance Keller prior to the Coordinating Committees meeting on November 18, 2014, when Chelan PUD will request approval of the report (Item III-B).

DOCUMENTS FINALIZED

- Kristi Geris sent an email to the Coordinating Committees on November 6, 2014, notifying them that no comments were received on the Bailey Douglas PUD Land Use Permit Application following a 60-day review period, which ended on November 5, 2014. As noted in the email, Douglas PUD will proceed with this application.

I. Welcome

A. Review Agenda (Mike Schiewe)

Mike Schiewe welcomed the Coordinating Committees and asked for any additions or other changes to the agenda. No additions or changes were requested.

B. Meeting Minutes Approval (Mike Schiewe)

The Coordinating Committees reviewed the revised draft Rock Island Coordinating Committee September 22, 2014 meeting minutes. Kristi Geris said that all comments and revisions received from members of the Rock Island Coordinating Committee were incorporated into the revised minutes, and there were no outstanding edits or questions to discuss. Rock Island Coordinating Committee members present approved the September 22, 2014 meeting minutes, as revised. Geris will finalize the minutes and distribute them to the Coordinating Committees.

The Coordinating Committees reviewed the revised draft Wells, Rocky Reach, and Rock Island September 23, 2014 meeting minutes. Geris said that all comments and revisions received from members of the Coordinating Committees were incorporated into the revised minutes, and there were no outstanding edits or questions to discuss. Coordinating Committees members present approved the September 23, 2014 meeting minutes, as revised. Geris will finalize the minutes and distribute them to the Coordinating Committees.

C. Last Meeting's Action Items (Mike Schiewe)

Action items from the Coordinating Committees conference call on September 22, 2014, and follow-up discussions were as follows: *(Note: italicized item numbers below correspond to agenda items from the September 22, 2014 meeting.)*

- *Chelan PUD will contact WDFW and the CCT to review and request approval of Chelan PUD's request to modify one of the middle adult fishway side-entrances at Rock Island Dam to provide an additional fish passage route into the middle fishway at low tailwater elevations (Item II-A).*

Chelan PUD contacted WDFW and the CCT and they approved the request via email on September 22 and 23, 2014, respectively.

Action items from the Coordinating Committees conference call on September 23, 2014, and follow-up discussions were as follows: *(Note: italicized item numbers below correspond to agenda items from the September 23, 2014 meeting.)*

- *Tom Kahler will provide Cory Kamphaus (Yakama Nation [YN]) with excerpts from the Coordinating Committees January 28, 2014 meeting minutes regarding the YN's original proposal to extend coho salmon trapping activities at Wells Dam and Bob Rose will review with Kamphaus the Coordinating Committees' approval and contingencies for approval of the YN coho salmon trapping request (Item I-C).*
  Kahler provided Kamphaus with the excerpts following the meeting on September 23, 2014, and Rose followed up with Kamphaus, as noted.
- *Tom Kahler will contact Cory Kamphaus to remind him that the Coordinating Committees' approval of extended coho salmon trapping at Wells Dam stipulated that the YN would monitor detection times of steelhead and fall Chinook salmon at Rocky Reach Dam and Wells Dam. Kahler will also confirm that Kamphaus is aware that both summer and fall Chinook salmon that were passive integrated transponder (PIT)-tagged in the Wells Reservoir will be reported in the PIT-Tag Information System (PTAGIS) as summer Chinook salmon only (Item I-C).*
  Kahler notified Kamphaus of this information via email following the meeting on September 23, 2014.
- *Scott Carlon will discuss internally with the National Marine Fisheries Service (NMFS) the delegation of approval of the annual Broodstock Collection Protocols to their HCP Coordinating Committees representative (Item I-D).*
  Carlon indicated that he received approval to delegate approval of the annual Broodstock Collection Protocols to their HCP Coordinating Committees representative.
- *Coordinating Committees representatives will submit comments or an email confirming "no comments" on the Bailey Douglas PUD Land Use Permit Application to Tom Kahler no later than November 5, 2014 (Item II-B).*
  This action item will be carried forward.

- *Chelan PUD will develop a memorandum summarizing Rock Island Dam and Rocky Reach Dam 2014 summer bypass operations, specifically the extended operations in September, for discussion at the Coordinating Committees meeting on October 28, 2014 (Item III-A).*
  Lance Keller provided a draft 2014 Rocky Reach and Rock Island spill report and a September 2014 Rocky Reach and Rock Island bypass operations summary to Kristi Geris prior to the meeting on October 28, 2014, which Geris distributed to the Coordinating Committees that same day. These will be discussed further during today's conference call.
- *Tom Kahler will provide HCP Coordinating Committees Chair position documents to Kristi Geris for distribution to the Coordinating Committees (Item V-A).*
  Kahler provided a list of qualifications, Scope of Work, and potential candidate résumés and CVs to Geris following the meeting on September 23, 2014, which Geris distributed to the Coordinating Committees representatives and alternates that same day.
- *Coordinating Committees representatives will review the HCP Coordinating Committees Chair position documents and will: 1) contact qualified candidates to gauge interest in the position; 2) have interested candidates contact Mike Schiewe to discuss the responsibilities of the position; and 3) provide a résumé or CV from interested candidates to Tom Kahler, Lance Keller, and Kristi Geris (Item V-A).*
  This will be discussed further during today's conference call.

D. HCP Hatchery Committees Approved Broodstock Collection Protocols SOA (Mike Schiewe, Scott Carlon, and Tom Kahler)

Mike Schiewe recalled the key components of the HCP Hatchery Committees approved Broodstock Collection Protocols SOA that was distributed to the Coordinating Committees by Kristi Geris on September 19, 2014, including that: 1) the HCP Hatchery Committees agree to develop and submit to NMFS annual Broodstock Collection Protocols each year by April 15; 2) Permit Holders will prepare the draft protocols for HCP Hatchery Committees and Coordinating Committees review no later than 10 days prior to their respective February meetings; 3) participation in the development, submission, and approval of the annual protocols within the Committees by the NMFS HCP Hatchery Committees and

Coordinating Committees representatives will constitute NMFS acceptance and approval of the protocols; and 4) Coordinating Committees approval meets the Wells HCP requirement for approval of broodstock collection and M&E activities involving the Wells Project facilities.

The Coordinating Committees representatives present approved the HCP Hatchery Committees Approved Broodstock Collection Protocols SOA, as revised.
(Note: Kirk Truscott provided the CCT's approval of the SOA via email on October 24, 2014, and Geris distributed the final SOA [Attachment B] to the Coordinating Committees following the meeting on October 28, 2014.)

II. Douglas PUD

A. DECISION: Methow River Coho Salmon Phase Designation SOA (Tom Kahler)

Tom Kahler said that he received a request prior to the meeting on October 28, 2014, from the YN for additional time to review the Methow River Coho Salmon Phase Designation SOA that was distributed to the Coordinating Committees by Kristi Geris on October 17, 2014. Bob Rose said that there was nothing of initial concern about the draft SOA, however, the YN are not ready to approve the SOA until they have additional time for review. Kahler also noted that the CCT provided edits on the SOA on October 24, 2014, which Geris distributed to the Coordinating Committees that same day. Kahler said that the CCT's edits included two word modifications, as follows: 1) "…Douglas PUD provided *cash* support for the YN coho salmon reintroduction program…" was revised to "…Douglas PUD provided *monetary* support for the YN coho salmon reintroduction program…"; and 2) "indefinite" was removed from "…the indefinite continuation of that surrogacy..."

Kahler said that Douglas PUD will provide a revised Methow River Coho Salmon Phase Designation SOA, with the CCT's edits incorporated, to Geris for distribution to the Coordinating Committees, and that Douglas PUD will request approval of the revised SOA during the Coordinating Committees meeting on November 18, 2014.

B. Draft 2014 Wells Dam Post-Season Bypass Report (Tom Kahler)

Tom Kahler said that each year, Dr. John Skalski and Dr. Richard Townsend of Columbia Basin Research develop a report summarizing the performance of Wells Dam bypass operations for the current year. Kahler explained that Skalski and Townsend estimate the proportion of the migration of each salmonid stock covered by bypass operations at Wells Dam (and determine whether passage was provided for 95% of the migration) using historical daily counts collected at the juvenile sampling facility at Rocky Reach Dam and adding the travel time from Wells Dam to Rocky Reach Dam. Kahler said that the draft report was recently received from Skalski and Townsend, however, Douglas PUD has not yet had the opportunity for internal review. Kahler summarized the preliminary estimated proportions covered as follows: 96.80% for subyearling Chinook salmon, 99.99% for coho salmon, 100.00% for sockeye salmon, 99.75% for steelhead, and 80.65% for yearling Chinook salmon. He noted the low estimated proportion covered for yearling Chinook salmon and said that when he reviewed those data, he noticed a spike in hatchery fish on April 11, 2014. He said that average travel time for yearling Chinook salmon is based on estimates from a 2010 survival verification study, while average travel time for other salmonid species are not (5 days for yearling Chinook salmon versus 2 days for other species). He said he thought that hatchery fish drive the calculations because they are numerically dominant; however, a review of adipose (ad)-present fish data for 2014 from Rocky Reach indicated less than 95% bypass coverage at Wells for the ad-present component of the run as well. He speculated that failure to achieve the 95% outmigration objective for yearling Chinook salmon was partially related to the earlier than usual release date for Chelan Falls summer Chinook salmon yearlings, which were released on April 10, 2014, instead of the usual April 15 release date; and partially to Chief Joseph Hatchery (CJH) fish (a 44,000 fish program) that were released from Omak Pond on April 1, 2014. Kahler said that he believes the more pressing issue is to make sure passage is provided for wild fish, so he has requested 2012-2013 migration sampling data for yearling Chinook salmon from Chelan PUD to review ad-present fish passage. Kahler said that based on further review, the start date for Wells Dam bypass operations may need to be adjusted to start earlier than April 9.

Kahler said that once available, Douglas PUD will provide the draft 2014 Wells Post-Season Bypass Report for review to Kristi Geris for distribution to the Coordinating Committees.

C. Twisp River Population Assessment (Tom Kahler)

Tom Kahler updated the Coordinating Committees on a Twisp River spring Chinook and steelhead population study that Greg Mackey and Chas Kyger (Douglas PUD) have been conducting with our M&E contractor, WDFW. Kahler explained that the Douglas PUD Hatchery M&E Plan and new hatchery permits will require a population estimate of the juveniles of those species to inform the evaluation of the effects of the hatchery program on the productivity of the wild population. Those requirements specifically include reporting the proportion of hatchery-origin spawners (pHOS) and proportionate natural influence (PNI), and the effects on freshwater productivity of the manipulation of pHOS and PNI. He said that Douglas PUD has been relying on two rotary screw traps (RSTs) for data on juvenile abundance; one located in the mainstem Methow downstream of the confluence with the Twisp River, and one located in the lower Twisp River.

Kahler said that data collected at the RST on the mainstem Methow are of limited usefulness because the trap is often removed from the flow during large freshets. He explained that a spike in discharge is typically accompanied by an increase in numbers of outmigrants, but that the trap is only in the river to collect data during the initial period of the increased flow and then again as flow declines. He said that an average number of emigrants during the trap outage is then calculated using only two data points—numbers of emigrants at the time of trap removal, and number at the time of reinstallation. Unfortunately, there is no way to accurately estimate the true number of emigrants missed during the trapping outage, but the estimates used in no way resemble the spike in emigrants observed in freshets during which the traps remain operational. He added that population size estimates from these data are so unreliable that they were not used during the recalculation of hatchery obligations.

Kahler said that the trap located in the lower Twisp River has higher collection efficiency and fewer trapping outages; however, even the population estimates derived from Twisp RST data have broad confidence intervals. He said that in an effort to determine how to improve population abundance estimates, Douglas PUD is implementing a population abundance pilot study in the Twisp that will provide PIT-tag-based population estimates for comparison with RST population estimates. He said that the study uses a stratified population estimate. He said that methods include electrofishing, mark and recapture, survival data collected at in-stream and dam PIT-tag detection, and modeling. He said that field work for this study was completed a few weeks ago, and Mackey and Kyger are now getting the data in a form that Dr. Rebecca Buchanan and Dr. John Skalski will use for statistical analysis.

D. Wells Dam Low-Level Fishway Entrances Update (Tom Kahler)

Tom Kahler recalled discussing with the Coordinating Committees the possibility of reopening the low-level entrances at Wells Dam to test improving Pacific lamprey passage, while still excluding salmonids from accessing the area. He indicated that the low-level entrances are located below the side entrances, both of which have been closed for years. He also recalled Bryan Nordlund's (NMFS, retired) concern that reopening this entrance would increase the necessary auxiliary water supply flow required to achieve the required head differential between the collection gallery and the tailrace, which would increase pressure on the diffuser grating.

Kahler said that flow through a wide open low-level entrance would be about 220 cubic feet per second (cfs). He said that Douglas PUD discussed with engineers how to reduce this flow without creating a jet at the orifice and they came up with a conceptual design for a box structure that could be installed inside of the low-level entrance that would reduce the total discharge and velocity through the low-level entrance. Kahler said that Douglas PUD discussed this design, which uses a series of panels with orifices to reduce flow, with Aaron Beavers (NMFS, Fish Passage Engineer). Kahler said that Beavers was concerned with the maze-like features of the proposed design and recommended a slightly modified design that used bollards, instead of panels, to diminish the flow from 220 cfs to 1.5 cfs. Kahler said that Douglas PUD and Beavers are currently working out the details of a hybrid of the two designs and that he will provide the draft conceptual box design to Kristi Geris for distribution to the Coordinating Committees when it is available.

Kahler noted that he is still waiting for an official request from the Aquatic SWG to reopen the low-level entrances; however, he anticipated receiving a request in the next couple of weeks. He added that the Coordinating Committees will likely need to approve the request prior to the next Coordinating Committees meeting on November 18, 2014, to allow adequate time for Douglas PUD to arrange for installation of the box structure during the annual winter maintenance at Wells Dam. Mike Schiewe said that the next Aquatic SWG meeting is scheduled for November 12, 2014, when it is anticipated that Douglas PUD will be requesting formal approval for reopening the low-level entrances and installing the proposed box structure.

Bob Rose asked if there were plans to install a half-duplex (HD) PIT-tag receiver at the entrance. Kahler said that Douglas PUD is working with Biomark to install a reader with both HD and full-duplex (FD) detection capability, which will serve a dual purpose, including: 1) HD detection of lamprey passage; and 2) FD detection of salmonids (to verify salmonids are not accessing the area). He said that this receiver will be installed on the collection-chamber side of the proposed box structure. He added that Douglas PUD also plans to install a radio-telemetry antenna in the collection chamber. He said that all of this work needs to be completed this winter in order to continue the Douglas PUD Lamprey Passage and Enumeration Study.

E. Wells Dam Fish Count Update (Tom Kahler)

Tom Kahler said that Douglas PUD is moving forward with installing a full, server-based fish counting system at Wells Dam. He said that the visual recorders that have previously been used are becoming obsolete and will be replaced by the server-based system, which uses digital cameras. He said that the new cameras have good resolution and are similar to ones used by Chelan PUD. He said the new system will be installed during the annual winter maintenance at Wells Dam. Kahler said that Douglas PUD plans to staff six fish counters, including three full-time and three temporary staff. He said that with six fish counters and the new system, Douglas PUD expects to improve fish counting and reporting. He added that if counts still fall behind, Douglas PUD will need to rethink the entire fish counting system because there is no additional space.

F. HCP Coordinating Committees Chair Position (Tom Kahler)

Tom Kahler said that since the last Coordinating Committees meeting, the HCP Hatchery Committees were briefed on the intent to involve the HCP Policy Committee in the HCP Chair selection process. He also noted that several new potential candidates had been discussed at the last Hatchery Committees meeting. In addition to the initial list that included Mr. Geoff McMichael, Dr. John Ferguson, and Mr. Bryan Nordlund, the following individuals were discussed:

Ms. Elizabeth McManus

Kahler said that Ms. Elizabeth McManus (Priest Rapids Coordinating Committee Hatchery Subcommittees [PRCC HSC] Facilitator) has been discussed as a possible HCP Hatchery Committees Chair candidate, however, a résumé or CV has not been received. Mike Schiewe said that aside from discussion at the Hatchery Committees meeting, no one has formally introduced McManus. Bob Rose said that based on discussions with Keely Murdoch (YN HCP Hatchery Committees Alternate Representative), he understands that the YN are interested in introducing McManus, and that McManus has expressed interest in the position. Jeff Korth agreed and said that he also received the same information from Murdoch. Rose said that Murdoch believes she has until November 6, 2014, to introduce new HCP Hatchery Committees Chair candidates. Schiewe clarified that the deadline to introduce HCP Hatchery Committees Chair candidates is October 31, 2014. Rose said that he will remind Murdoch of the correct deadline.

Mr. Chuck Peven

Schiewe said that Lynn Hatcher (NMFS HCP Hatchery Committees Representative) introduced Mr. Chuck Peven (Peven Consulting, Inc.) and that Peven has provided a letter of interest in the HCP Hatchery Committees Chair position. Kahler added that he understands that Peven also plans to revise his letter of interest and CV to reflect his interest in the Coordinating Committees Chair position as well.

Mr. Tom Schadt

Schiewe said that it is his understanding that Alene Underwood (Chelan PUD HCP Hatchery Committees Representative) plans to request a CV from Mr. Tom Schadt (Anchor QEA) for the HCP Hatchery Committees Chair position.

Kahler said that a joint HCP Policy Committee and Coordinating Committees meeting has been scheduled for November 6, 2014, at 1:00 pm, as distributed to the

Coordinating Committees by Kristi Geris on October 23, 2014. Kahler said that no comments were received on the Scope of Work and only one comment was received on the Qualifications document, which was a formatting request from Bill Gale (U.S. Fish and Wildlife Service [USFWS] HCP Hatchery Committees Representative). Kahler explained that Gale requested that all duties of the position be included as bullet points. Kahler said that he has not yet distributed the revised Qualifications document because the deadline for edits to all HCP Hatchery Committees Chair documents is October 31, 2014, at which time, he plans to distribute the revised drafts.

Kahler said that the HCP Chair selection process will be determined during the joint HCP Policy Committee and Coordinating Committees meeting. Kahler asked Schiewe to describe the process that the Aquatic SWG is using for their Chair selection. Schiewe explained that the Aquatic SWG introduced five Chair candidates to consider and members ranked the candidates from 1 to 5, in order of preference, and provided those rankings to Geris to compile. Schiewe said that on October 22, 2014, the Aquatic SWG convened a conference call to discuss the rankings and they ultimately settled on three candidates to interview, including: Dr. Ferguson (Anchor QEA), Dr. Tracy Hillman (BioAnalysts, Inc.), and Dr. Pete Bisson (Bisson Aquatic Consulting, LLC). By way of introduction, Schiewe explained that Bisson spent his early career working as an aquatic biologist for the Weyerhaeuser Company in Tacoma, Washington, and later working for the U.S. Forest Service. Schiewe said that Bisson served on the NMFS and Northwest Power Planning and Conservation Council Independent Scientific Advisory Board. Schiewe said that each Aquatic SWG member has been asked to submit two potential interview questions. He said that all Aquatic SWG members plan to participate in the interview process, which will consist of 45-minute interviews, followed by an Aquatic SWG meeting the same day to discuss the interviews and a path forward. Schiewe said that the tentative date to hold these interviews is December 8, 2014. Schiewe added that Bisson has expressed no interest in chairing the HCP committees. Kahler said that, although the HCP Policy Committee will ultimately determine the process for the HCPs, the Aquatic SWG's chosen process may be a good model to start the discussion.

Kahler asked, besides the HCP Chairs candidate lists, Scope of Work, and Qualifications document, what else needs to be place prior to the joint HCP Policy Committee and Coordinating Committees meeting. Rose said that regarding selecting a HCP Coordinating Committees Chair, he and Steve Parker (YN HCP Policy Committee Representative) discussed two options: 1) allow the HCP Policy Committee to make the selection; or 2) allow the Coordinating Committees to make the selection. Rose said he told Parker that he believes the process can be effectively managed by the Coordinating Committees and Rose asked the Coordinating Committees if this may be a recommendation that they want to present at the joint meeting. Jim Craig agreed that the selection should reside with the Coordinating Committees because they will be working with the Chair on a regular basis. Scott Carlon said that from NMFS' standpoint, the NMFS Policy Staff will make the selection but ask for the Coordinating Committees' preference; so, in essence, the Coordinating Committees will have a significant role in the selection. Korth said that the same is true for WDFW. Schiewe noted that 10 years ago when he was selected, the HCP Policy Committee was directly involved in Chair selections so there were no surprises. He added that the expectation is that the HCP Policy Committee and Coordinating Committees will work together.

Schiewe noted that another consideration is that the HCPs emphasize that the position is that of a Chair, who also facilitates the meetings. He said that there is an understanding that the Chair has a technical background and participates in the discussions. Korth asked if a scientific background is only a qualification for the Coordinating Committees Chair and Schiewe indicated that it is a qualification for all HCP Committee Chairs. Rose said that after reviewing the HCPs, he could not locate specific language that required a scientific background. Kahler explained that the HCPs do not explicitly stipulate a requirement for a scientific background, however, they do explicitly indicate selection of a Chair—not a Facilitator. He said that a Chair is one who engages in the subject matter, whereas a Facilitator is disengaged and only ensures that a meeting progresses. He said that often times a Chair is a Committee member, which is not the case for a Facilitator. He summarized that, by definition, requirement of a technical background is somewhat implied in a Chair selection. Rose asked what constituted a scientific background (e.g., a degree in the biological sciences). Kahler said a science degree was a good example of one criterion and

noted the importance of reaching a common understanding of these details. He added that in reviewing the original Scope of Work and Qualifications document that were developed during the first selection process, it is clear that attributes defining a Chair versus a Facilitator were really important to a majority of the parties. He said that these qualifications have served the HCPs well and Douglas PUD is reluctant to change that formula.
Rose recommended circulating the original documents. Korth read an excerpt from the updated Qualifications document that was distributed to the Coordinating Committees by Geris on September 23, 2014, as follows:

> *Applicants for HCP Coordinating Committees Chair must possess general knowledge and have working experience in at least one aspect of the scientific, engineering, and policy/legal issues within the Columbia Basin hydrosystem, and specifically understand the effects of hydroelectric projects on juvenile and adult salmonids and the various approaches to assessing those effects.*

Kahler said that the updated Scope of Work and Qualifications document that were distributed in September are essentially identical to the documents that were used during the first Chair selection processes, only with some details removed that were no longer applicable to the position. Kahler said that he will provide the original HCP Chair position Scope of Work and Qualifications document to Geris for distribution to the Coordinating Committees. Schiewe recommended that Coordinating Committees members also review the updated HCP Chair position documents that were distributed to the Coordinating Committees by Geris on September 23, 2014, and be prepared to discuss any comments on the documents during the joint HCP Policy Committee and Coordinating Committees on November 6, 2014.

Kahler noted that several HCP Committees members have expressed interest in having the same Chair for both the Hatchery and Coordinating Committees. He added that the Coordinating Committees Chair also serves as the HCP Policy Committee Chair, so the Coordinating Committees Chair would need to be able to work with the HCP Policy Committee in resolving conflicts, if any arise. Korth said that he sees value involving both the Coordinating Committees and HCP Hatchery Committees in the selection of the HCP Hatchery Committees Chair. Craig agreed, noting that he and Gale are already discussing the HCP Hatchery Committees Chair position. Carlon also agreed and said that he, Ritchie Graves (NMFS HCP Policy Committee Representative), and Lynn Hatcher plan to meet on November 4, 2014, to discuss the HCP Committees Chair selections.

Kahler asked the Coordinating Committees about their thoughts on selecting the same Chair for both Hatchery and Coordinating Committees. Craig asked if the candidates have been notified about the interest in applying for both Committees. Kahler said that, yes, Douglas PUD asked each candidate about their interest in chairing both Committees and all candidates agreed except for Bill Muir (retired NMFS), whom only indicated interest in the Coordinating Committees. Rose said that this raises the question of whether the Policy and Coordinating Committees place greater importance on the connection between Hatchery Committees (i.e., HCP HC and PRCC HSC) or between the HCPs (i.e., Hatchery and Coordinating Committees). Kahler added that, ideally, Douglas PUD would also like to have the same Chair for the HCPs and Aquatic SWG, which he noted is a shared interest for some.

Rose asked Lance Keller about Chelan PUD's thoughts regarding the HCP Chair selection process. Keller said that Chelan PUD shares the same interests as Douglas PUD, including that Chelan PUD also sees value in selecting the same Chair for both Hatchery and Coordinating Committees, and Chelan PUD also agrees that a technical background is an important quality in a Chair candidate.

Schiewe suggested that Coordinating Committees members take these topics back to their respective agencies for internal discussions and suggested that Douglas PUD and Chelan PUD, as the contracting agencies, take the lead in teeing up these discussions at the joint HCP Policy Committee and Coordinating Committees conference call on November 6, 2014. Korth said that it would be helpful to know the HCP and Aquatic SWG Chairs candidate lists prior to the meeting on November 6, 2014. Kahler agreed and said that he will provide the current HCP Hatchery Committees and Coordinating Committees Chair candidate lists, including whether the respective candidate is also an Aquatic SWG Chair candidate, to Geris for distribution to the

Coordinating Committees. Kahler also noted that the HCP Chair candidate lists may still be incomplete, however, as of today, are as follows:

Candidate	Coordinating Committees	Hatchery Committees	Aquatic SWG Candidate
Mr. Bill Muir	Yes	No	No
Dr. John Ferguson	Yes	Yes	Yes
Mr. Geoff McMichael	Yes	Yes	Yes*
Mr. Bryan Nordlund	Yes	Yes	Yes*
Dr. Tracy Hillman	Maybe	Unknown	Yes
Mr. Chuck Peven	Maybe	Yes	No
Mr. Tom Schadt	Maybe	Maybe	--
Ms. Elizabeth McMannus	Unknown	Maybe	--

Notes:
* = Nominated, but not selected for interview (however, not yet excluded from potential Chair selection)
-- = Interest not confirmed

Coordinating Committees representatives agreed to review the HCP Coordinating Committees Chair position documents and will: 1) contact any additional qualified candidates to gauge interest in the position; 2) have interested candidates contact Schiewe to discuss the responsibilities of the position; and 3) provide a résumé or CV from interested candidates to Kahler, Keller, and Geris by November 4, 2014.

III. Chelan PUD

A. Rocky Reach and Rock Island September 2014 Juvenile Bypass Operations Results Summary (Lance Keller)

Lance Keller said that a September 2014 Rocky Reach and Rock Island Bypass Operations Summary (Attachment C) was distributed to the Coordinating Committees by Kristi Geris prior to the meeting on October 28, 2014. Keller recalled that Chelan PUD requested Coordinating Committees approval on September 12, 2014, to end juvenile bypass operations at both the Rocky Reach and Rock Island juvenile bypasses on September 15, 2014, at midnight and at the time of this request the September 1 to 12, 2014 data were provided. He said that Attachment C also includes September 13 to 15, 2014 data for Coordinating Committees review.

Keller summarized that for Rocky Reach Dam, from September 1 to 15, 2014, a total of 76 juvenile subyearling Chinook salmon passed the dam, which equates to 0.34% of the total index from April 1 through August 31, 2014. He said that downstream at Rock Island Dam, a total of 227 juvenile subyearling Chinook salmon were counted passing the dam. He recalled that at Rock Island Dam, subyearling counts are only representative of Powerhouse 2 flows and that the Columbia River Data Access in Real Time (DART) database expands those data to include total project flow experienced for that sampling period. He said that 227 Chinook salmon expands to 474 subyearling Chinook salmon, which equals 1.39% of the total run. He said that as previously discussed, these passage data for both Rocky Reach and Rock Island dams indicate that a significant component (defined as greater than 5%, as outlined in the Rocky Reach and Rock Island HCPs) of the juvenile emigration do not appear to be present outside the normal bypass operating period of April 1 through August 31.

Keller said that because review of these data were requirements in the Rocky Reach and Rock Island HCPs, Chelan PUD would like to obtain formal approval of fulfillment of these requirements in the form of a SOA. He said that he will provide a draft SOA outlining completion of the Rocky Reach and Rock Island HCP requirements for conducting additional run-timing and species composition monitoring to verify that the normal bypass operating period (April 1 through August 31) is adequately protecting 95% of the spring and summer migrations of juvenile Plan Species.

B. Draft 2014 Rocky Reach and Rock Island Fish Spill Report (Lance Keller and Thad Mosey)

Lance Keller said that a draft 2014 Rocky Reach and Rock Island Spill Report (Attachment D) was distributed to the Coordinating Committees by Kristi Geris prior to the meeting on October 28, 2014. He said that he and Thad Mosey (Chelan PUD Spill Lead) developed the draft report and that Mosey, who tracked spill this year, will review the document.

Mosey reviewed the 2014 Rock Island spring spill, as described on page 2 of Attachment D. He noted the higher than usual amount of forced spill due to the Wanapum drawdown. He said that this equated to an overall average spill well above the 10% requirement for Rock Island Dam, which, he added, may have benefited fish passage. He said that spring spill ended on May 23, 2014, based on hatchery releases at Wells Dam and CJH. He reviewed the 2014 Rock Island summer spill, as described on page 3 of Attachment D. He noted a spike in the daily average spill from May 24 through June 4, 2014, which he speculated was due to work being conducted on Spill Gate 6, when the gate was wide open. Lastly, Mosey reviewed the 2014 Rocky Reach summer spill, as described on page 1 of Attachment D.

Mosey said that this is his first year as Chelan PUD Spill Lead, which was formerly filled by Steve Hemstrom. Mosey said that with help from Hemstrom and Keller the transition went smoothly and adequate spill coverage was achieved in 2014. Keller also noted that the draft 2014 report was developed using past report templates and also includes charts providing a visual depiction of daily passage and index counts, including when spill started and ended, and a horizontal daily average "spill line" to convey forced spill, as requested by the Coordinating Committees in 2013.

Keller requested any Coordinating Committees edits or comments on the draft 2014 Rocky Reach and Rock Island Fish Spill Report be submitted to Chelan PUD prior to the Coordinating Committees meeting on November 18, 2014, when Chelan PUD will be requesting approval of the report.

C. Wanapum Drawdown Update (Lance Keller)

Lance Keller said that since the Wanapum drawdown, Chelan PUD has requested this agenda item to facilitate open discussion and questions from the Coordinating Committees that may not have been addressed during the bi-weekly Wanapum briefings.

Keller said that Rock Island Dam is currently operating in a generation configuration. He said that conditions have been conducive to generating; however, there have also been periods of non-generation on the weekends. He said that during these periods of non-generation, fish are still passing via both fish ladders and via the recent modification in the middle fishway. He said that most passage has been occurring via the right bank denil structure and he added that over the past 6 days, over 2,700 coho salmon have passed via the right bank denil structure alone. He said that on average, 454 coho salmon are passing Rock Island Dam each day. He also noted that six Pacific lamprey passed Rock Island Dam from October 24 to 26, 2014. He said that he is currently drafting the Rock Island Dam Interim Fish Passage Plan November 2014 Monthly Report, which will be distributed shortly after November 1, 2014. *(Note: Keller provided the final monthly report to Kristi Geris on November 4, 2014, which Geris distributed to the Rock Island Coordinating Committee that same day.)*

Scott Carlon asked about the current river flow past Rock Island Dam. Keller said that today's river flow past Rock Island Dam is 105,000 cfs (105 kcfs), with an hourly average of 90 kcfs. He said that today, there were 2 hours of non-generation (from 2:00 to 4:00 am.) and he added that during periods of non-generation, river flow is around 45 to 46 kcfs, all of which would be going through the spillway at that point.

IV. WDFW

A. HCP Hatchery Committees Distribution List Approval – John Penny and Denise McCarver, Eastbank Hatchery Staff (Jeff Korth and Mike Schiewe)

Mike Schiewe said that Jeff Korth has requested Coordinating Committees approval to provide John Penny and Denise McCarver, Eastbank Hatchery Staff, access to the HCP Hatchery Committees Extranet site. Schiewe recalled that Korth's request follows the formal process that was agreed upon by the Coordinating Committees to keep track of which non-HCP representatives have access to the HCP Extranet sites. Korth explained that the reasoning behind his request is that WDFW is working to improve internal communications with Eastbank Hatchery Staff and that WDFW recommended that those staff attend HCP Hatchery Committees meetings, as appropriate. Coordinating Committees representatives present agreed to provide Penny and McCarver read-only access to the final document library on the HCP Hatchery Committees Extranet site.

Korth also noted that Penny plans to retire soon and asked if Penny's replacement will need to also obtain Coordinating Committees approval to access the HCP Hatchery Committees Extranet site. Coordinating Committees representatives present agreed that once the Coordinating Committees approve HCP Extranet site access for a particular position (e.g., Hatchery Complex Manager or Hatchery M&E Support Staff), succeeding staff filling those positions will be granted HCP Extranet site access without requiring an additional review and approval process. Kristi Geris said that she will contact Julene McGregor to request read-only access to the final document library on the HCP Hatchery Committees Extranet site for Penny and McCarver, as approved by the Coordinating Committees. *(Note: Geris sent an email to McGregor following the meeting on October 28, 2014, requesting access for Penny and McCarver, as discussed, and McGregor set up access for Penny and McCarver on October 29, 2014, as requested.*)

V. HCP Hatchery and Tributary Committees Update (Mike Schiewe)

Mike Schiewe said that the HCP Tributary Committees did not meet in October; however, some members toured habitat restoration projects in Canada on October 8 and 9, 2014. Schiewe added that the HCP Tributary Committees also approved two contract amendments, as follows:

- *Methow/Chewuch Shallow Groundwater Monitoring Project*: The Wells Tributary Committee approved the Cascade Columbia Fisheries Enhancement Group's request to shift funding from one labor category to another (the total budget amount will remain unchanged).
- *Entiat Stillwaters Gray Reach Acquisitions Project*: The Rocky Reach Tributary Committee approved Chelan-Douglas Land Trust's request to extend the project timeline so that components could be coordinated (the total budget amount will remain unchanged).
- *Next Steps*: The next HCP Tributary Committees meeting will be held on November 13, 2014.

Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the last HCP Hatchery Committees meeting on October 15, 2014:

- *Methow River Conditions and Implications for Populations and Hatchery Program Management:* This discussion was a continuation of a topic that Greg Mackey had brought up during the HCP Hatchery Committees meeting on September 17, 2014, regarding how Hatchery Managers can be proactive in mitigating potential impacts of the wildfires that burned areas in the Methow basin. The HCP Hatchery Committees agreed to defer to Hatchery Manager discretion regarding appropriate fish management actions (e.g., flexible release dates). The HCP Hatchery Committees also encouraged additional fish health monitoring and review of available science via Burned Area Emergency Response (BAER) reports.

- *HCP Hatchery Committees Chair Position:* There was an extensive discussion regarding the HCP Hatchery Committees Chair position, similar to what was discussed today. To recap, the candidate list includes Dr. John Ferguson, Mr. Geoff McMichael, Mr. Bryan Nordlund, and Mr. Chuck Peven. Also discussed were Ms. Elizabeth McMannus and Mr. Tom Schadt.
- *Annual Broodstock Collection Protocols Layout:* Mike Tonseth (WDFW HCP Hatchery Committees Representative) worked jointly with USFWS and NMFS staff to develop a streamlined Broodstock Collection Protocols template that includes only necessary information. This template is currently under HCP Hatchery Committees review.
- *HGMP Update:* Lynn Hatcher provided an update on permitting, which is on schedule for most programs, particularly those for listed stocks in the Wenatchee basin, which include several October 31, 2014 deadlines. The completion target for non-listed permits is spring 2015.
- *USFWS Consultation Update:* USFWS Ecological Services is still working to complete Biological Opinions for bull trout.
- *Winthrop National Fish Hatchery (NFH) Pipeline Replacement:* There was a water supply pipe failure at Winthrop NFH. The failure was detected and a repair was started without a loss of fish. The repair is ongoing now.
- *2016 Expanded Acclimation in the Methow:* The YN introduced a plan to acclimate spring Chinook salmon in the Methow at Goat Wall in 2016, some of which is covered under the new permits. Keely Murdoch plans to develop a draft proposal for HCP Hatchery Committees review.
- *Transfer of Surplus Carson Hatchery Eggs to CJH:* Kirk Truscott (CCT HCP Hatchery Committees Representative) is working with NMFS and Carson Hatchery staff to obtain approximately 350,000 eyed eggs that would augment the additional broodstock that were obtained from Winthrop NFH. These eggs would go towards making up for the loss of broodstock that occurred earlier this year due to a Columnaris outbreak.

- *Chelan PUD M&E Hatchery Activities Update:* Chelan PUD indicated that 915 redds were identified in the Wenatchee subbasin, which is greater than the 10-year average; however, it is lower last year's redd count.

VI. HCP Committees Administration

A. Next Meetings (Mike Schiewe)

Mike Schiewe said that there has been a request to reschedule the next Coordinating Committees meeting from November 25 to November 18, 2014, in order to accommodate scheduling of the PRCC HSC meeting. Schiewe also asked if Coordinating Committees members preferred an in-person meeting. Jim Craig and Lance Keller both indicated that they will need to call into the meeting due to other obligations. Coordinating Committees representatives agreed that the next Coordinating Committees meeting will be on November 18, 2014, and will be held by conference call. Coordinating Committees representatives also agreed to consider rescheduling the December Coordinating Committees meeting scheduled for December 23 to December 16, 2014, and may hold the meeting by conference call, which will be further discussed during the Coordinating Committees meeting on November 18, 2014.

Schiewe summarized that the next scheduled Coordinating Committees meeting is November 18, 2014, to be held by conference call. The December 16 or 23, 2014, and January 27, 2015 meetings will be held either by conference call or in person at the Radisson Hotel in SeaTac, Washington, as is yet to be determined.

List of Attachments

Attachment A	List of Attendees
Attachment B	Final Broodstock Collection Protocols SOA
Attachment C	September 2014 Rocky Reach and Rock Island Bypass Operations Summary
Attachment D	Draft 2014 Rocky Reach and Rock Island Spill Report

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Lance Keller*	Chelan PUD
Thad Mosey	Chelan PUD
Tom Kahler*	Douglas PUD
Scott Carlon*	National Marine Fisheries Service
Jim Craig*	U.S. Fish and Wildlife Service
Jeff Korth*	Washington Department of Fish and Wildlife
Bob Rose*	Yakama Nation

Note:
* = Denotes Coordinating Committees member or alternate

HCP Hatchery Committees and Coordinating Committees

Final Statement of Agreement

Annual Broodstock Collection Protocols

Hatchery Committees Approved September 17, 2014
Coordinating Committees Approved October 28, 2014

In fulfillment of requirements of existing and forthcoming Endangered Species Act permits for the Habitat Conservation Plan (HCP) Hatchery Programs, the Wells, Rocky Reach, and Rock Island HCP Hatchery Committees (HCP-HC) agree to develop and submit to the National Marine Fisheries Service (NMFS) annual Broodstock Collection Protocols each year by April 15.

Process and Schedule: The Permit Holders will prepare a draft Broodstock Collection Protocol for review by the HCP-HC and the HCP Coordinating Committees[1] (HCP-CC) no later than 10 days prior to their respective February meetings. Following Committees review and revision, a final Broodstock Collection Protocols will be subject to approval at the March HCP-HC and HCP-CC[1] meetings and submitted to NMFS by April 15.

NMFS Approval: Participation in the development, submission, and approval of the annual Broodstock Collection Protocols within the Committees by the NMFS HCP-HC and HCP-CC[1] representatives will constitute NMFS acceptance and approval of the annual Broodstock Collection Protocols.

[1] HCP-CC approval meets the Wells HCP requirement for approval of broodstock collection and monitoring and evaluation activities involving the Wells Project facilities.

Rocky Reach and Rock Island Juvenile Subyearling Chinook Index Counts During Extended Bypass Operations, September 1-15, 2014

Rocky Reach:

Total index count as of 8/31/14: 22,251
Subyearling count Sept. 1-15: 76 (0.34% of total index from 4/1-8/31/14)

Date	# of Sub. Chinook Sampled
9/1/2014	10
9/2/2014	11
9/3/2014	10
9/4/2014	7
9/5/2014	11
9/6/2014	2
9/7/2014	6
9/8/2014	1
9/9/2014	4
9/10/2014	3
9/11/2014	3
9/12/2014	2
9/13/2014	4
9/14/2014	1
9/15/2014	1
Total	**76**

- Daily collections were comprised of four 30 minute samples with no expansion needed, with 23 of the 44 samples collecting zero subyearling Chinook.

Rock Island:

Total index count as of 8/31/14: 34,165
Subyearling count Sept. 1-15: 475 (1.39% of total index from 4/1-8/31/14)

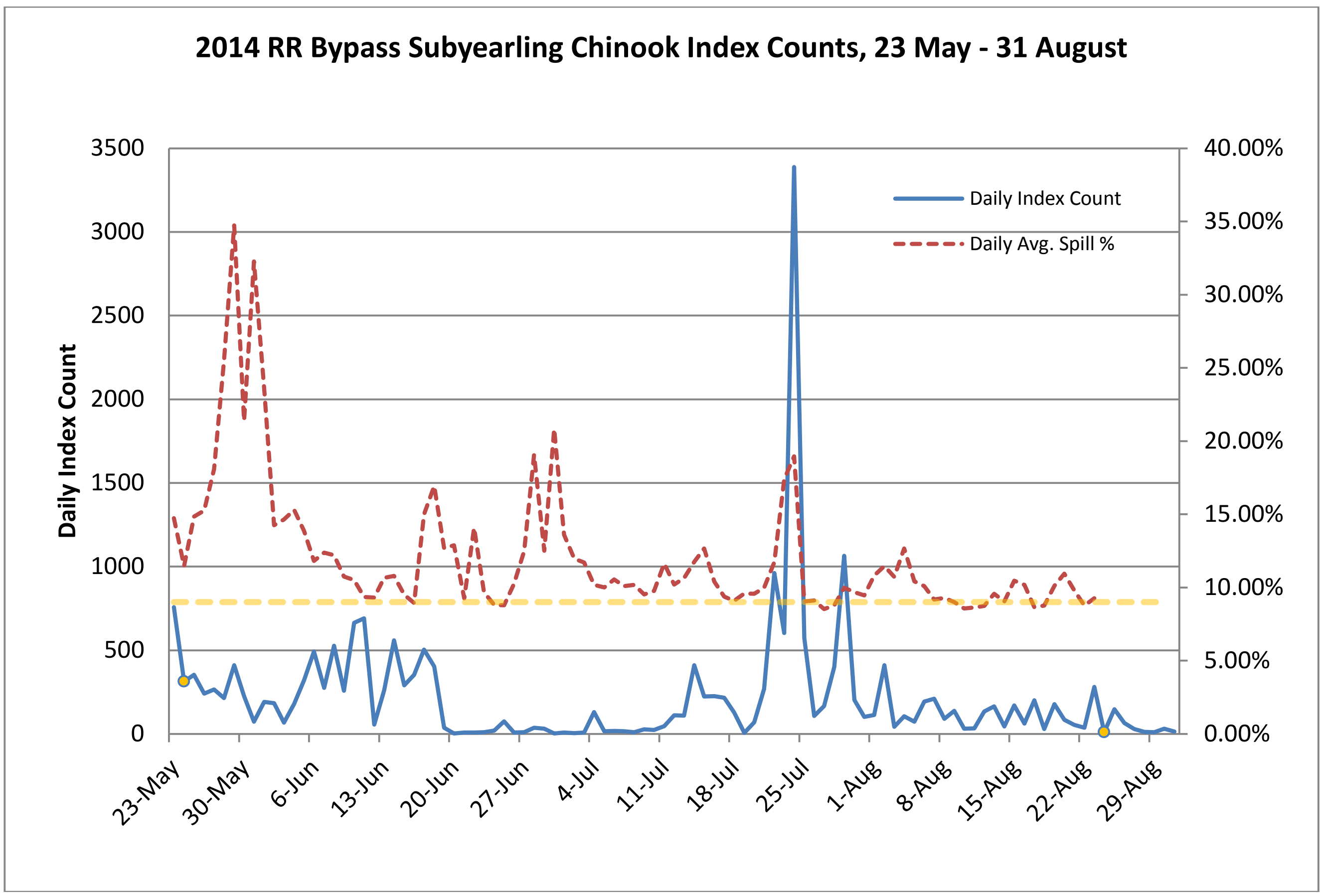
Date	# of Sub. Chinook Sampled	Expanded Count (DART Count)
9/1/2014	18	20
9/2/2014	31	35
9/3/2014	43	110
9/4/2014	36	42
9/5/2014	34	41
9/6/2014	16	29
9/7/2014	10	23
9/8/2014	7	30
9/9/2014	4	8
9/10/2014	7	17
9/11/2014	5	8
9/12/2014	6	10
9/13/2014	7	39
9/14/2014	0	0
9/15/2014	3	63
Total	**227**	**475**

Chelan PUD
Rocky Reach and Rock Island HCPs
Draft 2014 Fish Spill Report

2014 ROCKY REACH

Summer Spill

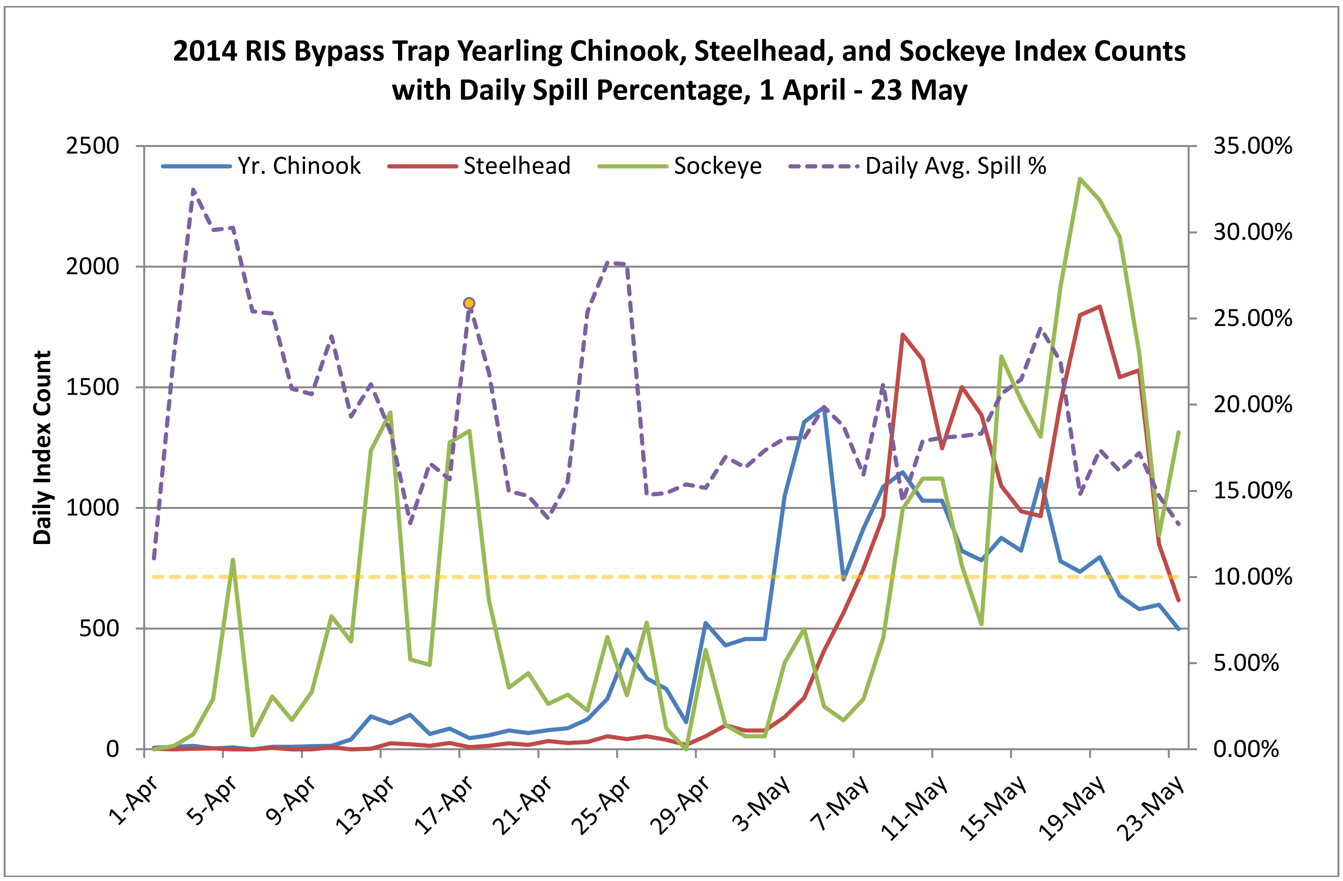
Target species:	Subyearling Chinook
Spill target percentage:	9% of day average river flow
Spill start date:	24 May, 0001 hrs
Spill stop date:	24 August, 2400 hrs
95% Est. passage date:	17 August
Percent of run with spill:	98.27% on 24-August (estimated as of 15 September)
Cumulative index count:	22,327 subyearling Chinook (as of 15 September)
Summer spill percentage:	12.72% (9.13%, plus 3.59% forced spill 24 May – 24 August)
Avg river flow at RR:	151,412 cfs (24 May - 24 August)
Avg spill rate at RR:	19,253 cfs (24 May - 24 August)
Total spill days:	93



2014 ROCK ISLAND

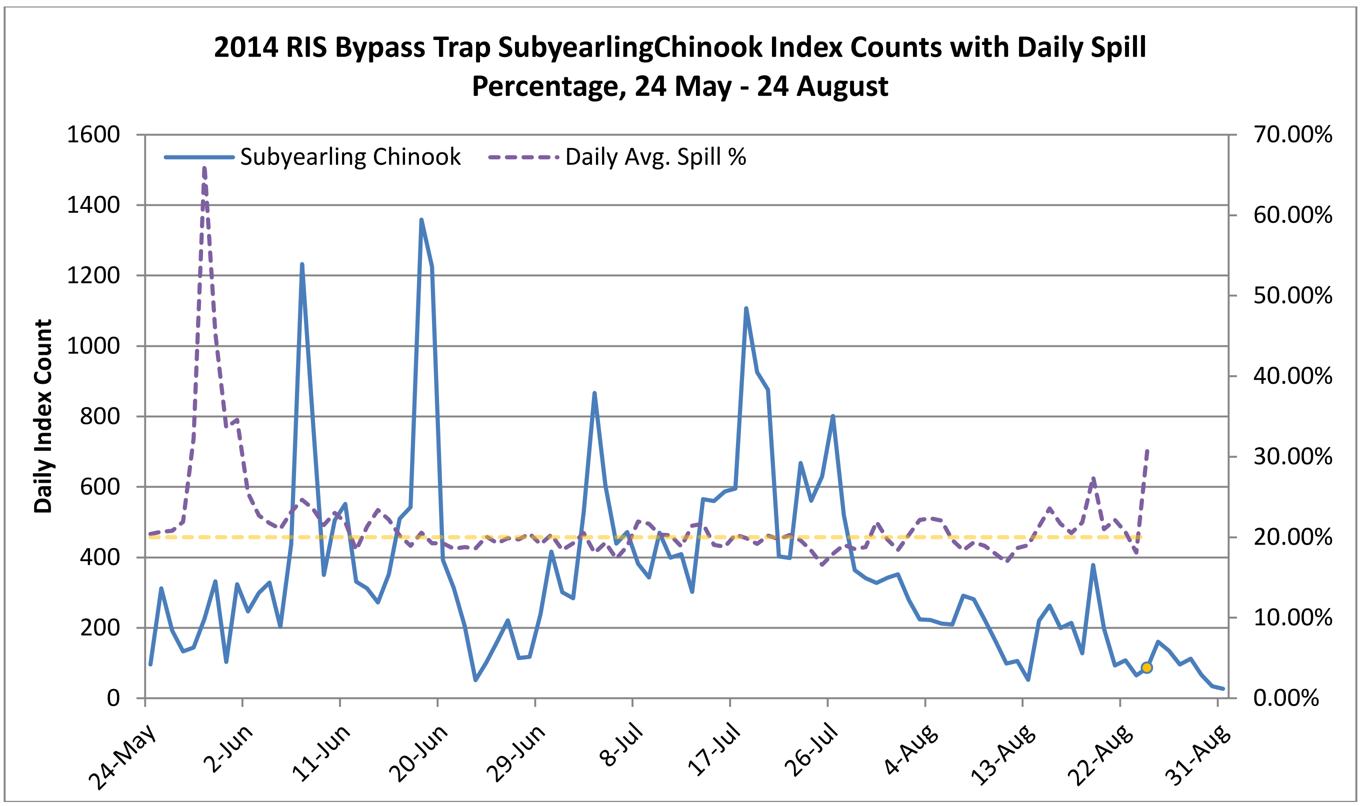
Spring Spill

Target species:	Yearling Chinook, steelhead, sockeye
Spill target percentage:	10% of day average river flow
Spill start date:	17 April, 0001 hrs
Spill stop date:	23 May, 2400 hrs (immediate increase to 20% summer spill)
Percent of run with spill:	Yearling Chinook 97.29%; steelhead 99.47%; sockeye 99.94%
Cumulative index count:	26,429 yearling Chinook**;** 28,299 steelhead**;** 38,596 sockeye
Spring spill percentage:	18.33% (10.06% plus 8.27% forced spill for 17 April – 23 May)
Avg river flow at RI:	175,295 cfs (17 April – 23 May)
Avg spill flow at RI:	32,126 cfs (17 April – 23 May)
Total spill days:	37



Summer Spill

Target species:	Subyearling Chinook
Spill target percentage:	20% of day average river flow
Spill start date:	24 May, 0001 hrs
Spill stop date:	24 August, 2400 hrs
95% Est. passage date:	19 August
Percent of run with spill:	Subyearling Chinook 97.12% (estimated as of 11 September)
Cumulative index count:	34,639 subyearling Chinook (as of 15 September)
Summer spill percentage**:**	21.83% (20.05% plus 1.78% forced spill for 24 May – 24 August)
Avg river flow at RI:	157,578 cfs (24 May - 24 August)
Avg spill flow at RI:	34,404 cfs (24 May - 24 August)
Total spill days:	93



Juvenile Index Counts 2004-2014 from the Rocky Reach Juvenile Fish Bypass Sampling Facility and Rock Island Bypass Trap Smolt Monitoring Program (SMP) 1 April – 31 August.

Table 1. Rocky Reach Juvenile Bypass index sample counts, 2004-2014

Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014*
Sockeye	30,935	17,575	239,185	169,937	136,206	40,758	724,394	67,879	384,224	199,497	**553,645**
Steelhead	6,433	5,821	4,329	4,532	8,721	6,309	4,931	5,683	4,902	2,528	**5,270**
Yearling Chinook	53,946	27,611	23,461	18,080	38,394	18,946	33,840	24,400	95,207	29,018	**15,871**
Subyearling Chinook	20,062	10,978	19,996	13,496	11,820	11,944	59,751	17,246	5,774	22,073	**22,327**

Table 2. Rock Island Smolt Monitoring Program index sample counts, 2004-2014

Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014*
Sockeye	7,114	1,991	34,604	16,410	38,965	4,926	37,404	18,697	46,788	25,111	**38,596**
Steelhead	10,735	15,974	26,930	18,482	22,780	17,636	17,194	28,408	16,957	15,099	**28,299**
Yearling Chinook	12,574	14,797	37,267	23,714	22,562	9,225	11,802	26,407	25,759	28,324	**26,429**
Subyearling Chinook	23,563	18,710	27,106	15,686	15,940	8,189	23,205	27,397	27,298	17,170	**34,639**

* In 2014, as directed by the HCP, Chelan PUD conducted bypass operations outside of the normal operating period of 1 April to 31 August to assess achievement of bypass operations for 95% of the subyearling Chinook outmigration. The Rocky Reach juvenile fish bypass operated from 1 April through 15 September, and the Rock Island bypass facility at powerhouse 2 operated from 1 April through 15 September.

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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Coordinating Committees	**Date:**	January 28, 2015
From:	Michael Schiewe, Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the November 18, 2014 HCPs Coordinating Committees Conference Call		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met by conference call, on Tuesday, November 18, 2014, from 9:30 am to 11:30 am. Attendees are listed in Attachment A of these meeting minutes.

ACTION ITEM SUMMARY

- Anchor QEA will coordinate with U.S. Fish and Wildlife Service (USFWS) to resolve the last pending item from the Coordinating Committees revised draft October 28, 2014 conference call minutes; once resolved Kristi Geris will finalize the minutes and distribute them to the Coordinating Committees (Item I-B). *(Note: Geris obtained clarification from Jim Craig on November 21, 2014, and distributed the final October 28, 2014 conference call minutes that same day.)*
- Kristi Geris will contact Julene McGregor (Douglas PUD Information System Staff) to request read-only access to the final document library on the HCP Hatchery Committees Extranet site for Peter Graf (Grant PUD), as approved by the Coordinating Committees (Item I-D). *(Note: Geris sent an email to McGregor on November 18, 2014, requesting access for Graf, as discussed.)*
- Chelan PUD will provide 2013 and 2014 adipose (ad)-present steelhead fish passage data for Rock Island and Rocky Reach dams to Kristi Geris for distribution to the Coordinating Committees (Item II-A).
- Chelan PUD will request from the Washington State Department of Ecology (Ecology) an extension of the review period for the draft Rocky Reach Total Dissolved Gas (TDG) Year Five Report from 30 to 60 days, and will notify the Coordinating Committees whether the extension is granted (Item II-D). *(Note:*

Ecology granted the extended review period with a new comment deadline of January 15, 2015, as distributed to the Coordinating Committees by Kristi Geris on November 26, 2014.)

- Coordinating Committees representatives will provide initial comments on the draft Rocky Reach TDG Year Five Report to Chelan PUD prior to the next Coordinating Committees meeting on December 16, 2014 (Item II-D).
- Douglas PUD will provide the draft 2014 Wells Post-Season Bypass Report for review to Kristi Geris for distribution to the Coordinating Committees (Item III-C). *(Note: Douglas PUD provided the draft report to Geris on January 16, 2015, which Geris distributed to the Coordinating Committees that same day.)*
- **The next Coordinating Committees meeting will be on December 16, 2014, and will be held by conference call (Item V-A).**

DECISION SUMMARY

- The Coordinating Committees representatives present approved the Rocky Reach and Rock Island 2014 Fish Spill Report (Item II-A). *(Note: Jim Craig and Kirk Truscott provided USFWS' and the Colville Confederated Tribe's [CCT's] approval of the report via email on November 12 and November 18, 2014, respectively.)*
- The Coordinating Committees representatives present approved the Rocky Reach and Rock Island September 2014 Juvenile Bypass Operations Statement of Agreement (SOA; Item II-B). *(Note: Jim Craig and Kirk Truscott provided USFWS' and the CCT's approval of the SOA via email on November 12 and November 18, 2014, respectively.)*
- The Coordinating Committees representatives present approved Douglas PUD's proposed modifications to the low-level fishway entrance to improve lamprey passage at Wells Dam (Item III-B). *(Note: Jim Craig and Kirk Truscott provided USFWS' and the CCT's approval of the modifications via email on November 12 and November 18, 2014, respectively.)*

AGREEMENTS

- Coordinating Committees representatives present agreed to provide Peter Graf read-only access to the final document library on the HCP Hatchery Committees Extranet site (Item I-D).
- Coordinating Committees representatives present agreed to reschedule the Coordinating Committees meeting on December 23 to December 16, 2014 (Item V-A).

REVIEW ITEMS

- Kristi Geris sent an email to the Coordinating Committees on January 9, 2015, notifying them that the draft 2015 Wells Gas Abatement Plan and Bypass Operating Plan is available for review, with comments due to Tom Kahler and Andrew Gingerich (Douglas PUD) by Monday, February 9, 2015.
- Kristi Geris sent an email to the Coordinating Committees on January 16, 2015, notifying them that the draft 2014 Wells Post-Season Bypass Report is available for review.
- Kristi Geris sent an email to the Coordinating Committees on January 16, 2015, notifying them that the draft 2014 Wells HCP Action Plan is available for review.

DOCUMENTS FINALIZED

- The Broodstock Collection Protocols SOA that was approved by the HCP Hatchery Committees on September 17, 2014, and approved by the Coordinating Committees on October 28, 2014, was finalized and distributed to the Coordinating Committees by Kristi Geris on October 28, 2014.
- The 2014 Rocky Reach and Rock Island Fish Spill Report was finalized and distributed to the Coordinating Committees by Kristi Geris on January 19, 2015 (Item II-A).

I. Welcome

A. Review Agenda (Mike Schiewe)

Mike Schiewe welcomed the Coordinating Committees and asked for any additions or other changes to the agenda. No additions or changes were requested.

B. Meeting Minutes Approval (Mike Schiewe)

The Coordinating Committees reviewed the revised draft October 28, 2014 conference call minutes. Kristi Geris said that there is one comment remaining to be discussed regarding a comment that Jim Craig made during Douglas PUD's discussion of the draft 2014 Wells Dam Post-Season Bypass Report. Tom Kahler requested clarification regarding Craig's question about the percentage for adipose (ad)-only yearling Chinook salmon. Geris said that she will coordinate with USFWS to resolve this last pending item, and once resolved, she will finalize the minutes and distribute them to the Coordinating Committees. Jeff Korth also requested, regarding Douglas PUD's Twisp River population assessment discussion, to indicate that the new hatchery permits "will" require a population estimate of the juveniles.
Coordinating Committees members present approved the October 28, 2014 conference call minutes, as revised. *(Note: Craig and Kirk Truscott provided USFWS' and the CCT's approval of the October 28, 2014 conference call minutes via email on November 12 and November 18, 2014, respectively, and Geris obtained clarification from Craig resolving the last pending item on November 21, 2014, and she distributed the final October 28, 2014 conference call minutes that same day.)*

C. Last Meeting's Action Items (Mike Schiewe)

Action items from the Coordinating Committees conference call on October 28, 2014, and follow-up discussions were as follows: *(Note: italicized item numbers below correspond to agenda items from the October 28, 2014 meeting.)*

- *Coordinating Committees representatives will submit comments or an email confirming "no comments" on the Bailey Douglas PUD Land Use Permit Application to Tom Kahler no later than November 5, 2014 (Item I-C).*
  Kristi Geris sent an email to the Coordinating Committees on November 6, 2014, notifying them that no comments were received on the Bailey Douglas PUD Land Use Permit Application following a 60-day review period, which ended on

November 5, 2014. As noted in the email, Douglas PUD will proceed with this application.

- *Douglas PUD will provide a revised Methow River Coho Salmon Phase Designation SOA, with the CCT's edits incorporated, to Kristi Geris for distribution to the Coordinating Committees; Douglas PUD will request approval of the revised SOA during the Coordinating Committees meeting on November 18, 2014 (Item II-A).* Douglas PUD provided the revised SOA to Geris on November 7, 2014, which Geris distributed to the Coordinating Committees that same day. This will be discussed further during today's conference call.
- *Douglas PUD will provide the draft 2014 Wells Post-Season Bypass Report for review to Kristi Geris for distribution to the Coordinating Committees (Item II-B).* This will be discussed further during today's conference call.
- *Douglas PUD will provide the draft conceptual box design for the Wells Dam low-level fishway entrances to Kristi Geris for distribution to the Coordinating Committees (Item II-D).* Douglas PUD provided the draft design to Geris on November 3, 2014, which Geris distributed to the Coordinating Committees that same day. This will be discussed further during today's conference call.
- *Douglas PUD will provide the original HCP Chair position Scope of Work and Qualifications document to Kristi Geris for distribution to the Coordinating Committees (Item II-F).* Douglas PUD provided the original Scope of Work to Geris on October 31, 2014, which Geris distributed to the Coordinating Committees that same day. Tom Kahler had indicated in the email that he could not locate the original Qualifications document.
- *Douglas PUD will provide the current HCP Hatchery Committees and Coordinating Committees Chair candidate lists, including whether the respective candidate is also an Aquatic Settlement Workgroup (SWG) Chair candidate, to Kristi Geris for distribution to the Coordinating Committees (Item II-F).* An updated HCP Chair candidate table was distributed to the Coordinating Committees by Geris on October 31, 2014.

- *Coordinating Committees representatives will review the HCP Coordinating Committees Chair position documents and will: 1) contact any additional qualified candidates to gauge interest in the position; 2) have interested candidates contact Mike Schiewe to discuss the responsibilities of the position; and 3) provide a résumé or curriculum vitae (CV) from interested candidates to Tom Kahler, Lance Keller, and Kristi Geris by November 4, 2014 (Item II-F).*
  This action item was completed.
- *Chelan PUD will provide a draft SOA outlining completion of the Rocky Reach and Rock Island HCP requirements for conducting additional run-timing and species composition monitoring to verify that the normal bypass operating period (April 1 through August 31) is adequately protecting 95% of the spring and summer migrations of juvenile Plan Species (Item III-A).*
  Chelan PUD provided the draft SOA to Kristi Geris on November 17, 2014, which Geris distributed to the Coordinating Committees that same day.
- *Kristi Geris will contact Julene McGregor (Douglas PUD Information System Staff) to request read-only access to the final document library on the HCP Hatchery Committees Extranet site for John Penny and Denise McCarver (Eastbank Hatchery Staff), as approved by the Coordinating Committees (Item IV-A).*
  Geris sent an email to McGregor following the meeting on October 28, 2014, requesting access for Penny and McCarver, as discussed, and McGregor set up access for Penny and McCarver on October 29, 2014, as requested.
- *The next Coordinating Committees meeting will be on November 18, 2014, and will be held by conference call (Item VI-A).*
  This action item was completed today.
- *The Coordinating Committees meeting scheduled for December 23, 2014, may be rescheduled to December 16, 2014, and may be held by conference call, which will be further discussed during the Coordinating Committees meeting on November 18, 2014 (Item VI-A).*
  This will be discussed further during today's conference call.

D. HCP Hatchery Committees Extranet Site Access Request – Peter Graf (Mike Schiewe)

Mike Schiewe said that Peter Graf, Grant PUD Biologist, requested via email on October 30, 2014, access to the HCP Hatchery Committees Extranet site. Schiewe said that Grant PUD has had a representative attending the HCP Hatchery Committees meetings for the past 8 years. He added that obtaining access to the HCP Hatchery Committees Extranet site will require Coordinating Committees approval. Coordinating Committees representatives present agreed to provide Graf read-only access to the final document library on the HCP Hatchery Committees Extranet site. Kristi Geris will contact Julene McGregor to request read-only access to the final document library on the HCP Hatchery Committees Extranet site for Graf, as approved by the Coordinating Committees. *(Note: Geris sent an email to McGregor on November 18, 2014, requesting access for Graf, as discussed.)*

II. Chelan PUD

A. DECISION: Rocky Reach and Rock Island 2014 Fish Spill Report (Lance Keller)

Lance Keller said that Kristi Geris sent an email to the Coordinating Committees on October 28, 2014, notifying them that the draft 2014 Rocky Reach and Rock Island Fish Spill Report was available for review, with edits and comments due to Keller prior to the Coordinating Committees meeting on November 18, 2014. Keller said that no edits or comments were received on the draft report.

Bob Rose asked how 20% spill is calculated at Rock Island Dam. Keller explained that flow estimates; comprised of flow from Chief Joseph Dam, tributary side flows, and daily average river flow; are used to develop a spill shape. He said that this information is included in a memorandum that the Chelan PUD Fish and Wildlife Department provides to the Spill Operators 2 days before spill is scheduled to occur. He said that RealTime monitoring also takes place to help shape spill. Rose noted the big spike in late-May to early-June, and asked if that is included in the average spill through August. He said that he wanted to make sure that spill was 20% when the majority of the run passes through. Keller agreed, and said that this is why RealTime monitoring takes place on a daily basis—to achieve as close to 20% as possible. He added that the variability on the tail end of the spill season was due primarily to changing river flow due to the drawdown of the Wanapum Reservoir, and the variability at the beginning of the spill season was attributed to gate maintenance when there was a defective seal, and the gate was opened to replace the seal. He said that following that maintenance, spill was immediately returned to the 20% range.

Rose asked, regarding Table 1 in the draft report, if the fish counts are reflective of both hatchery and wild populations. Keller replied that those numbers include both ad-clipped and ad-present fish through the bypass system. Rose asked if any trends were observed for steelhead based on 2014 data. Keller said that he would need to review those data, and noted that the numbers fluctuated a bit. Jeff Korth also noted the low steelhead numbers in 2013, and asked if Keller knew the reason. Keller said that he would need to review those data as well. Rose said that he was interested in the possible influence of hatchery releases above Rock Island Dam on bypass numbers; Keller said that Chelan PUD will provide 2013 and 2014 ad-present steelhead fish passage data for Rock Island and Rocky Reach dams to Geris for distribution to the Coordinating Committees.

The Coordinating Committees representatives present approved the Rocky Reach and Rock Island 2014 Fish Spill Report. *(Note: Jim Craig and Kirk Truscott provided USFWS' and the CCT's approval of the report via email on November 12 and November 18, 2014, respectively; and the final report [Attachment C] was distributed to the Coordinating Committees by Geris on January 19, 2015.)*

B. Draft Rocky Reach and Rock Island September 2014 Juvenile Bypass Operations SOA (Lance Keller)

Lance Keller reviewed the draft SOA outlining completion of the Rocky Reach and Rock Island HCP requirements for conducting additional run-timing and species composition monitoring to verify that the normal bypass operating period (April 1 through August 31) is protecting 95% of the spring and summer migrants. The draft SOA was distributed to the Coordinating Committees by Kristi Geris on November 17, 2014. Keller recalled the additional monitoring that took place from September 1 to 15, 2014, at Rocky Reach and Rock Island dams, which indicated that there did not appear to be a significant component (greater than 5%) of the juvenile emigrants present outside the normal bypass operating period. He also noted the Columbia River Data

Access in Real Time (DART) database expanded value that was applied at Rock Island Dam. Keller said that Kirk Truscott provided the CCT's approval of the SOA via email, with the comment that if the September 1 to 15 index counts represented 3 to 4% of the total index counts, Truscott would have recommended an additional year of extended bypass operations. Keller said that, however, because the percentages were so low, that the end date of August 31 is sufficient, as Truscott also noted.

The Coordinating Committees representatives present approved the Rocky Reach and Rock Island September 2014 Juvenile Bypass Operations SOA. *(Note: Jim Craig and Truscott provided USFWS and the CCT approval of the SOA via email on November 12 and November 18, 2014, respectively; and the final SOA [Attachment B] was distributed to the Coordinating Committees by Geris on November 25, 2014.)*

C. Wanapum Drawdown Update (Lance Keller)

Lance Keller said that the latest Wanapum briefing was held yesterday, November 17, 2014. He said that during the briefing, Jim Craig had asked about plans to remove the denil structures at Rock Island Dam. Keller explained that removal of those structures is still under discussion, and that Chelan PUD is uncertain whether the denil structures may be needed again if the Rock Island tailrace is lowered. He added that if the structures are removed, reinstalling them would require a substantial amount of time, and high flows would make re-installation impossible. He said that Chelan PUD is discussing this further with Grant PUD and the Federal Energy Regulatory Commission, and he said that Chelan PUD will keep the Coordinating Committees apprised of the outcome of these discussions.

Keller said that river flow at Rock Island Dam is increasing, and is currently 127,000 cubic feet per second (127 kcfs). He said that this translates to an average tailrace elevation of 563.63 feet. He said that all fishway entrances at Rock Island Dam are available, and all denils are fully submerged. He said that additional units have been brought online, and that Powerhouses 1 and 2 are running at full capacity, with no spill.

Keller said that the Rock Island Dam 2014 fish counting season, which started April 15, ended on November 15, 2014. He said that the 2014 annual totals include: 150,030 steelhead, 145,101 Chinook salmon, 81 bull trout, 581,121 sockeye salmon, 2,452 lamprey, and 47,580 coho salmon. Keller noted that the lamprey number only includes those fish passing the count window, and does not include fish transported via Grant PUD's trap and haul effort. He said that Chelan PUD is working to get the lamprey count, as reported on the DART database, to include those lamprey that were trapped and hauled above Rock Island Dam.

Keller said that the next Rock Island Interim Fish Passage Plan monthly report will be available by December 1, 2014. He said that the report will largely be the same as previous reports, only with updated fish counts and flow past the Project for the month of November, and also some details about possibly leaving the denil structures in place.

Scott Carlon asked if there would be any structural issues with leaving the denils in place. Keller replied that there would not. He said that at an operational range of 558 to 562 feet (Wanapum interim pool raise elevation), fish passage at Rock Island Dam will be similar to what was experienced from May through July of this year. He said that based on fish counts from those months, there did not appear to be any passage issues. He added that at that elevation, fish would not have to ascend the denil structures. He also added that the denils are anchored to concrete and other structures to account for varying tailwater.

D. Draft Rocky Reach TDG Year Five Report (Marcie Steinmetz and Steve Hays)

Marcie Steinmetz reviewed the draft Rocky Reach TDG Year Five Report (Attachment D), which was distributed to the Coordinating Committees by Kristi Geris on November 17, 2014. Steinmetz said that the Rocky Reach Hydroelectric Project 401 Water Quality Certification requires that Chelan PUD submits a 5-year TDG check-in report to Ecology, the Rocky Reach Fish Forum (RRFF), and the HCP Coordinating Committees. Steinmetz said that the report covers the years 2008 to 2013, and does not include 2014 data. She said that also as required by the 401 Water Quality Certification and addressed within this report, is the requirement to evaluate alternative spillway operations, using any of gates 2 through 12, to determine whether TDG levels can be reduced. She said that Chelan PUD addresses spill configuration as a phased approach, as further described on page 16 in Attachment D.

Steve Hays said that fish passage data will be evaluated once obtained (i.e., post-hoc analyses). He recalled spill configurations that were studied in 2011 and 2012, particularly the high level spill patterns (above 50 kcfs), at which time the desired V-shaped pattern tended to distort and appeared to have less value for enhancing fish guidance to the fishway entrances. He said that spill was also spread to more gates than usual, which created a whitewater pattern below the dam that the fish have to navigate through, but the tapered pattern led fish to the powerhouse collection system, which is the entrance where most fish enter when into a non-spill configuration. He said that both Chinook and sockeye salmon were passing in optimal numbers, and he noted that steelhead and coho salmon had not yet reached Rocky Reach Dam. He noted Figures 2-3 and 2-4 in Attachment D, where daily fish counts by species are plotted along with the spill pattern in effect for that day. He also noted that the figures do not account for fish that entered the ladders, and did not pass the count window (see note below). He said that the spill patterns were not refined enough to correlate fish entry by ladder. He added that the 2011 and 2012 studies were an attempt to identify any obvious problems, and he noted that none were observed. He also noted that the proposed alternative spillway operations summarized in this draft report are not necessarily final. *(Note: Hays later clarified via email that fish could have entered the fishway, but would not have been counted until they passed through the counting window. Thus, the count data are not a perfect temporal match to the spill pattern in effect at the time an individual fish may have found the entrance and entered the fishway. However, since it is believed that the majority of fish pass through the fishway in the same day that they enter, the comparison is still useful, just not exact.)*

Mike Schiewe asked when Chelan PUD is required to submit a final report to Ecology. Steinmetz replied that a final report is due to Ecology by the end of 2014; however, she reiterated that the proposed operations summarized in this report are not necessarily final. She said, for example, that the use of automated gates may change. Hays further explained that the gates are currently not capable of automatically adjusting as spill level increases and decreases, and may not be ready for testing next summer. Steinmetz estimated that the system would be automated in 2015, and ready to test in 2016. She also stated that, as further described under Phase 4 on page 20 of Attachment D, Chelan PUD will develop a schedule to make the necessary changes to perform the new spill configurations. She also noted that while operating under a new configuration, adaptive management may be implemented based on review of data. Hays added that operations can be stopped at any time.

Schiewe said that the typical comment period for HCP documents is 60 days; however, a shortened comment period has been approved in the past under special circumstances. Steinmetz noted that the portion of the report that discusses flat spill is subject to change. Jeff Korth asked if only the TDG portion needs to be reviewed and not the spill configuration portion. Steinmetz said that review of the entire report would be preferred; however, the flattened spill portions are a work in progress. Hays said that, specifically, he would like for the Coordinating Committees to review the section on effect on fish. Steinmetz said that any portion of the report that the Coordinating Committees are not comfortable with approving can be removed from the report. Schiewe asked if Chelan PUD could draft an abbreviated version of the report that only includes those elements that require Coordinating Committees approval, as required by the 401 Water Quality Certification. Steinmetz said that she could do that. She also suggested requesting an extension from Ecology to allow for HCP 60-day review, and she said that Chelan PUD will request from Ecology an extension of the review period for the draft Rocky Reach TDG Year Five Report from 30 to 60 days, and will notify the Coordinating Committees whether the extension is granted. *(Note: Ecology granted the extended review period with a new comment deadline of January 15, 2015, as distributed to the Coordinating Committees by Kristi Geris on November 26, 2014.)*

Coordinating Committees representatives will provide initial comments on the draft Rocky Reach TDG Year Five Report to Chelan PUD prior to the next Coordinating Committees meeting on December 16, 2014.

III. Douglas PUD

A. DECISION: Methow River Coho Salmon Phase Designation SOA (Tom Kahler)

Tom Kahler said that the Yakama Nation (YN) made a request to postpone the decision on the revised Methow River Coho Salmon Phase Designation SOA, which was distributed to the Coordinating Committees by Kristi Geris on November 7, 2014. Kahler said that the YN indicated that they had not yet had the opportunity to internally discuss this SOA, and that Douglas PUD agreed to postpone the decision until the Coordinating Committees meeting on December 16, 2014.

B. DECISION: Wells Dam Low-Level Fishway Entrance (Tom Kahler)

Tom Kahler said that the most recent draft conceptual box design for the Wells Dam low-level fishway entrance (Attachment E) was provided to Kristi Geris this morning, which she will distribute to the Coordinating Committees following the meeting. *(Note: Geris distributed the draft design to the Coordinating Committees following the meeting on November 18, 2014, as discussed.)*

Kahler recalled that reopening the low-level fishway entrance (LLE) at Wells Dam and installing a modification to improve lamprey passage has been under discussion for the past several months. He said that the Aquatic SWG recently agreed to seek approval from the Coordinating Committees to install a structure (lamprey box) in the LLE that prevents access to salmonids but allows lamprey to pass. He recalled that Bryan Nordlund had expressed concerns about salmonids entering the LLE, and also about high discharge through the entrance resulting in the need to increase discharge from the auxiliary water supply (AWS). Kahler said that the structure is also designed to reduce flow through the LLE, which addresses Nordlund's concerns. Kahler said that no significant changes have been made to Attachment E compared to past iterations of the design other than to include more details about the structure itself. He noted that no exit is shown on the lamprey box in Attachment E; however, an orifice will be drilled into the back panel of the lamprey box as an exit. He said that Biomark is installing an antenna on the structure exit that will connect with a reader capable of detecting both half-duplex (HD) and full-duplex (FD) PIT tags. He said that flow exiting the lamprey box will only be about 1.5 cubic feet per second (cfs). He said that Douglas PUD plans to continue discussing velocities through the LLE with Aaron Beavers (National Marine Fisheries Service [NMFS] Engineer), with the objective of selecting a total LLE discharge that produces a flow net with velocities capable of attracting lamprey and not salmonids, and that does not substantially increase AWS discharge. However, Kahler noted that these discussions would not change the design of the lamprey box but would rather modify the steel plate that fills the portion of the entrance not occupied by the lamprey box. He added that all modifications to the LLE will be performed behind a bulkhead, which can be left in place, if requested, which would render the LLE impassable. He said that Douglas PUD would like to obtain approval of the lamprey box design in order to move forward with fabrication and plans to install the modification during the annual winter maintenance period at Wells Dam.

Mike Schiewe asked if Attachment E addresses Kirk Truscott's concerns about salmonids being attracted to or accessing the structure. *(Note: Truscott's comments were distributed to the Coordinating Committees by Geris prior to the meeting on November 18, 2014.)* Kahler said yes, and that by installing HD and FD PIT-tag detection inside the entrance, PIT-tagged salmonids will be detected if they access the structure. He said that radio telemetry antennas will be installed throughout the Project for Douglas PUD's 2015 Lamprey Passage and Enumeration Study, and the Washington Department of Fish and Wildlife (WDFW) is implementing a Steelhead Radio Telemetry Study, the tagged steelhead from which will contribute additional information on salmonid behavior in the vicinity of the LLE.

The Coordinating Committees representatives present approved the Douglas PUD proposed modifications to the low-level fishway entrance to improve lamprey passage at Wells Dam. *(Note: Jim Craig and Truscott provided USFWS' and the CCT's approval of the modifications via email on November 12 and November 18, 2014, respectively.)* Schiewe noted that Truscott's approval was contingent on ongoing monitoring of the area.

C. Draft 2014 Wells Dam Post-Season Bypass Report (Tom Kahler)

Tom Kahler recalled discussing a draft Passage Dates Analysis, being developed by Drs. John Skalski and Richard Townsend of Columbia Basin Research, during the last Coordinating Committees meeting on October 28, 2014. Kahler said that Skalski and Townsend were evaluating the performance of Wells Dam bypass operations based on collection of juvenile salmonids at the Rocky Reach Juvenile Fish Bypass sampling facility, corrected for Wells passage by subtracting estimated travel times between Wells and Rocky Reach dams. Kahler recalled that all preliminary migration proportions were compliant (passage was provided for 95% of the migration) except for yearling Chinook salmon, which appeared to be heavily influenced by hatchery releases. He said that Douglas PUD further evaluated passage data separating ad-clipped from ad-present spring migrants, and the results revealed differences among years. Kahler said that data from 2012, 2013, and 2014 were reviewed, which are the years when the new bypass dates were in effect at Wells Dam. He said that passage data for 2012 and 2013 were compliant (i.e., greater than 95% coverage for both ad-present and ad-clipped Chinook); however, 2014 fell short for Chinook of both origins. He explained that the date at which more than 5% of the run passed Wells Dam was the same for ad-clipped and ad-present Chinook in 2012 and 2013, but in 2014 the date upon which cumulative passage of the ad-present fish reached 5% was much earlier than the date of that event for ad-clipped Chinook. He said that he also reviewed data from 2010 and 2011 when bypass operations were compliant for the run-at-large Chinook, and that the same situation occurred in 2010 (5% cumulative passage of ad-present Chinook occurred much earlier than that of ad-clipped Chinook), but not in 2011. He said he thought that by reviewing hatchery releases, it would be clear that in years when there were early hatchery releases above Rocky Reach Dam that Wells Dam would be below the 95% standard, but that wasn't necessarily the case. He added that it was clear that hatchery releases, because they are numerically dominant, drive compliance with the 95% bypass standard when analyzing the run at large, but for years when ad-present fish arrive much earlier than ad-clipped fish, the April 9 start date is still too late to cover at least 5 percent of the ad-present outmigration. He said, to this end, that Douglas PUD believes that it is important to start evaluating the ad-present component of the run annually. He added that considering this, Douglas PUD also thinks that an earlier bypass start date may be needed.

Kahler said that he shared these data with Townsend, and Townsend noted that the numbers that he and Skalski typically use for the program RealTime are spill adjusted; whereas, the numbers Kahler reviewed are not. Kahler said that Townsend wants to apply a spill adjustment on those numbers and run them again. Kahler asked Townsend to redo the analysis, adding the fish that were not included due to a sampling outage. Kahler said that Skalski and Townsend's draft Passage Dates Analysis (Attachment F) was provided to Kristi Geris this morning, which she will distribute to the Coordinating Committees following the meeting; however, Kahler noted that a revised draft will be provided when it is available. *(Note: Geris distributed the draft analysis to the Coordinating Committees following the* *meeting on November 18, 2014, as discussed, and Kahler later clarified via email on November 26, 2014, that no revisions are needed as originally thought and that the draft distributed to the Committees on November 18, 2014, is the final draft for review.)*

Kahler said that Douglas PUD wants the Coordinating Committees to consider a revised bypass start date for 2015. Mike Schiewe suggested that the Coordinating Committees first review the draft analysis, and after the revised analysis is provided, follow up later to evaluate whether adjustments are needed to meet HCP requirements for wild fish. Lance Keller clarified that there is no spill adjustment applied to Rocky Reach Dam counts. Kahler added, and Keller concurred, that the expansion of the bypass counts at Rocky Reach would not affect the ratio of wild to hatchery migrants.

D. HCP Coordinating Committees Chair Position (Tom Kahler)

Tom Kahler said that the HCP Policy and Coordinating Committees held a joint conference call on November 6, 2014. He said that the following HCP signatory representatives were identified to select the HCP Chairs for the Hatchery and Coordinating Committees: Steve Parker for the YN, Kirk Truscott for the CCT, Jim Craig for USFWS, Ritchie Graves for NMFS, Jeff Korth for WDFW, Keith Truscott for Chelan PUD, and Shane Bickford for Douglas PUD. Kahler said that a ranking system was also approved for narrowing the HCP Chair candidate lists to a "short list" for interviews, where each Party ranks the candidates first to last (1 to 6 for Hatchery Committees candidates, and 1 to 8 for Coordinating Committees candidates) for filling the Chair positions, and those rankings were to be provided to Kristi Geris by November 17, 2014, so that she could compile the results for discussion at the joint HCP Policy and Coordinating Committees conference call scheduled for November 18, 2014 at 3:00 p.m. Kahler said that the goal of today's joint HCP Policy and Coordinating Committees conference call is to develop an interview list and establish a date, time, place, and process for conducting the interviews.

IV. HCP Hatchery and Tributary Committees Update (Mike Schiewe)

Mike Schiewe said that the HCP Hatchery Committees will meet at Douglas PUD tomorrow, November 19, 2014, most notably, to discuss approval of the YN's proposed SOA for expanded acclimation of spring Chinook salmon (2014 broodstock origin) at Goat Wall in 2016.

Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the last HCP Tributary Committees meeting on November 13, 2014:

- *Small Projects Program Application: Clear Creek Fish Passage and Instream Flow Enhancement Project*: The Rocky Reach Tributary Committee approved a Small Projects Program application from Trout Unlimited that involves removing barriers and accessing a well in order to increase flow by 0.45 cfs, improving spawning and rearing habitat from May 13 to September 30. The contribution was for about $70,000 of the approximately $95,000 project.
- *Small Projects Program Application: Lehman Riparian Restoration Project*: The Rock Island Tributary Committee approved a Small Projects Program application from the Methow Conservancy that involved restoring the riparian zone in four areas. The contribution was for about $9,000 of the approximately $40,000 project.
- *Okanagan Project Tours*: The Tributary Committees toured habitat restoration projects on the Okanagan River in Canada in October.
- *Entiat River Restoration Projects Presentation*: The Bureau of Reclamation (Reclamation) presented restoration actions proposed for the Entiat River Gray and Stormy Reaches. The Tributary Committees will have additional opportunities to provide comments on the 30 and 60% designs.
- *Upper White Pine Presentation*: Chelan County Natural Resources Department, Interfluve, and Reclamation presented to the Tributary Committees and the Priest Rapids Coordinating Committee Habitat Subcommittee (PRCC HSC) updated information on the proposed approach for the Nason Creek Upper White Pine Restoration Project. The Tributary Committees and the PRCC HSC were alerted that there will be an additional request for funds. The Tributary Committees and the PRCC HSC provided early feedback to help with preparation of the application.
- *Next Steps*: The next HCP Tributary Committees meeting will be held on December 11, 2014.

V. HCP Committees Administration

A. Next Meetings (Mike Schiewe)

Mike Schiewe suggested, in consideration of the holiday, to reschedule the Coordinating Committees December meeting to December 16, 2014, and to hold the meeting via conference call. He said that the PRCC is planning to hold their meeting on December 17, 2014. Coordinating Committees representatives present agreed to reschedule the Coordinating Committees meeting on December 23 to December 16, 2014.

The next scheduled Coordinating Committees meeting is on December 16, 2014, to be held by conference call. The January 27 and February 24, 2015 meetings will be held either by conference call or in person at the Radisson Hotel in SeaTac, Washington, as is yet to be determined.

List of Attachments

Attachment A	List of Attendees
Attachment B	Final Rocky Reach and Rock Island September 2014 Juvenile Bypass Operations SOA
Attachment C	Final Rocky Reach and Rock Island 2014 Fish Spill Report
Attachment D	Draft Rocky Reach TDG Year Five Report
Attachment E	Draft Conceptual Box Design for the Wells Dam Low-Level Fishway Entrance
Attachment F	Skalski and Townsend's Draft Passage Dates Analysis

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Lance Keller*	Chelan PUD
Steve Hays	Chelan PUD
Tom Kahler*	Douglas PUD
Marcie Steinmetz	Chelan PUD
Scott Carlon*	National Marine Fisheries Service
Jeff Korth*	Washington Department of Fish and Wildlife
Bob Rose*	Yakama Nation

Note:
* = Denotes Coordinating Committees member or alternate

FINAL
Rock Island and Rocky Reach Habitat Conservation Plan
Coordinating Committees

Statement of Agreement

Maintain Rock Island and Rocky Reach
Juvenile Bypass Operating Period of
April 1-August 31 Annually

(Approved November 18, 2014)

Agreement Statement

The Rock Island and Rocky Reach HCP Coordinating Committees (CC) reviewed the juvenile subyearling Chinook bypass data collected during extended operations from September 1 through September 15, 2014 and agree that the normal juvenile bypass period as outlined in the Rocky Reach and Rock Island HCPs (April 1 through August 31) is adequately protecting 95% of the spring and summer migrations of juvenile Plan Species. The juvenile bypass operational period will be evaluated again in ten years (2024).

Background

Section 5.4.1 of both the Rocky Reach and Rock Island HCPs includes a requirement to conduct additional juvenile run-time monitoring outside of the normal operational timeframe to ensure bypass operations adequately cover 95% of the juvenile outmigration of all Plan Species. In consultation with the CC, both the Rocky Reach Juvenile Bypass System and the Rock Island Juvenile Bypass Trap were operated through September 15, 2014 to collect additional run timing data on subyearling Chinook (Table 1). Through approval of the CC, additional juvenile subyearling Chinook indexing was completed on September 15, 2014.

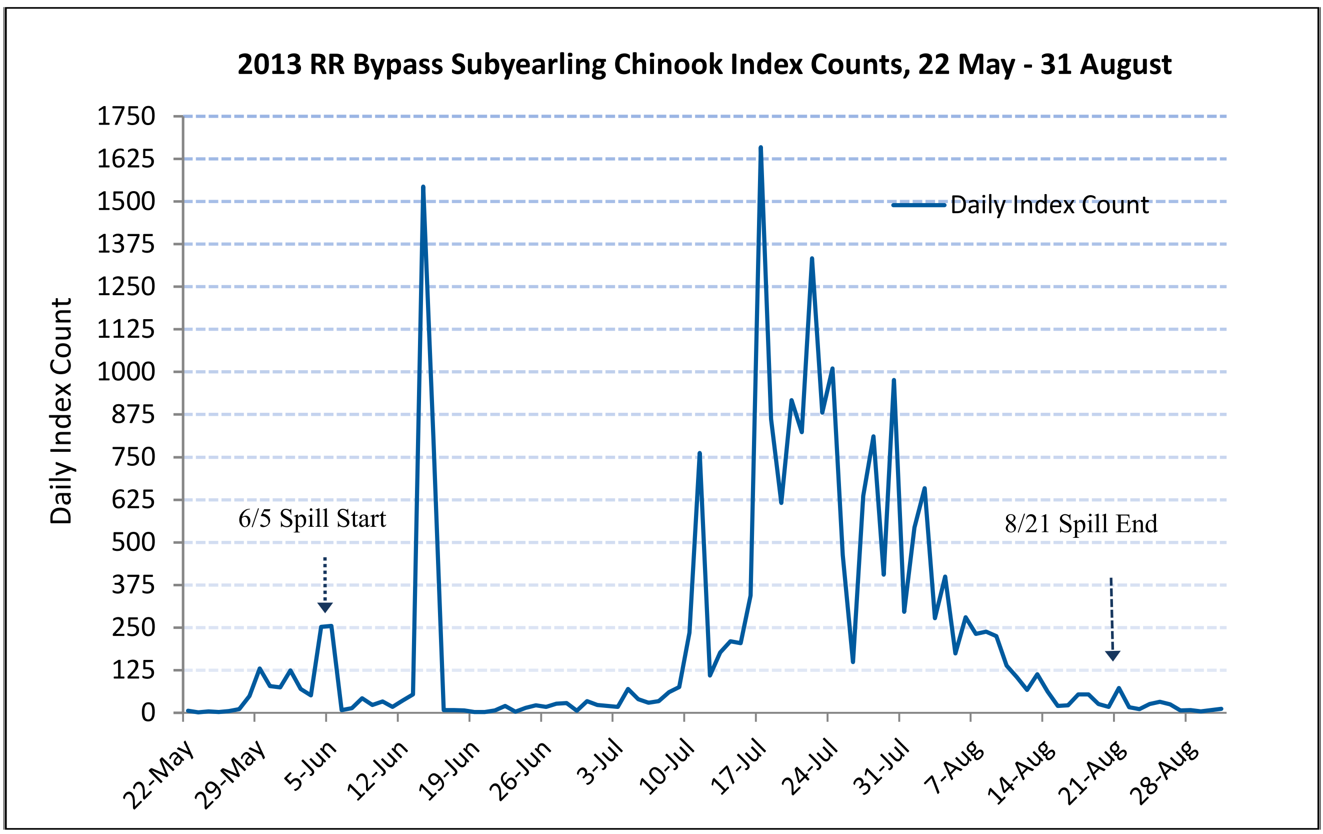
Table 1. Juvenile subyearling Chinook index counts (and run percentiles) during extended bypass operations, September 1-15, 2014.

	Index Count on 8/31/14	**Index Count 9/1-9/15/14**
Rocky Reach	22,251	76 (0.34%)
Rock Island	34,165	471 (1.37%)

Chelan PUD
Rocky Reach and Rock Island HCPs
Final 2014 Fish Spill Report

2014 ROCKY REACH
Summer Spill

Target species:	Subyearling Chinook
Spill target percentage:	9% of day average river flow
Spill start date:	24 May, 0001 hrs
Spill stop date:	24 August, 2400 hrs
95% Est. passage date:	17 August
Percent of run with spill:	98.27% on 24-August (estimated as of 15 September)
Cumulative index count:	22,327 subyearling Chinook (as of 15 September)
Summer spill percentage:	12.72% (9.13%, plus 3.59% forced spill 24 May – 24 August)
Avg river flow at RR:	151,412 cfs (24 May - 24 August)
Avg spill rate at RR:	19,253 cfs (24 May - 24 August)
Total spill days:	93



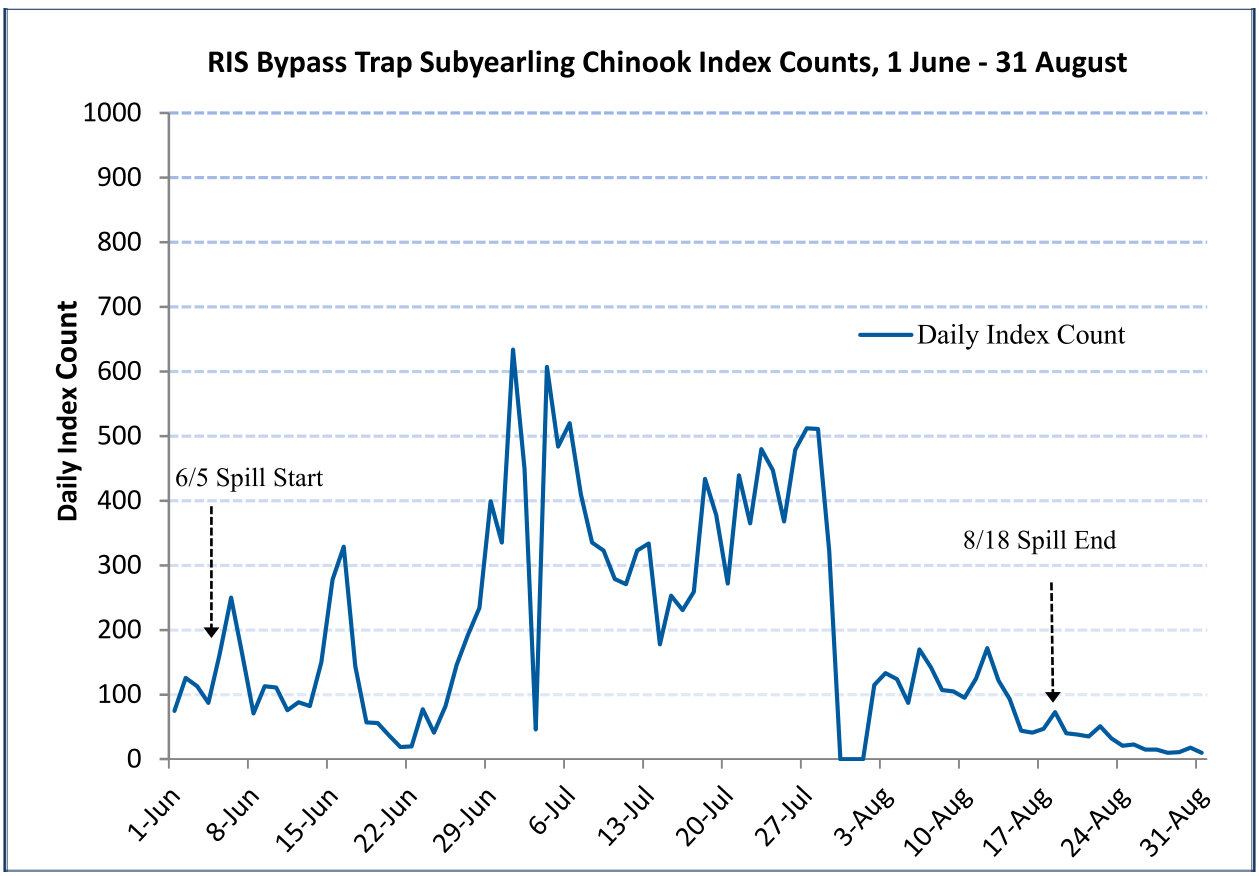
<u>2014 ROCK ISLAND</u>

Spring Spill

Target species:	Yearling Chinook, steelhead, sockeye
Spill target percentage:	10% of day average river flow
Spill start date:	17 April, 0001 hrs
Spill stop date:	23 May, 2400 hrs (immediate increase to 20% summer spill)
Percent of run with spill:	Yearling Chinook 100%; steelhead 99.91%; sockeye 99.94%
Cumulative index count:	26,429 yearling Chinook**;** 28,299 steelhead**;** 38,596 sockeye
Spring spill percentage:	18.33% (10.06% plus 8.27% forced spill for 17 April – 23 May)
Avg river flow at RI:	175,295 cfs (17 April – 23 May)
Avg spill flow at RI:	32,126 cfs (17 April – 23 May)
Total spill days:	37

Summer Spill

Target species:	Subyearling Chinook
Spill target percentage:	20% of day average river flow
Spill start date:	24 May, 0001 hrs
Spill stop date:	24 August, 2400 hrs
95% Est. passage date:	19 August
Percent of run with spill:	Subyearling Chinook 97.12% (estimated as of 15 September)
Cumulative index count:	34,527 subyearling Chinook (as of 15 September)
Summer spill percentage**:**	21.83% (20.05% plus 1.78% forced spill for 24 May – 24 August)
Avg river flow at RI:	157,578 cfs (24 May - 24 August)
Avg spill flow at RI:	34,404 cfs (24 May - 24 August)
Total spill days:	93



Juvenile Index Counts 2004-2014 from the Rocky Reach Juvenile Fish Bypass Sampling Facility and Rock Island Bypass Trap Smolt Monitoring Program (SMP) 1 April – 31 August.

Table 1. Rocky Reach Juvenile Bypass index sample counts, 2004-2014

Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014*
Sockeye	30,935	17,575	239,185	169,937	136,206	40,758	724,394	67,879	384,224	199,497	**553,645**
Steelhead	6,433	5,821	4,329	4,532	8,721	6,309	4,931	5,683	4,902	2,528	**5,270**
Yearling Chinook	53,946	27,611	23,461	18,080	38,394	18,946	33,840	24,400	95,207	29,018	**15,871**
Subyearling Chinook	20,062	10,978	19,996	13,496	11,820	11,944	59,751	17,246	5,774	22,073	**22,327**

Table 2. Rock Island Smolt Monitoring Program index sample counts, 2004-2014

Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014*
Sockeye	7,114	1,991	34,604	16,410	38,965	4,926	37,404	18,697	46,788	25,111	**38,596**
Steelhead	10,735	15,974	26,930	18,482	22,780	17,636	17,194	28,408	16,957	15,099	**28,299**
Yearling Chinook	12,574	14,797	37,267	23,714	22,562	9,225	11,802	26,407	25,759	28,324	**26,429**
Subyearling Chinook	23,563	18,710	27,106	15,686	15,940	8,189	23,205	27,397	27,298	17,170	**34,527**

* In 2014, as directed by the HCP, Chelan PUD conducted bypass operations outside of the normal operating period of 1 April to 31 August to assess achievement of bypass operations for 95% of the subyearling Chinook outmigration. The Rocky Reach juvenile fish bypass operated from 1 April through 15 September, and the Rock Island bypass facility at powerhouse 2 operated from 1 April through ? September.

TOTAL DISSOLVED GAS: YEAR FIVE COMPLIANCE REPORT

Draft

ROCKY REACH HYDROELECTRIC PROJECT
FERC Project No. 2145

November 3, 2014

Public Utility District No. 1 of Chelan County
Wenatchee, Washington

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TERMS AND ABBREVIATIONS

7Q10	highest seven consecutive day average flow with a 10-year recurrence frequency
cfs	cubic feet per second
CCT	Confederated Tribes of the Colville Reservation
Chelan PUD	Public Utility District No. 1 of Chelan County
Ecology	Washington State Department of Ecology
EPA	Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
FMS	fixed monitoring station
GBT	gas bubble trauma
HCP	Habitat Conservation Plan
HCP CC	Habitat Conservation Plan Coordinating Committee
JFB	juvenile fish bypass system
kcfs	thousand cubic feet per second
NMFS	National Marine Fisheries Service
Project	Rocky Reach Hydroelectric Project
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
RRFF	Rocky Reach Fish Forum
standards	Washington State water quality standards
TDG	total dissolved gas
USFWS	United States Fish and Wildlife Service
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WQC	water quality certification
WQMP	Water Quality Management Plan

EXECUTIVE SUMMARY

Public Utility District No. 1 of Chelan County (Chelan PUD) owns and operates the Rocky Reach Hydroelectric Project (Project), located on the Columbia River downstream of Wells Dam. The Project is licensed as Project No. 2145 by the Federal Energy Regulatory Commission (FERC, 2009).

The following Rocky Reach Dam Total Dissolved Gas Abatement Year Five Report (Report) summarizes the results of the first five years of total dissolved gas (TDG) monitoring and studies at Rocky Reach Dam, including an evaluation of compliance to date.

In accordance with Section 5.4.1(b), Chelan PUD is required to manage spill toward meeting water quality criteria for TDG during all flows below seven-day, ten-year frequency flood stage (7Q10) levels, but only to the extent consistent with meeting the passage and survival standards set forth in the Habitat Conservation Plan (HCP) and Anadromous Fish Agreement. Chelan PUD has been implementing the required TDG abatement measures as well as completing annual monitoring and reporting requirements in accordance with its 401 Water Quality Certification (WQC) (Ecology, 2006) and the Rocky Reach Water Quality Management Plan (WQMP) (Chelan PUD, 2006).

The total number of Rocky Reach Dam TDG exceedances (for both fish-spill and non-fish spill seasons) during the first five years of the License ranged from zero in 2009 to 21 in 2013, with a five year total of 210. Over all, Chelan PUD has been effective in their compliance efforts regarding the TDG criterion at the Project by implementing the gas abatement measures identified in the 401 WQC and the WQMP.

SECTION 1: INTRODUCTION

The Rocky Reach Hydroelectric Project (Project), owned and operated by Chelan County Public Utility District (Chelan PUD), is located on the Columbia River in Chelan County, Washington, approximately seven miles upstream of the city of Wenatchee, Washington (Figure 1-1). The Project utilizes the waters of the Columbia River, whose drainage basin extends over substantial portions of northern Washington, Idaho, Montana and into Canada. The Project reservoir (Lake Entiat) extends 43 miles to Douglas County PUD's Wells Dam. The Project consists primarily of an 8,235-acre reservoir; a 2,847-foot-long by 130-foot-high concrete gravity dam spanning the river, including a powerhouse and spillway; a juvenile fish bypass system, and hatchery facilities.

The Federal Energy Regulatory Commission (FERC) issued a new license (License) for the Project on February 19, 2009 (FERC, 2009) authorizing the Public Utility District No. 1 of Chelan County (Chelan PUD) to operate the Project for a period of 43 years. The License incorporated the terms of the Rocky Reach Settlement Agreement, which included a comprehensive Water Quality Management Plan (WQMP) (Chelan PUD, 2006), and the terms of the Water Quality Certification (WQC) (Ecology, 2006) issued by the Washington Department of Ecology (Ecology) as required by Section 401 of the Clean Water Act (Order 3155).

In accordance with WQC Condition 5.4(1)(d) *Determination of Compliance*, in the fifth year of the effective date of the License, Chelan PUD is required to prepare a report summarizing the results of all TDG studies performed to date, and describing whether compliance with the numeric criteria has been attained. Probable and possible impacts to fish species from such TDG abatement methods will be included in the report. Chelan PUD will also submit a report to Ecology summarizing GBT monitoring and other relevant information regarding the effects of TDG produced by the Project on aquatic life. Chelan PUD will submit these reports to Ecology, members of the Rocky Reach Fish Forum (RRFF), and members of the HCP Coordinating Committee (HCP CC).

The Total Dissolved Gas 5-Year Compliance Report hereby summarizes Chelan PUD's efforts towards compliance with the numeric criteria as set for in the WQC Condition 5.4.1. The studies associated with total dissolved gas and considered for this report are:

Appendix A - Section 5.4 - Total Dissolved Gas

- December 24, 2013 - 2013 Gas Abatement Annual Report
- December 27, 2012 - 2012 Gas Abatement Annual Report
- June 1, 2012 - 2012 Alternative Spillway Configuration Operations Plan to Measure Impacts on TDG, Draft
- January 12, 2012 - 2011 Gas Abatement Annual Report
- December 22, 2010 - 2010 Gas Abatement Annual Report
- December 29, 2009 - 2009 Gas Abatement Annual Report

Appendix A - Section 5.7(2) - Quality Assurance Project Plan

- April 28, 2014 - 2014 Quality Assurance Project Report and QAPP Update
- April 30, 2013 - 2013 Quality Assurance Project Report and QAPP Update
- July 26, 2012 - Quality Assurance Project Plan
- April 30, 2012 - 2011 Quality Assurance Project Report and QAPP Update
- April 29, 2011 - 2010 Water Quality Monitoring Results Report
- November 3, 2010 - Quality Assurance Project Plan
- February 19, 2010 - Quality Assurance Project Plan
- February 1, 2011 - 2010 Water Quality Monitoring Results Report

1.1 Project Description

The Rocky Reach Project (Project) is located on the Columbia River about seven miles upstream of the city of Wenatchee. Construction of the dam and powerhouse began in 1956 and the project was completed and put into production in 1961. The impounding structures are reinforced concrete consisting of a forebay wall section about 460 feet long; a combined intake and powerhouse section 1,088 feet long; a non-overflow center dam spillway that is 740 feet long consisting of 12 bays, each controlled by a 50 foot wide, 58 foot high radial gate; and a 2,000-foot sub-surface cutoff consisting of a grout curtain and a compacted impervious barrier limits seepage through a terrace forming the east bank.

The forebay wall consists of concrete gravity blocks of various heights, with a maximum height of 118 feet. The service bay connects the forebay wall to the powerhouse. The powerhouse contains 11 units, each 86 feet wide and about 200 feet long. The Project's FERC authorized installed capacity is 865.76 megawatts.

The Project contains an upstream (adult) fish passage facility consisting of a fish ladder located downstream of the forebay wall with three entrances, and a juvenile bypass system (JBS) which began operation in 2003 to provide downstream fish passage for juvenile salmon and steelhead.

The JBS consists of; a surface collection system adjacent to the forebay wall, intake screens and a bypass conduit routed along the downstream side of the powerhouse and spillway; a fish collection facility and an outfall downstream of the Project near the dam's left abutment.

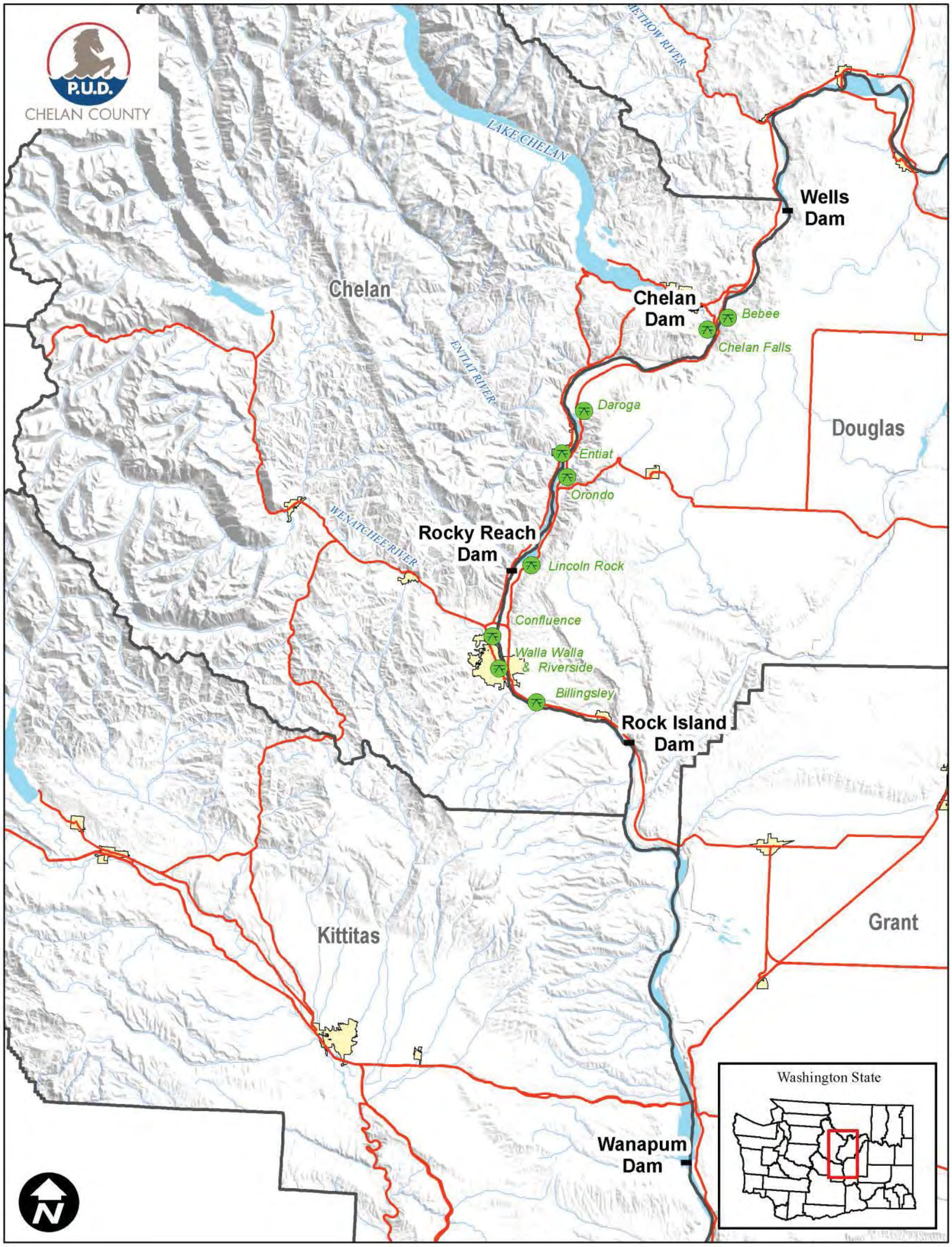

Figure 1-1: Project Location

1.2 Regulatory Framework

The Washington State water quality numeric criteria for TDG (Washington Administrative Code (WAC) 173-201A-200(1)(f)) address standards for the surface waters of Washington State. Under the water quality standards (standards), TDG shall not exceed 110 percent at any point of measurement in any state water body. However, the TDG criteria may be adjusted to aid fish passage over hydroelectric dams when consistent with an Ecology approved gas abatement plan. This plan must be accompanied by fisheries management and physical and biological monitoring plans. Ecology may approve, on a per application basis, a temporary exemption to the TDG standard (110 percent) to allow spill for juvenile fish passage on the Columbia and Snake rivers (WAC 173-201A-200(1)(f)(ii)). On the Columbia and Snake rivers, there are three separate standards with regard to the TDG exemption. First, in the tailrace of a dam, TDG shall not exceed 125 percent as measured in any one-hour period. Further, TDG shall not exceed 120 percent in the tailrace of a dam and shall not exceed 115 percent in the forebay of the next dam downstream as measured as an average of the 12 highest consecutive (12C-High) hourly readings in any one day (24-hour period).

It is important to note that the TDG water quality standards identified above are intended to help protect aquatic life designated uses within the Project. This includes Ecology's allowance of higher TDG levels during the fish-spill season, which allow dams to spill water to help meet juvenile salmonid passage performance standards.

Specific passage performance (or survival) standards for the Project are outlined in the HCP for the Rocky Reach Project. Specifically, the HCP provides that Chelan PUD achieve and maintain Combined Adult and Juvenile Project Survival. The Combined Adult Juvenile Survival standard is 91%. The ninety-one percent standard is composed of 98% adult project passage survival and 93% juvenile project survival.

Chelan PUD is currently in Phase III - Standards Achieved (the 91% adult-juvenile combined survival standard is achieved) for the spring migrating HCP species; sockeye, spring Chinook, and steelhead. Summer/fall subyearling Chinook are in Phase III - Additional Juvenile Studies, due to limitations on acoustic tag technology for subyearling fish and unpredictable migration behavior of Upper Columbia River subyearling Chinook. Coho, the last Plan species, is in Phase III - Standards Achieved - Interim.

Achieving the survival standards as described above and in addition to meeting TDG numeric criteria as outlined in WAC 173-201A-200(1)(f), are an integral part of meeting the water quality standards (e.g. protection of designated uses) as described in the Project's 401 WQC (Ecology, 2006).

1.2.1 7Q10 Flows

Section 5.4.1(b) of the 401 WQC (Ecology, 2006) and Washington Administrative Code (WAC) 173-201A-200(f)(i) states that the water quality criteria for TDG shall not apply when the stream flow exceeds the seven-day, ten-year frequency flood stage (7Q10). The 7Q10 flood flow for the Rocky Reach Project was calculated to be 252 kcfs.

1.2.2 Daily Total Dissolved Gas Compliance Value Calculation Method

Prior to 2008, the method used to calculate the daily TDG compliance value during the fish-spill season was based on the average of the twelve highest hourly values in a twenty-four hour period, starting at 0100 hours and ending at 2359 hours. This method was based on Ecology's 1997 water quality standards. In Ecology's 2006 revision to the water quality standards (which were not approved by the Environmental Protection Agency (EPA), and thus not effective, until 2008) the method for calculating the TDG compliance value was changed. The new method provided that the TDG compliance value be determined by calculating the average of the twelve highest "consecutive" hourly values in a twenty-four hour period. Prior to the 2008 fish-spill season, there were discussion amongst the Columbia and Snake River dam operators on how to properly implement the "rolling average" method, especially as it related to what time the rolling average began. There were concerns related to the addition of the previous day's last eleven hours to the compliance value calculation on the next day.

On May 21, 2008, Ecology requested, via memo, that all Columbia and Snake River dam operators use a rolling average method for calculating the twelve highest consecutive hourly TDG readings in a twenty-four hour period, beginning at 0100 hours, based on Ecology's 2006 revised water quality standards (Ecology, 2008). Using a rolling average method that begins at 0100 hours results in counting the hours 1400 through 2359 twice: in the average calculations on the day they occur and on the next reporting day. As a result, a TDG water quality standard exceedance may be indicated on two separate days based on the same group of hours.

The annual fish-spill season TDG monitoring reports from 2012-2013 Gas Abatement Annual Reports provide examples of how the "rolling average" method could create a TDG exceedance on two separate days based on the same grouping of hourly values during the applicable fish-spill season, and Chelan PUD's method for accounting for those occurrences.

1.2.3 401 Water Quality Certification Condition

The following is the total dissolved gas condition from the WQC (Ecology, 2006) Section 5.4(1)(d).

> **5.4(1)(d) <u>Determination of Compliance</u>**. In Year 5 of the effective date of the New License, Chelan PUD shall prepare a report summarizing the results of all TDG studies performed to date, and describing whether compliance with the numeric criteria has been attained. If Ecology concludes, upon reviewing such report and other applicable information, that the Project complies with the applicable TDG numeric criteria, Ecology, in consultation with Chelan PUD, will determine which measures will be continued for the term of the New License to maintain such compliance. If Ecology concludes that compliance with the TDG numeric criteria has not been attained, Chelan PUD shall prepare a report that evaluates what measures (operational and structural) may be reasonable and feasible to implement to further reduce TDG production at the Project. Probable and possible impacts to fish species from such TDG abatement methods shall be included in the report. Chelan PUD shall also submit a report to Ecology summarizing GBT monitoring and other relevant information regarding the effects of TDG produced by the Project on aquatic life. Chelan PUD shall submit these reports to Ecology, members of the RRFF, and members of the HCP CC.

Chelan PUD has identified several steps within Section 5.4(1)(d) of the WQC. They are as follows:

1. Prepare a report summarizing the results of all TDG studies performed to date, and describing whether compliance with the numeric criteria has been attained,

2. Ecology shall review the report and conclusions regarding the Project's compliance with the TDG numeric criteria,

3. If TDG numeric criteria are met, then Ecology in consultation with Chelan PUD will determine which measures will be continued for the term of the license to maintain compliance,

4. If Ecology concludes that compliance with TDG standards have not been attained, then Chelan PUD shall prepare a report that evaluates what measures (operational and structural) may be reasonable and feasible to implement to further reduce TDG production at the Project. Probable and possible impacts to fish species from such TDG abatement methods shall be included in the report.

5. Chelan PUD shall also submit a report to Ecology summarizing GBT monitoring and other relevant information regarding the effects of TDG produced by the Project on aquatic life.

6. Chelan PUD shall submit these reports to Ecology, members of the Rocky Reach Fish Forum (RRFF), and members of the HCP Coordinating Committee.

Chelan PUD has prepared this report with the intent to satisfy the first step of Section 5.4(1)(d) of the WQC, as identified above. If Ecology concludes that TDG numeric criteria have not been met within five years of the effective date of the new License, further conditions apply. The conditions from Section 5.4(1)(e)-(g) are stated below.

> **(e) <u>Actions if TDG Numeric Criteria Not Achieved</u>**. If compliance with numeric TDG criteria has not been achieved within five years of the effective date of the New License, Ecology will proceed as described below. Such determination shall be based on an analysis of the water quality standard for TDG from the perspective of attainability and biological necessity, as provided in subsections (1) and (2) below:
>
> **(1) <u>Aquatic Life Adversely Affected</u>.** Upon receipt of the section d) reports, Ecology will determine, based on the monitoring data and analysis provided by Chelan PUD, as may be supplemented by the RRFF and/or the HCP Coordinating Committee, whether aquatic life has been adversely affected, or insufficient information exists to conclude that it has not been adversely affected, by TDG resulting from the Project. If Ecology determines an effect has occurred or insufficient information exists, it shall then further determine, in consultation with Chelan PUD and the RRFF, whether additional seasonable and feasible measures exist to further reduce TDG without significant adverse impact to fish species, and, if so, Chelan PUD shall begin implementation, which may

include structural modifications. Ecology retains the right to make the final determination with respect to measures it requires to be implemented to reduce TDG subject to FERC approval, when needed. Nothing limits either Ecology's or Chelan PUD's option to evaluate new, additional or previously evaluated alternatives to abate TDG. Ecology may also require Chelan PUD to perform additional engineering studies of TDG abatement structures or operations. Notice should be given to all parties potentially affected by this decision. If structural modifications are necessary and found reasonable and feasible, Chelan PUD shall provide design, construction and final assessment reports to Ecology in a timely manner as determined by Ecology. If it appears to Ecology, based on the information before it, that no reasonable and feasible TDG abatement measures may exist, Ecology will follow the procedures set forth in subsection (g) below in processing a related rule petition that Chelan PUD may file. If the Corps of Engineers requires a 404 permit, Ecology retains its option to issue a separate water quality certification for construction.

(2) Aquatic Life Not Adversely Affected. If Ecology determines, under subsection (1), that aquatic life has not been adversely affected by TDG resulting from ongoing Project operations, Chelan PUD shall consult with Ecology and the RRFF to determine if any additional reasonable and feasible measures may exist to meet the TDG standards. If Chelan PUD concludes that no other additional reasonable and feasible measures exist to reduce TDG, Chelan PUD may petition Ecology to modify the standards as described below

f) Chelan PUD may petition Ecology for a rule change to the TDG standard after Year 10 or sooner, if Chelan PUD believes that it can demonstrate it has done everything reasonable and feasible to attain the TDG numeric criteria at that time. In evaluating whether all reasonable and feasible measures have been done as part of reviewing such petition, Ecology will, among other relevant factors, consider information regarding biological impacts of TDG caused by the Project and the extent to which the Project has achieved the Biological Objectives. However, to be granted, any petition for a rule change must satisfy any additional legal requirements that are applicable.

g) If, in conformance with the above, Chelan PUD petitions Ecology to modify the standards to eliminate any non-compliance with such standards, and files a timely and scientifically robust petition, Ecology will provide a schedule for the evaluation and completion of action on such rulemaking petition. Such schedule shall provide target dates for Ecology's determination of whether to grant or deny the petition, and, if granted, for submission of proposed rule change to EPA. While such petition is pending before Ecology and EPA, no non-compliance orders or penalties for TDG violations shall be issued against Chelan PUD, as long as Chelan PUD continues to operate in accordance with the GAP and this Certification.

SECTION 2: WATER QUALITY MANAGEMENT PLAN ABATEMENT MEASURES

Upon receipt of the License, Chelan PUD has worked toward TDG compliance in accordance with the conditions of the 401 WQC (Ecology, 2006) and the conditions set forth in Section 4 of the WQMP (Chelan PUD, 2006), including implementation of operational TDG abatement measures, as well as development of annual Gas Abatement Plans (GAPs) and monitoring reports.

In accordance with Section 5.4.1(b), Chelan PUD is required to manage spill toward meeting water quality criteria for TDG during all flows below 7Q10 levels, but only to the extent consistent with meeting the passage and survival standards set forth in the HCP. Further TDG abatement measures are discussed below.

2.1 Operational

In general, during the first five-years of the License, there have not been any major non-routine operational changes at Rocky Reach; however, informal contact with Ecology related to involuntary spill (especially during non-fish spill season), power market conditions, or unscheduled turbine outages that had potential to impact TDG levels has occurred throughout the first five years of the TDG compliance. Annual GAPs and Annual Reports have been submitted to Ecology, in accordance with Section 5.4.3 and 5.4.4 of the 401 WQC, which have included Chelan PUD's planned TDG abatement measures, operational plans, monitoring plans, etc.

Chelan PUD implemented the following operational TDG abatement measures during the first five years of License issuance, in accordance with the conditions of the 401 WQC and Section 4 of the WQMP.

2.1.1 Minimize Voluntary Spill

Following over 15 years of testing and prototype operation, Chelan PUD constructed a permanent juvenile fish bypass system (bypass system or JFB) in 2002 and began operation of that system at Rocky Reach in 2003 to guide migrating fish before they enter the powerhouse and divert them downstream past the dam. The bypass system is a key component of Habitat Conservation Plans (HCPs) signed by Chelan PUD, the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW), and the Confederated Tribes of the Colville Reservation (CCT) to meet HCP juvenile fish survival standards. Results of survival studies have allowed Chelan PUD to greatly reduce spill for fish at Rocky Reach Dam. The JFB is now operated exclusively, for spring migrants; and spill during the summer migration has been reduced to 9% of the daily average flow. The JFB continues to be the most efficient non-turbine route for fish passage at the Rocky Reach Project.

2.1.2 Manage Voluntary Spill Levels in Real Time

Spillway releases to pass water in excess of turbine capability for load requirements; or for fish passage are controlled by computer. The Project's automated functions are backed up with around-the-clock, on duty plant operators who monitor operations and can over-ride computer control if needed. When the headwater level exceeds operator-set maximum points, gates are automatically opened to pass the excess flow.

During fish passage spill operations, the sequence and amounts of gate opening can also be adjusted to maximize the effectiveness of the water being spilled, both for juvenile passage and adult attraction. Based on the daily spill memo sent by the Chelan PUD Spill Coordinator by 10:00 a.m., the plant operators input into the system the volume of spill, begin time, and end time requested. On occasion the daily spill volumes are revised later in the day based on flows from Grand Coulee and Chief Joseph dams. The computer then determines, based on the program, which gates to open and how far.

Since 2003, the University of Washington has been contracted to provide Chelan PUD with run-timing predictions for spring and summer out migrating salmon and steelhead using the Program RealTime runtime forecasting model. Program RealTime provides daily forecasts and cumulative passage percentiles for steelhead, yearling Chinook, sockeye, and sub yearling Chinook at both Rocky Reach and Rock Island. The program enables the Chelan PUD to better predict the date when a selected percentage of these species will arrive, or when a given percentage of any stock has passed (e.g. the 5 percent passage point for juvenile sub yearling Chinook at Rocky Reach to trigger summer spill). The program utilizes daily fish counts from the juvenile sampling facility at Rocky Reach and the bypass trap at Rock Island. Estimates of the program's forecast error in daily run projections will be calculated and displayed with the daily predictions at www.cbr.washington.edu/rt/rt.html.

Spill will be provided for juvenile summer Chinook salmonid passage to cover 95 percent of the run at each of the projects in accordance with the criteria set forth in the HCP. Spill levels and durations are correlated with operations necessary for meeting the HCP juvenile survival standards and the specific passage studies designed to measure attainment.

2.1.3 Minimize Spill

Operation of the turbines at the Project is automated, including decisions to start, stop and adjust the output of the 11 generating units to achieve maximum efficiency. The Project's automated functions are backed up with around-the-clock on-duty plant operators who monitor operations and can over-ride computer control if needed.

Turbines are inspected as necessary based on hours operated and other associated stresses. To the extent possible, maintenance of priority units has been scheduled outside of fish passage periods. Because units 1 and 2 provide attraction water flows they are important components of the bypass system; long-term outages of the two units will be avoided during the juvenile passage season.

Additionally, to minimize TDG uptake in the tailrace, Chelan PUD has, to the extent practicable, avoided maintenance outages during the high flow periods. When possible, maintenance has been scheduled based on predicted flows.

Scheduled maintenance of the bypass system has occurred in the off-season, which typically runs from September through March of each year. At this time, the various systems that comprise the Bypass System are inspected.

2.1.4 Participate in the Hourly Coordination Agreement

Chelan PUD operates the Project in a manner to avoid spill as much as possible, while meeting the passage and survival standards set forth in the HCP and Fish Management Plans. When spilling for fish or due to excess inflow or generation needs, the spillway is operated using gate settings that have been shown to limit TDG production and meet fish passage requirements (Schneider and Wilhelms, 2005). These gate settings are consistent with Section 5.4(1)(b) of the 401 Certification, which states "manage spill toward meeting state water quality criteria for TDG during all flows below 7Q10 levels, but only to the extent consistent with meeting the passage and survival standards set forth in the HCP and Fish Management Plans…."

Chelan PUD participates in regional coordination meetings regarding Columbia River spill and project operations. These meetings occur prior to and during the fish spill season and include representatives from Natural Resources, Power Marketing, and Hydro Operations staff from Chelan, Douglas, and Grant PUDs, as well as representatives from Bonneville Power Association (BPA) and the Corps. Discussions typically included topics such as:

- Each project's operational limitations, competing regulations, fish studies, and/or other natural resources requirements
- The possibility of shifting generation away from those projects that produce relatively low levels of TDG to those that have the propensity to produce higher TDG levels
- Each project's planned maintenance schedules and how it may limit ability to spill water through spillways and/or pass water through turbine units

2.1.5 Maximize Powerhouse Discharge as Appropriate up to 212 kcfs.

It is important to note that while Chelan PUD attempts to reduce involuntary spill by maximizing powerhouse discharge during periods of high flows, there are other regional constraints that limit the ability to maximize powerhouse flows. These constraints include, but are not limited to:

- Regional renewable energy portfolio standards and federal tax incentives have stimulated investment of variable energy resources. The Pacific Northwest has the highest wind production capacity in the country, which tends to peak during the spring runoff (e.g. higher flow) and lower energy demand periods, which can lead to limited markets for hydroelectric energy, forcing negative pricing and/or involuntary spill.

- Variable market conditions.

2.1.6 Implement Alternative Spillway Operations

Under Section 5.4.1(b)(6) of the 401 WQC, Chelan PUD is required to implement alternative spillway operations, using any of gates 2 through 12, to determine, in consultation with the RRFF and HCP CC, whether TDG levels can be reduced without adverse effects on fish passage.

If effective in reducing TDG and not adversely affecting fish passage, Chelan PUD will implement the alternative.

Chelan PUD has identified four steps or phases necessary in order to complete the condition 5.4.1(b)(6). The identified phases are listed and discussed further below.

Phase 1. Develop and run test scenarios for spill gate configurations, collect data

Phase 2. Analyze the data collected during the test scenarios for TDG reduction

Phase 3. Further analyze the TDG reductions and potential effects on fish passage

Phase 4. If effective in TDG reduction without potentially effecting fish passage, develop an implementation plan in coordination and consultation internally with Chelan PUD operations and externally with the RRFF and the HCP CC

Phase 1. Develop and run test scenarios for spill gate configurations, collect data

Alternative spillway flow distribution patterns were studied in 2011 and 2012 in order to evaluate the potential to reduce total dissolved gas (TDG) levels, particularly during high spill levels (above 50,000 cfs). The standard spillway flow pattern, which has been in use for over 20 years, is designed to create a V-shaped pattern of high velocity, aerated water below the spillway that is presumed to lead upstream migrating adult salmon toward the vicinity of the entrances to the upstream passage fishways. However, the margins of the V-shaped pattern tend to distort at spillway flows above 50,000 cfs and appear to have less value for enhancing fish guidance to the fishway entrances. The standard spillway pattern confines spill to 7 gates (gates 2 – 8), leaving gates 9 – 12 unused. Studies of TDG levels at other Columbia River basin hydroelectric projects have shown that TDG levels are typically reduced when spillway flows are spread between more gates, thus reducing the flow per gate. The studies in 2011 and 2012 were planned to test three alternative spill patterns during normal operations to see if TDG levels would be reduced by any of these alternate patterns.

Phase 2. Analyze the data collected during the test scenarios for TDG reduction

The results of the 2011 and 2012 studies (Chelan PUD, 2013) were analyzed from the perspective of absolute TDG levels under different spillway flow volumes and the percentage of increase or decrease in TDG levels in the tailrace below the spillway, compared to the ambient TDG arriving at the Rocky Reach Project’s forebay. Generally, all of the three alternative spill patterns resulted in lower TDG levels than the standard spill pattern. Of the three alternative patterns, the flat spill pattern (flow distributed evenly between spillway gates) had a slightly better TDG performance than the other two alternative patterns, which attempted to maintain some semblance of the V-shaped turbulence zone desired for adult salmon guidance. The Parametrix (Chelan PUD, 2013b) analysis did not explore whether there was any disruption of fish passage associated with the use of the alternative spill patterns. Also, since both 2011 and 2012 were high flow years, most of the time the spillway flow was greater than 50,000 cfs during these tests, thus any effects on fish passage might have been masked due to the overall effects of high spill, regardless of the spill pattern in use. The standard spill pattern is a required operating procedure for upstream salmon passage, thus prior to changing that pattern for the purpose of reducing TDG an analysis of effects on fish passage is needed. Any decision to permanently change the spill pattern would require approval by the RRFF and HCP CC.

Phase 3. Further analyze the TDG reductions and their potential effect on fish passage

Chelan PUD has conducted some further analysis of the 2011 and 2012 spill and TDG data to determine if there is sufficient potential benefit regarding TDG levels to warrant changing the spill pattern for spill volumes of 50,000 cfs or less. Chelan PUD began by looking only at the 2011 data set, as this year was more consistent in the duration and frequency of the test of the flattened spill configuration. In addition, the adult salmon passage data for Chinook and sockeye was examined to determine if there were any apparent adverse effects on daily passage rates during the 2011 study. This analysis indicates that there may be a significant reduction in TDG levels for spillway volumes of 40,000 cfs or greater if the flat spill pattern were used rather than the standard spill pattern. There were not sufficient data to determine if the flat spill pattern would significantly reduce TDG for spill levels of less than 40,000 cfs. This is, for the most part, consistent with the findings of a previous study (Schneider and Wilhelms, 2005) which found little difference in TDG levels generated with either the standard spill pattern or with spill spread evenly between spillway gates 2 – 12 (roughly equivalent to the flat spill pattern tested in 2011). However, the Schneider and Wilhelms study had very limited data for spill levels above 40,000 cfs and no data for spill volumes greater than 60,000 cfs. Thus, the ability to detect a reduction in TDG levels using the flat spill pattern was limited during this study.

Chelan PUD grouped the 2011 spill and TDG data for the standard spill pattern (FISH) and the flat spill pattern (FLAT) into increments of spillway flow bands of 10,000 cfs. For example, all data for spillway flows greater than or equal to 40,000 cfs, but less than 50,000 cfs, were analyzed for the standard and flat spill patterns. The TDG data during these spill levels was averaged over 10 minute intervals and the percent TDG saturation was plotted for each ten minute average. The forebay TDG level was also averaged over the same interval and plotted. The graphs for the 40,000 cfs – 50,000 cfs and 50,000 cfs – 60,000 cfs spill levels are shown in Figures 2-1 and 2-2. These plots of 10 minute intervals indicate that the flat spill pattern may reduce TDG levels slightly compared to the standard spill pattern. However, the plots also show a correlation between TDG levels measured at the tailrace monitoring location and TDG levels measured in the forebay. In theory, if the tailrace monitoring location is only measuring TDG from water that passed through the spillway, as opposed to a mixture of water from both the spillway and the powerhouse, the TDG level in spillway flows should be independent from the forebay TDG level. Since this was not the case, the flow passing by the tailrace monitoring location must be receiving a mixture of powerhouse flows and spillway flows. Since forebay TDG was not consistent for the different time periods when the standard and flat spill patterns were being used, the data could not definitively demonstrate that the flat spill pattern reduced TDG levels over the standard spill pattern. In order to determine whether the flat spill pattern indeed reduces TDG, that pattern would need to be observed over a longer time period than under the daily change in spill pattern that was used during the 2011 and 2012 studies.

The use of different spill patterns did not appear to have any adverse effect on adult salmon passage at the Rocky Reach Project. The two species of salmon with peak migrations during the study were Chinook salmon and sockeye salmon. Plots of daily passage counts for these two species did not demonstrate any apparent delays or failures to find the fishway entrances. The daily passage counts of Chinook and sockeye salmon, with the spill pattern in effect each day, are shown in Figures 2-3 and Figure 2-4. Further study of the flat spill pattern, particularly for spill flows less than 50,000 cfs where the standard pattern creates a well defined V-shaped pattern, would be needed to evaluate whether adult salmon passage is adversely affected by use of the flat spill pattern.

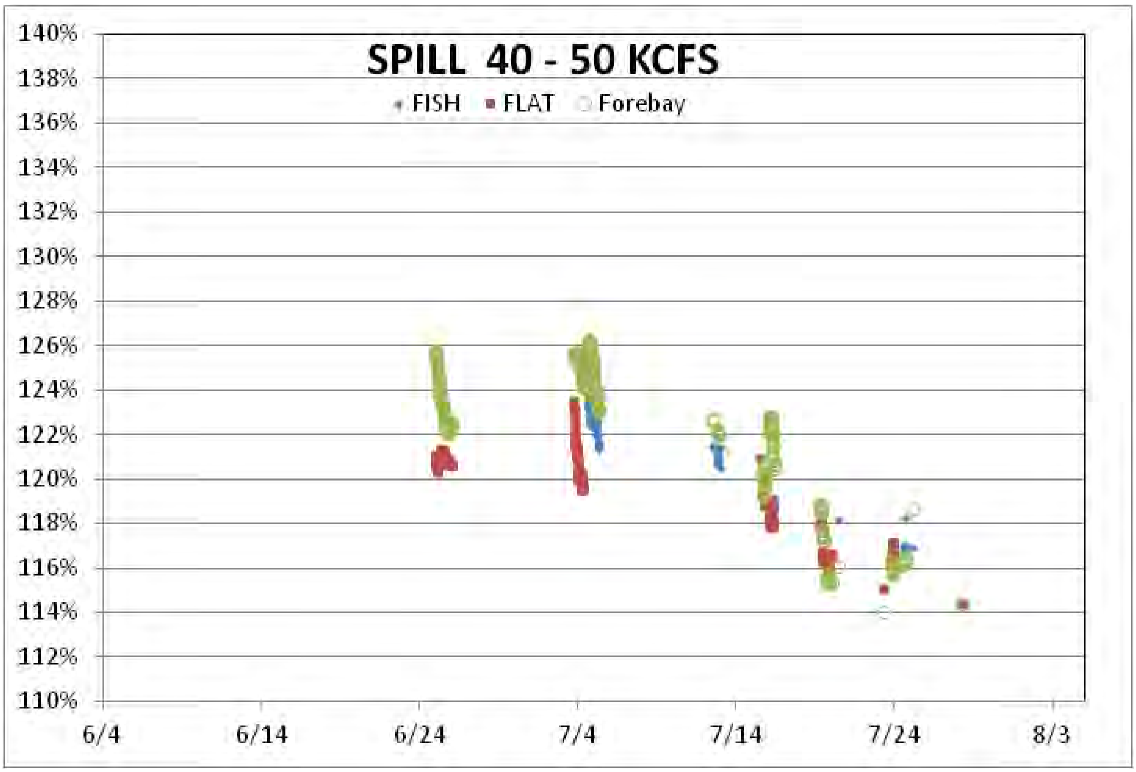

Figure 2-1: TDG levels at the Rocky Reach tailrace monitoring station for spillway flows from 40,000- 50,000 cfs.

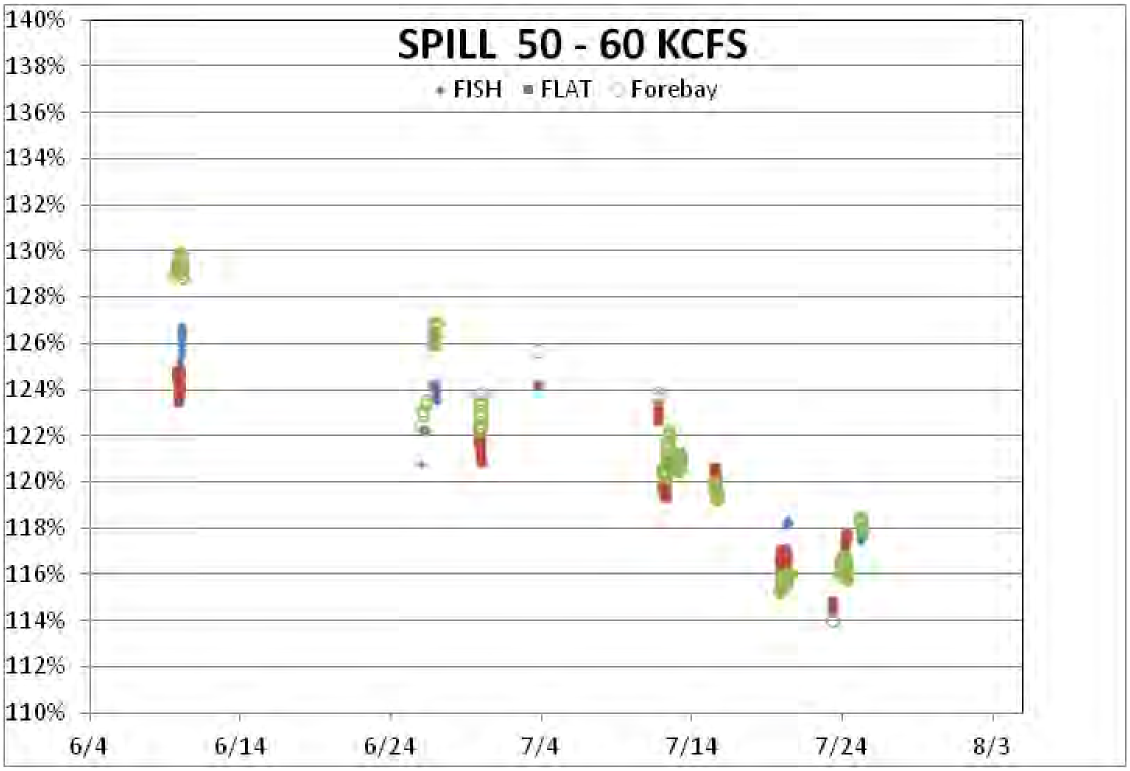

Figure 2-2: TDG levels at the Rocky Reach tailrace monitoring station for spillway flows from 50,000- 60,000 cfs.

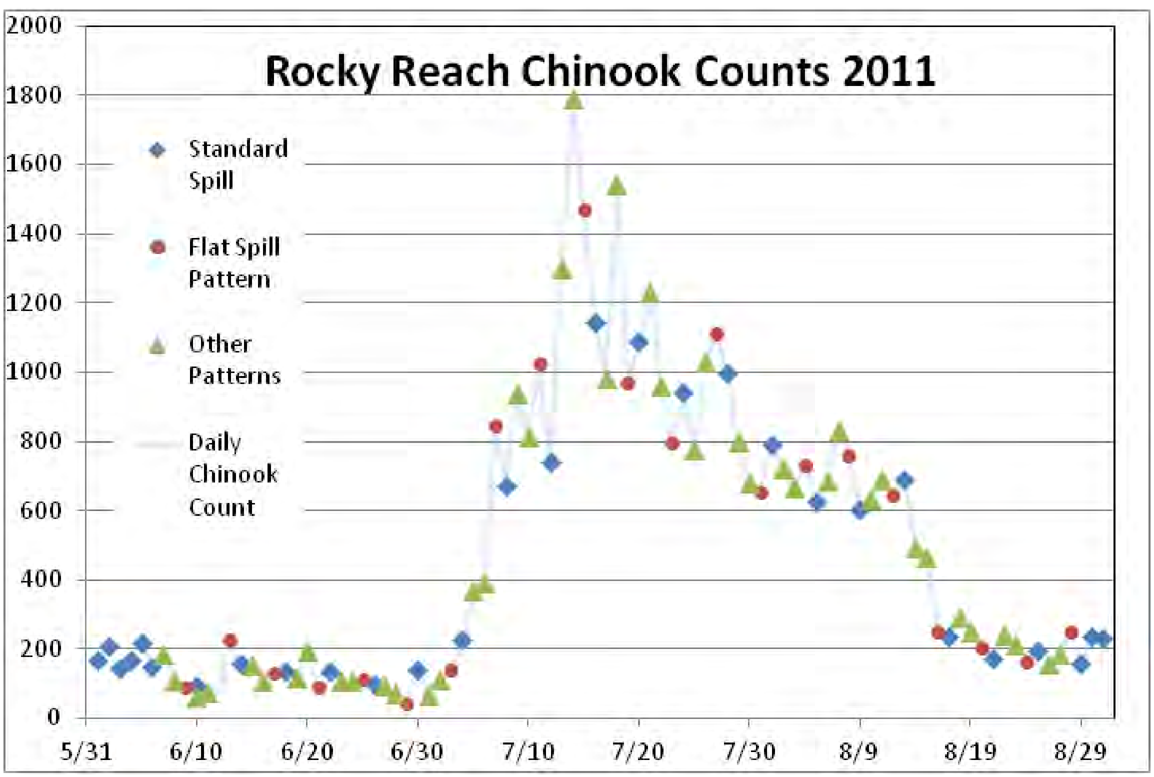

Figure 2-3: Daily passage counts of Chinook salmon at Rocky Reach, with spill pattern in effect that day.

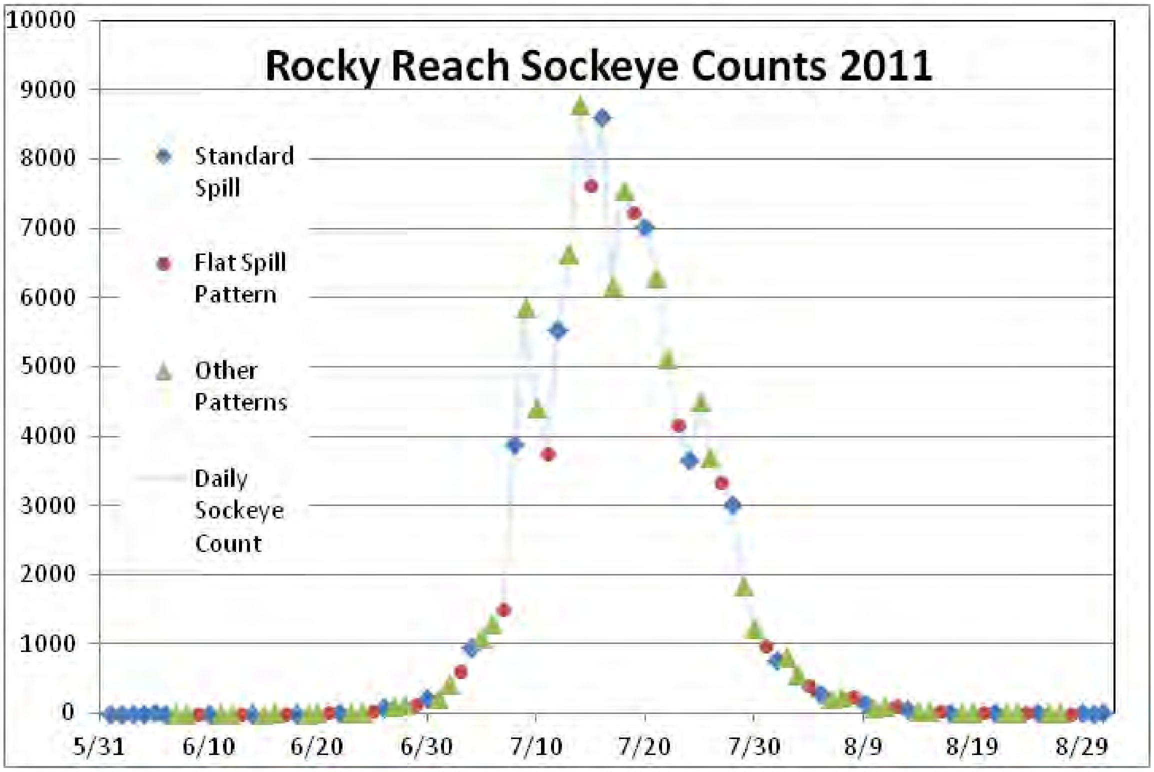

Figure 2-4: Daily passage counts of sockeye salmon at Rocky Reach, with spill pattern in effect that day.

Phase 4. If effective in TDG reduction without potentially effecting fish passage, develop an implementation plan in coordination with various parties

Upon our evaluation of the Flattened Spill configuration, Chelan PUD shall present our findings with the RRFF and HCP CC. Through the consultation process, the RRFF and HCP CC shall determine if the Flattened Spill configuration will be implemented. If implementation is decided by consensus, then Chelan PUD will develop a schedule to make the necessary changes to perform the new spill configuration. This schedule may include, but is not be limited to computer automation of spill gates, changes to system operations, and monitoring. Chelan PUD will operate the new spill configuration as a pilot or test spill and further evaluate the results for a designated period of time. If upon operating under the new spill configuration, data show that optimal results are not occurring as previously evaluated, Chelan PUD will implement adaptive management in coordination with the RRFF and HCP CC.

2.1.7 Total Dissolved Gas Monitoring

In accordance with Section 5.4.1(a) of the 401 WQC (Ecology, 2006), Chelan PUD currently operates and maintains four fixed-site water quality monitoring stations (FMS) that record barometric pressure (millimeters of mercury (mm/hg)), TDG (mm/hg), and temperature (°C). Barometric pressure, TDG, and temperature are recorded at 15 minute intervals, throughout the year in accordance with Chelan PUD's Ecology-approved Quality Assurance Project Plan (QAPP) (Chelan PUD, 2010b).

TDG data enables plant operators to adjust spill volumes to maintain gas levels to reduce the likelihood of exceeding the TDG criteria. These 15-minute intervals are averaged into hourly readings for use in compiling daily and 12-hour averages. All hourly data are forwarded to Chelan PUD headquarters and then onto the US Army Corps of Engineers Reservoir Control Center and posted at their site on the World Wide Web.

The Rock Island forebay FMS is located at a fixed site on the upstream face of Rock Island dam. The Rocky Reach tailrace monitoring station is located approximately one third of a mile downstream of the spillway on the juvenile fish bypass outfall, as required by the 401 WQC (Ecology, 2006). This location was chosen because it was the most feasible location near the end of the aerated zone, which is the compliance point for the Mid-Columbia TDG TMDL. There is not a bridge or other structure downriver of Rock Island Project to which a monitoring station can be attached.

Each Chelan PUD FMS station is equipped with a Hydrolab® Minisonde® 5 enclosed in a submerged conduit. Multi-probes are connected to an automated system that allows Chelan PUD to monitor barometric pressure, TDG, and water temperature on an hourly basis. Probes are maintained and calibrated as outlined in the QAPP. For a complete description of the FMS see the QAPP (Chelan PUD, 2010bb).

SECTION 3: DATA SUMMARY

The following sections summarize the hydrological and TDG monitoring results from the 2009-2013 time periods. Additional detail can be found in the GAPs, annual reports (GAP Reports) and annual water quality monitoring reports. All of these reports have been submitted to Ecology in accordance with Sections 5.4.3, 5.4.4 and 5.7.8 of the 401 WQC (Ecology, 2006).

3.1 Hydrological

Mean daily discharges for each year from 2009-2013 as measured at Rocky Reach Dam are shown in Figure 3-1. In general 2009 and 2010 were the lowest flow years, while 2011 and 2012 were the highest, which corresponded to the highest TDG levels due to the amount of involuntary spill that was required to pass high flows throughout the mid-Columbia River. In 2011 and 2012, the 7Q10 flow was exceeded at Rocky Reach 70 of the 153 days in 2011, and 90 of the 153 days in 2012 of the fish-spill seasons (Frantz, 2011 and 2012).

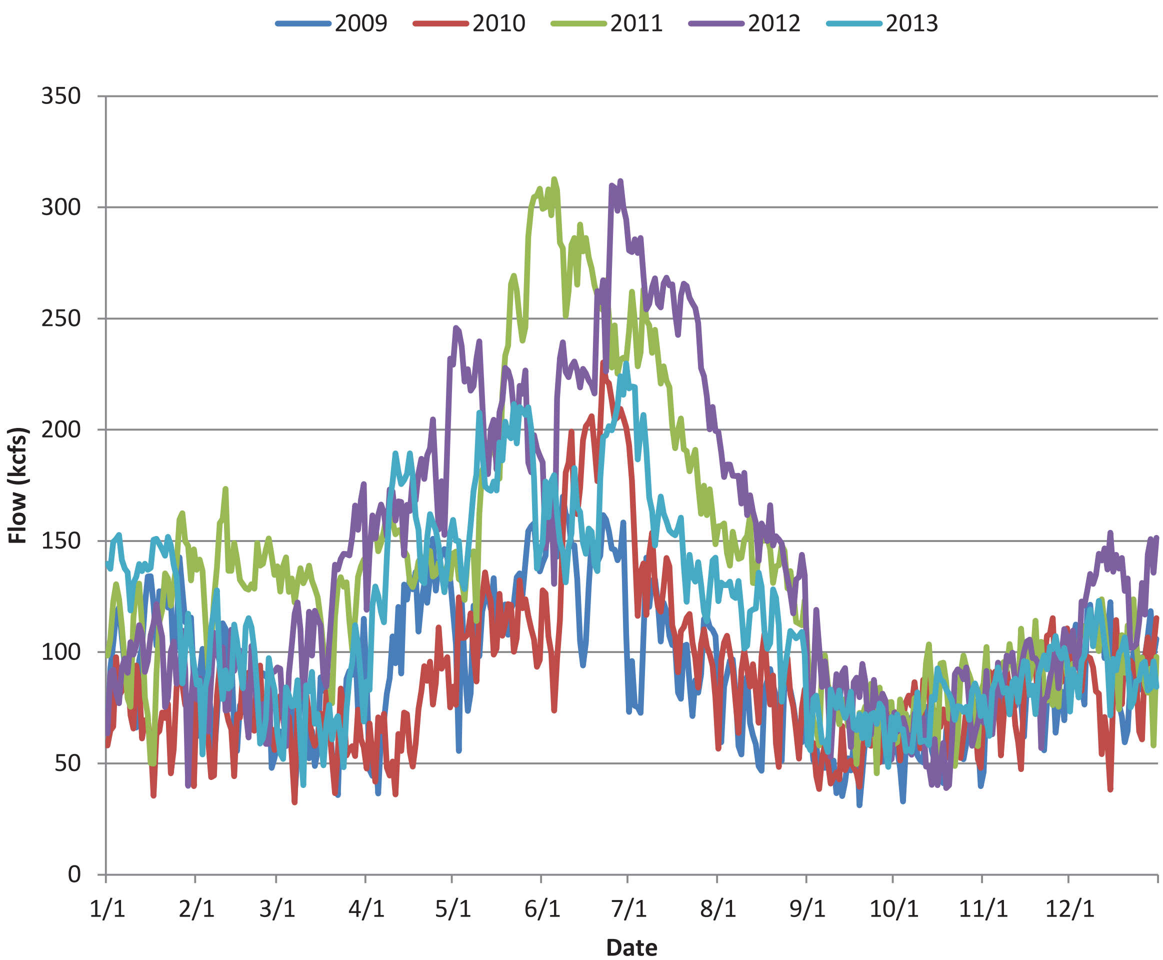

Figure 3-1: Mean daily discharge values as measured at Rocky Reach Dam.

3.2 Gas Bubble Trauma

From 2008-2013, Chelan PUD examined 12,636 smolts for signs of gas bubble trauma (GBT) during the fish spill season (typically between April and August). During the 5-year time period, only 354 showed signs of GBT, or approximately 2.8 percent. The highest percentages of GBT effects occurred between 2011 and 2012, during which the highest flows and highest TDG values occurred as well (Frantz, 2011 and 2012). Table 3-1 provides the summary results of GBT monitoring at Rock Island Dam from 2009 through 2013.

Table 3-1: Number salmon and steelhead smolts examined for external signs of GBT of at Rock Island Dam from 2009-2013.

Year	Species	Number of fish examined	Fish with GBT	
			Number of fish	%
2009	Chinook yearling	609	9	1.48%
	Steelhead	677	4	0.59%
	Chinook Sub-yearling	502	1	0.20%
	Total	***1,788***	***14***	***0.78*%**
2010	Chinook yearling	603	3	0.50%
	Steelhead	817	1	0.12%
	Chinook Sub-yearling	1,029	0	0.00%
	Total	***2,449***	***4***	***0.16*%**
2011	Chinook yearling	927	18	1.94%
	Steelhead	1,022	230	22.50%
	Chinook Sub-yearling	1,351	31	2.29%
	Total	***3,300***	***279***	***8.45*%**
2012	Chinook yearling	818	9	1.10%
	Steelhead	586	10	1.71%
	Chinook Sub-yearling	1283	30	2.34%
	Total	***2,687***	***49***	***1.82*%**
2012	Chinook yearling	935	5	1.10%
	Steelhead	454	2	1.71%
	Chinook Sub-yearling	1,024	1	2.34%
	Total	***2,413***	***8***	***0.33*%**
5-year Total	Chinook yearling	3,892	44	1.13%
	Steelhead	3,555	247	6.95%
	Chinook Sub-yearling	5,189	63	1.21%
	5-year combined Total	***12,636***	***354***	***2.80*%**

3.3 Total Dissolved Gas

Table 3-2, summarizes the number of times TDG levels exceeded the current water quality standards from 2009-2013 during the fish-spill season (April-August) at the Rocky Reach Project tailrace and Rock Island Project forebay. Table 3-3, summarizes the same information for the non-fish spill season (January-March and September-December). Chelan PUD did not begin

recording data during non fish-spill until September 1, 2011, when Ecology requested that data be collected (Ecology, 2011). Therefore, Table 3-3 begins on September 1, 2011.
Additional detail can be found in the Final Gas Abatement Annual Reports (Chelan PUD, 2009, 2010, 2011, 2012 and 2013), all of which were submitted to Ecology in accordance with Sections 5.4.4 and 5.7.8 of the 401 WQC (Ecology, 2006).

Table 3-2: Number of fish-spill season total dissolved gas exceedances from 2009-2013 for Rocky Reach Dam

Year	**Location**[1]	**Fish-spill (April 1-August 31)**		
		Total	**Total # of days**[2]	**% time standard achieved**
2009	RRTR	0	153	100
	RIFB	0	153	100
2010	RRTR	5	152	96.7
	RIFB	4	110	96.4
2011	RRTR	11	121	90.9
	RIFB	9	119	92.4
2012	RRTR	27	120	77.5
	RIFB	20	118	83.1
2013	RRTR	8	153	94.8
	RIFB	2	153	98.7
5-year Total	RRTR	51	699	92.7
	RIFB	35	653	94.6

Notes:
[1]RRTR = Rocky Reach Dam tailrace, RIFB = Rock Island Dam forebay
[2]Based on total number of available days minus days omitted due to the 7Q10 flood flow being exceeded or TDG membrane failures, multi-probe failures, data transmission errors, and/or electrical issues that resulted in communication errors, or other QA/QC issues

Table 3-3: Number of non fish-spill season total dissolved gas exceedances from 2009-2013 for Rocky Reach Dam

Year	Location[1]	Date	Non-Fish Spill January 1-March 31 September 1-December 31 Total	Total # of days[2]	% time below standard
2011	RRTR	09/01-12/31	0	122	100
	RIFB	09/01-12/31	0	122	100
2012	RRTR	01/01-03/31	52	91	42.8
		09/01-12/31	0	122	100
	Total		**52**	**213**	**75.6**
	RIFB	01/01-03/31	61	91	33
		09/01-12/31	0	122	100
	Total		**61**	**213**	**71.4**
2013	RRTR	01/01-03/31	7	90	92.2
		09/01-12/31	4	122	96.7
	Total		**11**	**212**	**94.8**
	RIFB	01/01-03/31	0	90	100
		09/01-12/31	0	122	100
	Total		**0**	**212**	**100**
5-year Totals	RRTR	01/01-03/31	59	213	67.4
		09/01-12/31	4	212	98.9
	Total		**63**	**425**	**85.2**
	RIFB	01/01-03/31	61	213	66.3
		09/01-12/31	0	212	100
	Total		**61**	**425**	**85.6**

Notes:
[1]RRTR = Rocky Reach Dam tailrace, RIFB = Rock Island Dam forebay
[2]Based on total number of available days minus days omitted due to the 7Q10 flood flow being exceeded or TDG membrane failures, multi-probe failures, data transmission errors, and/or electrical issues that resulted in communication errors, or other QA/QC issues

For the fish-spill seasons, the total number of exceedances ranged from zero in 2009 (lowest flow year between 2009 and 2012) to 41in 2012 (highest flow year between 2009 and 2013). Higher mean daily flows as described in Section 3-3 above in 2011 and 2012, created higher incoming TDG levels. Higher flows in excess of 7Q10 values resulted in increased involuntary spill at Rocky Reach Dam, as well as the rest of the mid-Columbia River projects.

During the non fish-spill season, TDG levels were notably higher in the January through March time period. These higher TDG levels can be attributed to higher river flows during this period as mentioned during fish-spill season. Higher river flows in the January through March period of 2012 contributed to higher TDG levels when compared to the 2011 or 2013 non fish-spill season.

SECTION 4: CONCLUSIONS

The Total Dissolved Gas 5-Year Compliance Report summarized the results of the first five years of TDG monitoring at Rocky Reach Dam in accordance with the 401 WQC (Ecology, 2006) and the WQMP (Chelan PUD, 2006).

During the majority of five year time period (2009-2013), the Rocky Reach Project has experienced high percentages of compliance with the numeric criteria for TDG, with the exception of years with exceptionally high flows.

Throughout this five year period, Chelan PUD implemented the compliance measures as set forth in 401 WQC and Section 4 of the WQMP thereby successfully reducing TDG levels.

Regarding the Flattened Spill configuration, Chelan PUD will present our findings with the RRFF and HCP CC. Through the consultation process, the RRFF and HCP CC will determine if the Flattened Spill configuration will be implemented. If implementation is decided by consensus, Chelan PUD will develop a schedule to make the necessary changes to perform the new spill configuration. This schedule may include but not be limited to; computer automation of spill gates (2015), and/or changes to system operations and monitoring. Chelan PUD will operate the new spill configuration as a pilot or test spill and further evaluate the results for a designated period of time. Chelan PUD shall develop a monitoring schedule to test operations under the new spill configuration. If upon operating under the new spill configuration data show that optimal results are not occurring as previously evaluated, Chelan PUD shall implement adaptive management in coordination with the RRFF and HCP CC.

Chelan PUD will continue to implement the gas abatement measures in accordance with 401 WQC and WQMP, which will continue to produce reductions in TDG levels at the Rocky Reach Project.

SECTION 5: LIST OF LITERATURE

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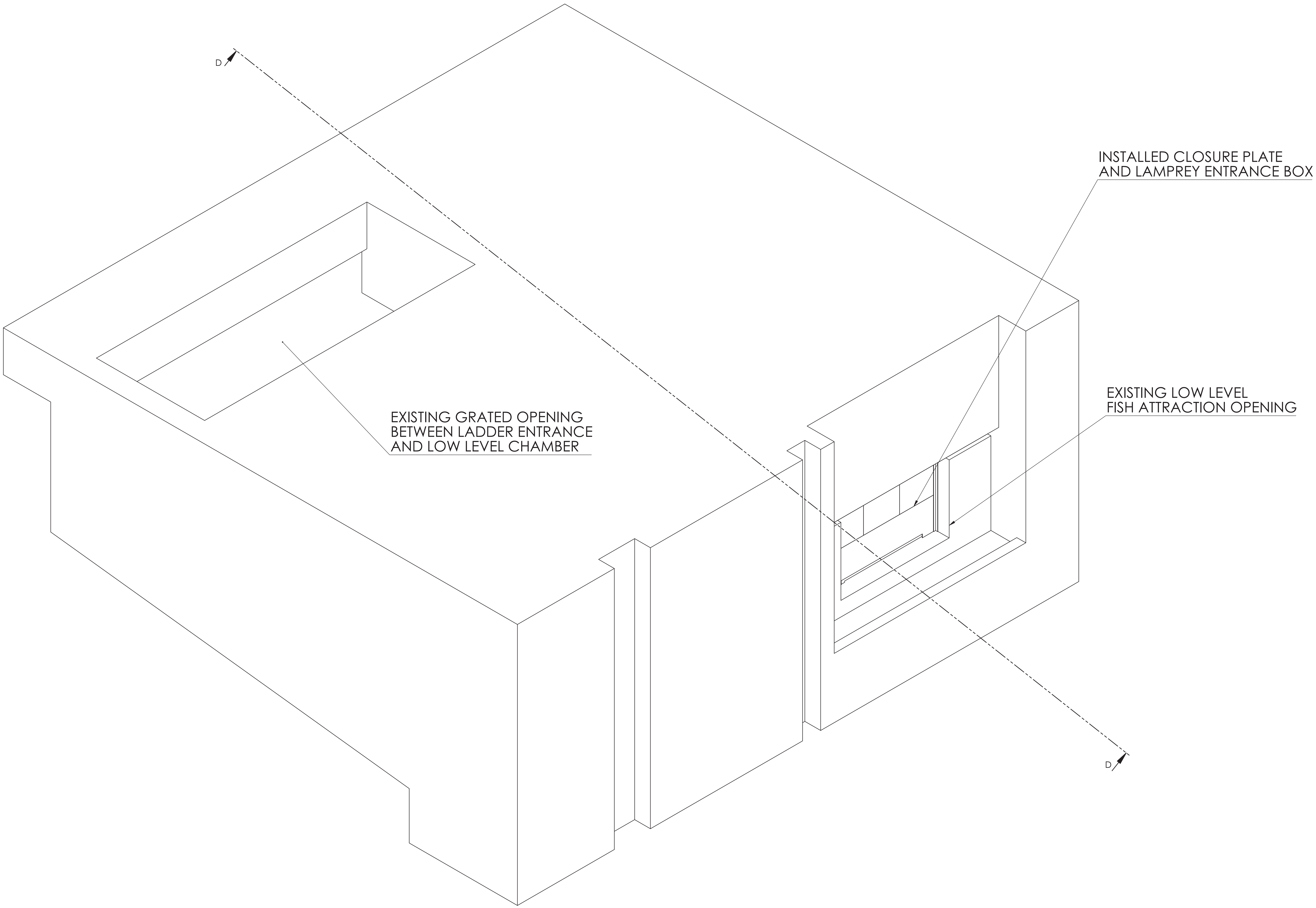
APPENDIX A:

Placeholder for comments

Attachment E



LOW LEVEL FISH ATTRACTION OPENING - ISOMETRIC

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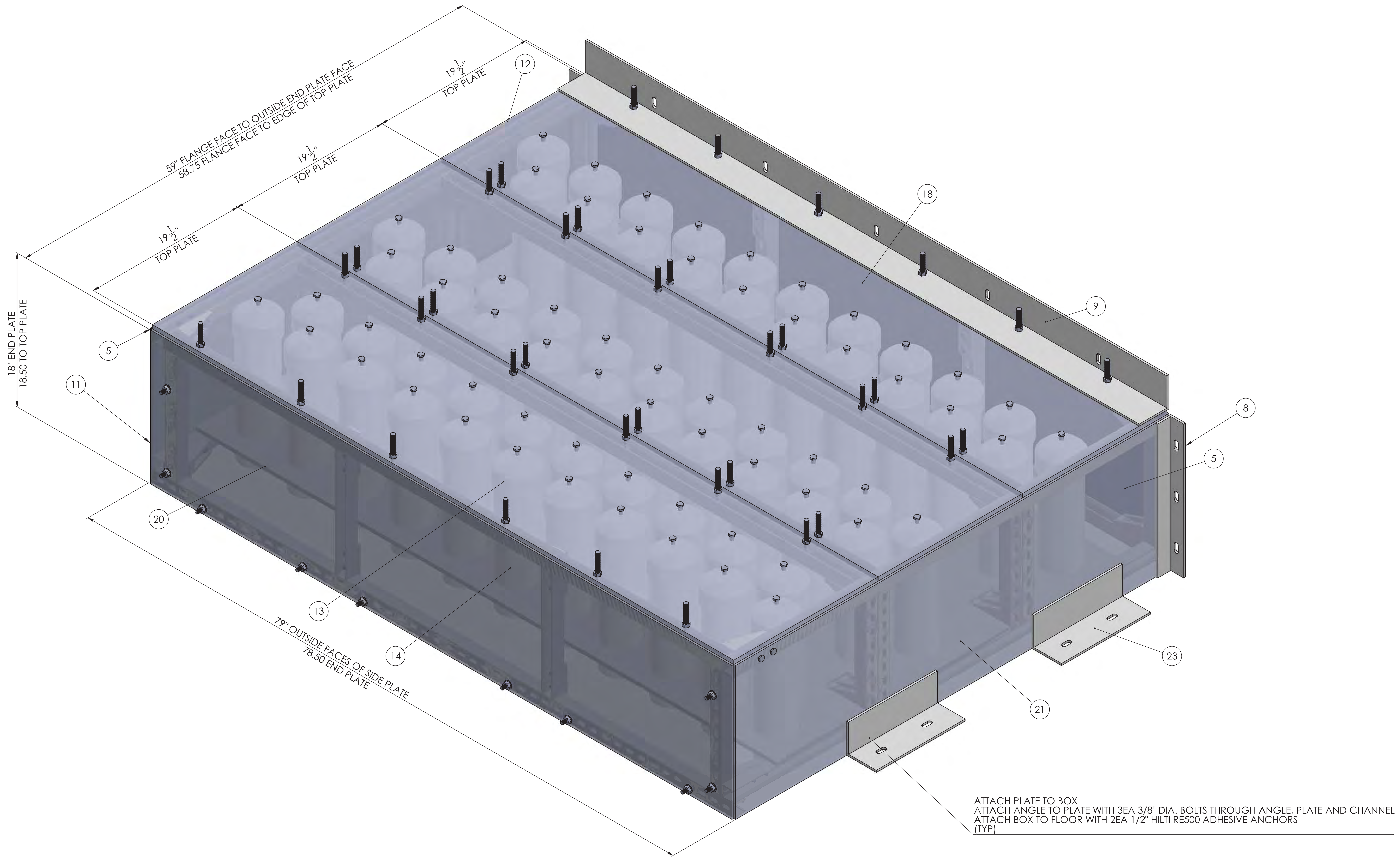

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LOW LEVEL ENTRANCE - LAMPREY MODIFICATION BOX

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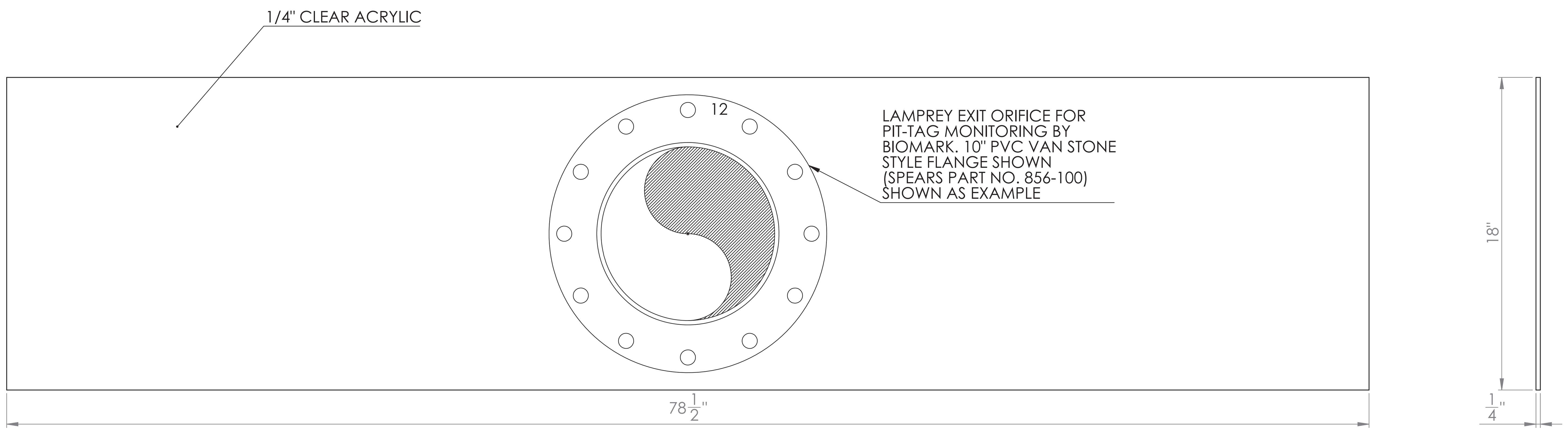
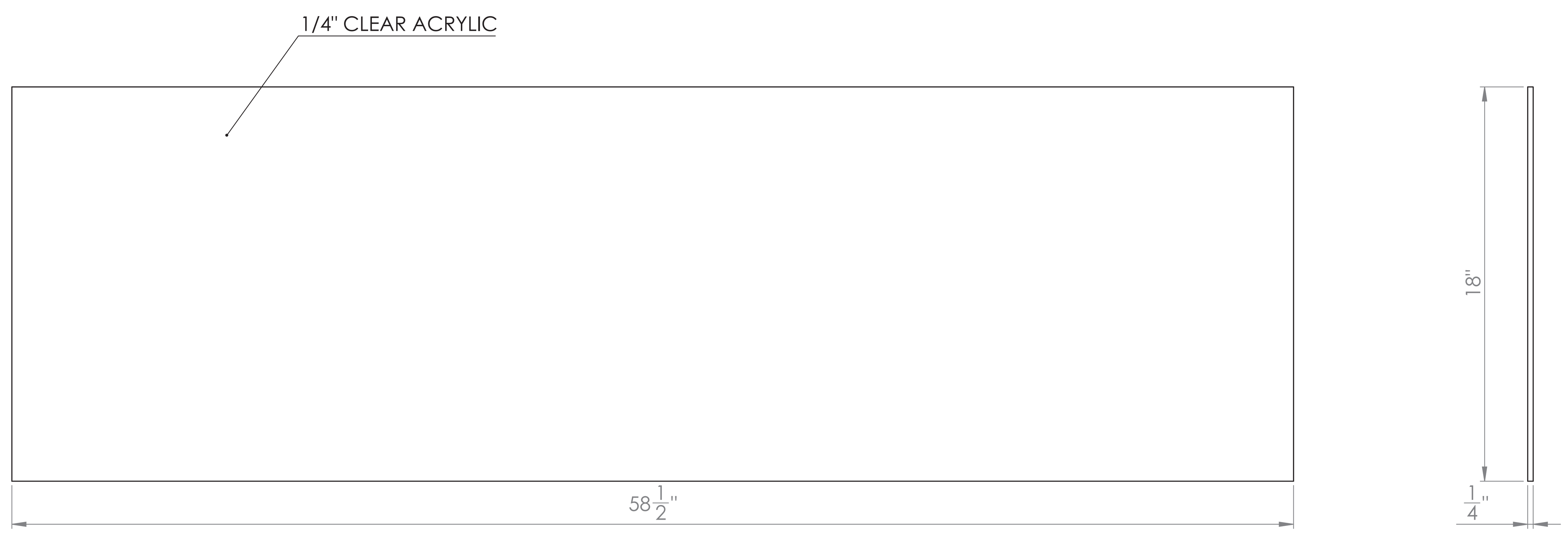
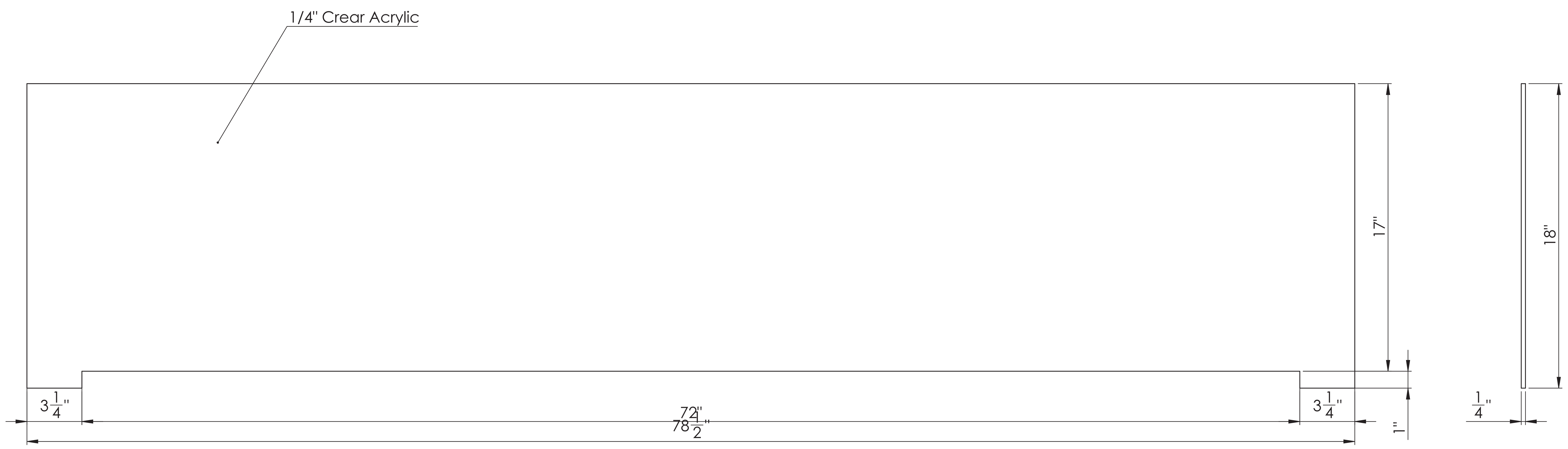
	NAME	SIGNATURE	DATE	TITLE: For Douglous County HYDROCOMBINE - WEST FISH FAC. LOW LEVEL ENTRANCE - LAMPREY MODS		
DRAWN						
CHK'D						
APPV'D						
MFG						
Q.A			MATERIAL:	DWG NO. X643-06-6170-DC-108		A1
			WEIGHT:	SCALE:1:10	SHEET 9 OF 16	



ITEM #11: EXIT PLATE



ITEM #5: SIDE PLATE (SAME FOR BOTH SIDE PLATES)



ITEM #18: ENTRANCE PLATE

LOW LEVEL ENTRANCE - BOUNDARY PLATES

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS SURFACE FINISH: TOLERANCES: LINEAR: ANGULAR:	FINISH:		DEBUR AND BREAK SHARP EDGES	DO NOT SCALE DRAWING	REVISION
				JACOBS	
	NAME	SIGNATURE	DATE	TITLE: For Douglous County HYDROCOMBINE - WEST FISH FAC. LOW LEVEL ENTRANCE - LAMPREY MODS	
DRAWN					
CHK'D					
APPV'D					
MFG					
Q.A			MATERIAL:	DWG NO. X643-06-6170-DC-105	A1
			WEIGHT:	SCALE:1:5	SHEET 6 OF 16

Analysis of Proportion of Outmigration Affected by Bypass Operations at Wells Dam in 2014

Prepared for:

Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, Washington 98802 - 4497

Prepared by:

John R. Skalski
Richard L. Townsend

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18 November 2014

Introduction

Outmigration has been monitored at the juvenile sampling facility at Rocky Reach Dam for four stocks of salmonids (yearling and subyearling Chinook salmon, steelhead, and sockeye salmon) from 2005 onward. Coho salmon were added in 2013, using the detections at Rocky Reach of PIT-tagged fish. The proportions of each stock covered by the bypass operations at Wells Dam can be estimated using the historical daily counts at Rocky Reach, and adding the travel time from Wells to Rocky Reach Dam. Table 1 has the average travel times based on Douglas PUD's 2010 PIT-tag study for yearling Chinook salmon, and acoustic-tag studies for steelhead and sockeye salmon. Due to a dearth of PIT-tag or acoustic-tag studies performed with subyearling Chinook and coho salmon, travel time was assumed to be 2 days.

Table 1: Average travel times from Wells tailrace to Rocky Reach Dam.

Stock	Travel time
Yearling Chinook salmon	5 days
Subyearling Chinook salmon	2 days
Steelhead	2 days
Sockeye salmon	2 days
Coho salmon	2 days

This year, monitoring was extended 11 days at Rocky Reach under its Habitat Conservation Plan 10-year requirement. Estimates of daily passage reflect the additional daily monitoring. Plots of the annual cumulative proportion of the outmigration for spring migrants (yearling Chinook, steelhead, sockeye, and coho), and the subyearling Chinook in the summer had fairly consistent start and end dates at Rocky Reach (Figure 1). The timing of bypass operations for the spring outmigration at Wells from 2004 through 2011 was from 00:00 12 April – 24:00 13 June of each year for the "spring" spill season, and from 00:00 14 June – 24:00 26 August for the "summer" spill season. For 2012 and beyond, the Wells Habitat Conservation Plan (HCP) Coordinating Committee approved the modification of the timing of bypass operations at Wells Dam as follows: bypass operations commenced at 00:00 on April 9 and continued through 24:00 on August 19. This current timing of bypass operations will continue annually, unless modified as a result of future investigations that demonstrate an inadequacy of these dates at providing bypass passage for 95% of both spring- and summer-migrating Plan Species at Wells Dam.

Results

The proportions of passage during the bypass operations in 2014 were 0.8065 for yearling Chinook salmon, 0.9975 for steelhead, 1.00 for sockeye salmon, 0.9999 for coho salmon, and 0.9680 for subyearling Chinook salmon. The 2014 results for steelhead, sockeye, coho, and subyearling Chinook salmon were all consistent with historical trends, 2005–2012 (Table 2). The unusually low coverage percentage for yearling Chinook salmon (i.e., 0.8065) was due primarily to early releases of yearling summer Chinook from two hatchery programs: the Chief Joseph Hatchery Omak Creek acclimation facility (approximately 44,000 fish), and the Chelan Falls acclimation facility (approximately 573,000 fish). Of those, only the Omak Creek releases occurred upstream of Wells Dam; nevertheless, since the assessment of Wells bypass performance relies on Rocky Reach sampling, and we cannot determine from the sampling data whether those fish originated upstream or downstream from Wells Dam--the analysis includes all fish irrespective of origin. Nearly 20% (i.e., 0.1935) of the yearling Chinook run sampled at Rocky Reach apparently passed Wells Dam prior to the beginning of the 9 April bypass operations. For yearling Chinook salmon in 2014, the bypass operations would have needed to start 3 days earlier to achieve the ≥95% coverage (Table 3). Figure 1 illustrates the sudden early spike in yearling Chinook salmon migration in 2014. The termination of the bypass operation in August 2014 was 4 days later than required to assure ≥95% coverage for subyearling Chinook salmon (Table 4).

To assess the effectiveness of the selected start date for spring bypass operations, Table 3 has the date that, with hindsight, the spring bypass operations should have started to achieve 95% coverage of the yearling Chinook salmon outmigration for that year. These dates ranged from 6 April to 3 May. For the three years when yearling Chinook salmon coverage was less than 95%, bypass starting dates should have been 6, 9, and 11 April, instead of 12 April.

Similarly, Table 4 compares the actual termination date for bypass operations with the date on which bypass operations covered 95% of the subyearling Chinook salmon outmigration. In each year, an earlier termination of bypass operations would have been possible without jeopardizing the achievement of the HCP standard of providing a bypass route for ≥95% of outmigrating subyearling Chinook salmon. During the ten years analyzed, the 95% HCP standard was achieved 4 to 32 days prior to the actual date on which bypass operations were terminated.

Investigation of possible causes for the low coverage percentage for yearling Chinook focused on the timing of hatchery releases, since, as the numerically dominant component of the run, hatchery migrants substantially influence cumulative passage. Initial investigation of available raw counts (unadjusted for spill at Rocky Reach) compared the “wild” (adipose-present [ad+]) and hatchery (adipose-minus [ad-]) components of the run, and it did appear that the outmigration distributions differ for a few of the years (2010-2014). However, the fact remains that the source of both components cannot be directly determined as having come from above Wells Dam or below it.

Table 2. Total proportion of each stock's migration affected by bypass operations (spring, summer) at Wells Dam, based on travel times from Wells to Rocky Reach Dam, the cumulative proportion of the annual migration of each stock at Rocky Reach, and the start and stop dates of Wells bypass operations.

	Proportion passed	Annual migration proportion					
Spring Outmigration	**Yearling Chinook Salmon**	2005	2006	2007	2008	2009	2010
	prior to spring Bypass Ops period	0.0528	0.0259	0.0551	0.0025	0.0116	0.0067
	during spring Bypass Ops period	0.9455	0.9559	0.9154	0.9972	0.9827	0.9917
	during summer Bypass Ops period	0.0017	0.0182	0.0296	0.0002	0.0056	0.0016
	after Bypass Ops period	0	0	0	0	0	0
	Total Covered by Bypass Ops	**0.9472**	**0.9741**	**0.9449**	**0.9975**	**0.9884**	**0.9933**
		2011	2012	2013	**2014**		
	prior to spring Bypass Ops period	0.0085	0.0004	0.0171	**0.1935**		
	during spring Bypass Ops period	0.9910	0.9996	0.9823	**0.8064**		
	during summer Bypass Ops period	0.0005	0.0001	0.0006	**0.0002**		
	after Bypass Ops period	0	0	0	**0**		
	Total Covered by Bypass Ops	**0.9915**	**0.9996***	**0.9829**	**0.8065***		
	Steelhead	2005	2006	2007	2008	2009	2010
	prior to spring Bypass Ops period	0.0015	0.0101	0.0066	0.0009	0.0019	0.0045
	during spring Bypass Ops period	0.9903	0.9762	0.9887	0.9901	0.9965	0.9763
	during summer Bypass Ops period	0.0081	0.0137	0.0042	0.0089	0.0016	0.0188
	after Bypass Ops period	0	0	0.0004	0.0001	0	0.0004
	Total Covered by Bypass Ops	**0.9985**	**0.9899**	**0.9930**	**0.9990**	**0.9981**	**0.9951**
		2011	2012	2013	**2014**		
	prior to spring Bypass Ops period	0.0190	0.0014	0.0079	**0.0021**		
	during spring Bypass Ops period	0.9513	0.9885	0.9847	**0.9817**		
	during summer Bypass Ops period	0.0297	0.0101	0.0074	**0.0158**		
	after Bypass Ops period	0	0	0	**0.0004**		
	Total Covered by Bypass Ops	**0.9810**	**0.9986**	**0.9921**	**0.9975**		
	Sockeye Salmon	2005	2006	2007	2008	2009	2010
	prior to spring Bypass Ops period	0	0	0	0	0	0
	during spring Bypass Ops period	0.9983	0.9984	0.9998	0.9972	0.9957	0.9992
	during summer Bypass Ops period	0.0017	0.0016	0.0001	0.0028	0.0043	0.0008
	after Bypass Ops period	0	0	0	0	0	0
	Total Covered by Bypass Ops	**1.0000**	**1.0000**	**0.9999**	**1.0000**	**1.0000**	**1.0000**
		2011	2012	2013	**2014**		
	prior to spring Bypass Ops period	0	0	0	**0**		
	during spring Bypass Ops period	0.9923	0.9995	0.9990	**0.9999**		
	during summer Bypass Ops period	0.0077	0.0005	0.0009	**0.0001**		
	after Bypass Ops period	0	0	0.0001	**0**		
	Total Covered by Bypass Ops	**1.0000**	**1.0000**	**0.9999**	**1.0000**		

***Proportions not summing to 1 are due to round-off error.**

Table 2. Total proportion of each stock's migration affected by bypass operations (spring, summer) at Wells Dam (continued).

	Proportion passed	Annual migration proportion					
Spring Outmigration	**Coho Salmon**			2013	**2014**		
	prior to spring Bypass Ops period			0	**0.0001**		
	during spring Bypass Ops period			0.9910	**0.9984**		
	during summer Bypass Ops period			0.0090	**0.0015**		
	after Bypass Ops period			0	**0**		
	Total Covered by Bypass Ops			**1.0000**	**0.9999**		
Summer Outmigration	**Subyearling Chinook Salmon**	2005	2006	2007	2008	2009	2010
	prior to spring Bypass Ops period	0	0	0	0	0	0
	during spring Bypass Ops period	0.1937	0.1894	0.2136	0.1266	0.1029	0.5212
	during summer Bypass Ops period	0.8022	0.8077	0.7847	0.8620	0.8882	0.4723
	after Bypass Ops period	0.0041	0.0029	0.0017	0.0113	0.0089	0.0064
	Total Covered by Bypass Ops	**0.9959**	**0.9971**	**0.9983**	**0.9887**	**0.9911**	**0.9936**
		2011	2012	2013	**2014**		
	prior to spring Bypass Ops period	0	0	0	**0**		
	during spring Bypass Ops period	0.5628	0.5871	0.1670	**0.3529**		
	during summer Bypass Ops period	0.4331	0.4059	0.8263	**0.6151**		
	after Bypass Ops period	0.0041	0.0070	0.0067	**0.0320**		
	Total Covered by Bypass Ops	**0.9959**	**0.9930**	**0.9933**	**0.9680**		

Table 3. Comparison of the actual start date for spring bypass operations at Wells Dam each year, versus the start date necessary to have covered at least 95% of the yearling Chinook salmon outmigration that year. Operations are assumed to begin at 00:00 for the date listed.

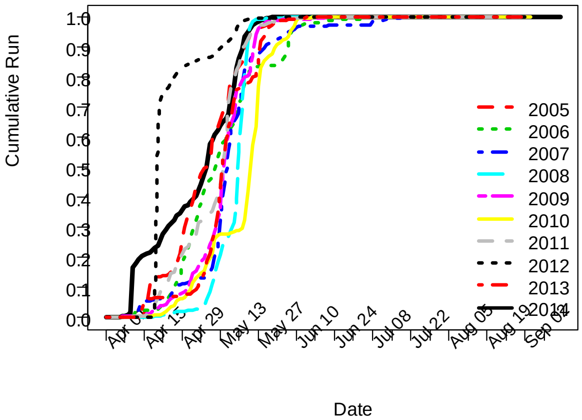
Migration Year	Actual Date	Cumulative proportion passed before 00:00	Proportion Covered by Bypass Ops	Date by which the first 5% passed	Cumulative proportion passed before 00:00	Bypass Ops would have Covered this Proportion	# Days before or after actual date to get 95%
2005	April 12	0.0528	0.9472	April 11	0.0039	0.9961	1 before
2006	April 12	0.0259	0.9741	April 18	0.0468	0.9532	6 after
2007	April 12	0.0551	0.9449	April 9	0.0243	0.9757	3 before
2008	April 12	0.0025	0.9975	May 3	0.0406	0.9594	21 after
2009	April 12	0.0116	0.9884	April 19	0.0436	0.9564	7 after
2010	April 12	0.0067	0.9933	April 22	0.0410	0.9590	10 after
2011	April 12	0.0085	0.9915	April 15	0.0446	0.9554	3 after
2012	April 9	0.0004	0.9996	April 15	0.0115	0.9885	6 after
2013	April 9	0.0171	0.9829	April 10	0.0240	0.9760	1 after
2014	April 9	0.1935	0.8065	April 6	0.0153	0.9847	3 before

Table 4. Comparison of the actual stop date for summer bypass operations at Wells Dam each year, versus the stop date necessary to have covered at least 95% of the subyearling Chinook salmon outmigration that year. Operations are assumed to end at 24:00 for the date listed.

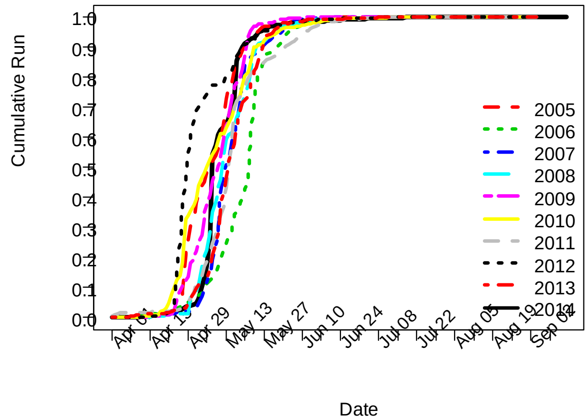
Migration Year	Actual Stop Date	Cumulative proportion passed by 11:59:59 PM	Date on or before the last 5% passed	Cumulative proportion passed by 11:59:59 PM (Bypass Ops would have Covered this Proportion)	# Days before actual date to get 95%
2005	August 26	0.9959	August 3	0.9525	23
2006	August 26	0.9971	August 2	0.9524	24
2007	August 26	0.9983	August 11	0.9538	15
2008	August 26	0.9887	August 19	0.9502	7
2009	August 26	0.9911	August 22	0.9709	4
2010	August 26	0.9936	August 10	0.9537	16
2011	August 26	0.9959	July 25	0.9528	32
2012	August 19	0.9930	July 29	0.9502	22
2013	August 19	0.9933	August 7	0.9592	12
2014	August 19	0.9696	August 15	0.9524	4

Figure 1. Passage dates at Rocky Reach Dam for spring and summer migrating stocks, 2005-2014. Cumulative proportions are based on the expanded counts obtained from sampling daily from 1 April – 31 August (or through 4 September in 2008 and 15 September in 2014).

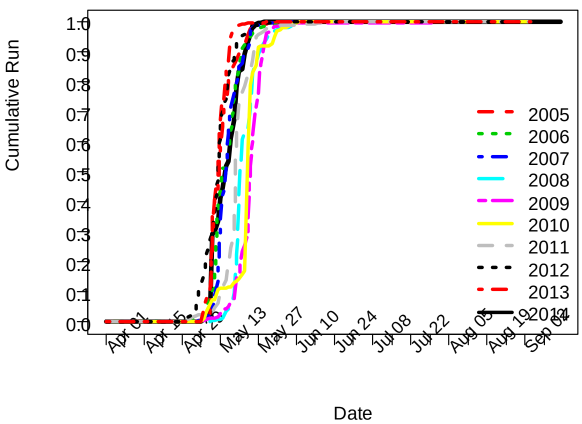
a. Yearling Chinook Salmon



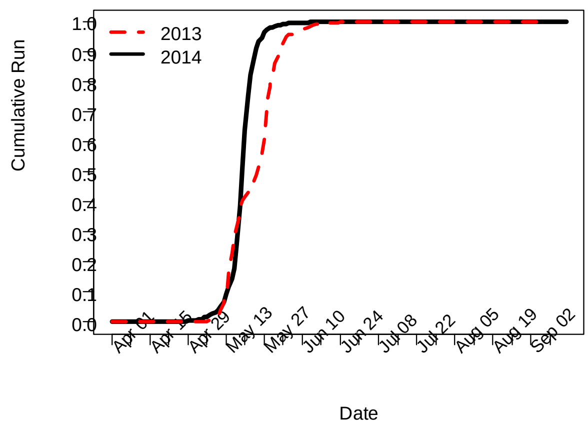
b. Steelhead



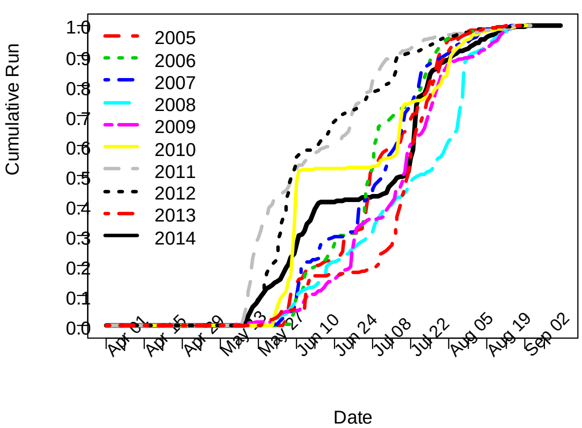
c. Sockeye Salmon



d. Coho Salmon



e. Subyearling Chinook Salmon



APPENDIX B
HABITAT CONSERVATION PLAN
HATCHERY COMMITTEES
2014 MEETING MINUTES AND
CONFERENCE CALL MINUTES

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Seattle, Washington 98101
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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	February 20, 2014
From:	Mike Schiewe, Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the January 15, 2014 HCP Hatchery Committees Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees' meeting was held at Douglas PUD headquarters in East Wenatchee, Washington, on Wednesday, January 15, 2014, from 9:30 am to 2:30 pm. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- Bill Gale will discuss with RD Nelle an appropriate venue for a presentation on lamprey distribution in the Wenatchee River, and discuss the outcome with Mike Schiewe (Item II-A).
- Hatchery Committees representatives will discuss with their respective agency's Coordinating Committees representative their recommendations regarding Hatchery Committees access to all HCP-related documents on the HCP Extranet site, including Coordinating, Hatchery, and Tributary Committees' documents; Mike Schiewe will raise the issue during the HCP Coordinating Committees meeting on January 28, 2014 (Item II-B).
- Mike Schiewe will obtain feedback from the HCP Coordinating Committees regarding their views on providing access rights to the HCP Extranet site to participants in the Hatchery Evaluation Technical Team (HETT; Item II-B).
- Tom Kahler will ensure that selected pre-HCP documents are available on the HCP Extranet site; actions needed to fulfill this action item will be determined following discussions in the HCP Coordinating Committees regarding Committee access rights to HCP documents on the site (Item II-B).
- Greg Mackey will provide the Wells Hatchery Modernization 30% design drawings for review to Kristi Geris for distribution to the Hatchery Committees (Item II-D).
- **The Hatchery Committees' meeting on February 19, 2014, will be held at Douglas**

PUD, with the Wells Hatchery Modernization Workshop to follow in the afternoon (Item II-D).

- Mike Tonseth will revise the Extension Request for the Wenatchee Relative Reproductive Success (RRS) Study, as discussed, and will provided the final request to Kristi Geris for distribution to the Hatchery Committees (Item III-A).
- Mike Tonseth will develop a draft protocol for measuring fecundity at size, and will provide the draft protocol to Kristi Geris for distribution to the Hatchery Committees to be discussed at the Hatchery Committees meeting on February 19, 2014 (Item III-B).
- Chelan PUD will coordinate with the Washington Department of Fish and Wildlife (WDFW) and the Yakama Nation (YN) to further discuss and revise the draft Sockeye Addendum to the final Chelan PUD 2014 Hatchery Monitoring and Evaluation (M&E) Implementation Plan (Item IV-A).
- Chelan PUD will provide a formal Rocky Reach Trap Pilot Study Proposal for consideration at the Hatchery Committees' meeting on February 19, 2014 (Item IV-B).
- Bill Gale will provide Chelan PUD with the U.S. Fish and Wildlife Service's (USFWS') comments on the Chelan PUD Spring Chinook Hatchery and Genetic Management Plan (HGMP) no later than close of business on Friday, January 17, 2014 (Item IV-C).
- **Kristi Geris distributed a meeting invite on January 16, 2014, for a WebEx conference call on February 6, 2014, from 9:00 am to 11:00 am, to discuss final comments on Chelan PUD's Spring Chinook HGMP (Item IV-C).**
- Hatchery Committees representatives will submit edits and comments on the draft Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan to Chelan PUD no later than Friday, January 31, 2014 (Item IV-D).
- Alene Underwood will review the status of pending recirculation pilot studies at Eastbank Fish Hatchery and Chiwawa Fish Facility, and will report back to the Hatchery Committees at the February 19, 2014 meeting (Item IV-D).
- Hatchery Committees representatives will discuss with their respective agencies' Coordinating Committees representatives their recommendations regarding the YN's proposed coho trapping under the YN HGMP and future Biological Opinion (BiOp) (Item VI-A).

DECISION SUMMARY

- The Hatchery Committees representatives present approved the Hatchery Committee portion of the Douglas PUD 2014 HCP Wells Action Plan, as revised. Kirk Truscott provided the Colville Confederated Tribes' (CCT's) approval of the Hatchery Committee portion of the Action Plan via email on January 13, 2014 (Item II-C).
- The Hatchery Committees representatives present approved Douglas PUD's request to sacrifice 300 Methow Hatchery spring Chinook juveniles in spring 2014 for an early maturation study (Item II-F).
- The Hatchery Committees representatives present approved the extension request from WDFW and the National Marine Fisheries Service (NMFS) for a change in the scope of work for the Bonneville Power Administration (BPA)-funded Wenatchee RRS Study, contingent on incorporation of edits discussed. Kirk Truscott provided the CCT's approval of the request via email on January 13, 2014 (Item III-A).
- The Hatchery Committees representatives present approved the CCT's Wells Steelhead Broodstock Replacement proposal (Item V-A).

AGREEMENTS

- The Hatchery Committees representatives present agreed to hold the Hatchery Committees' meeting on February 19, 2014, at Douglas PUD in order to accommodate the Wells Hatchery Modernization Workshop that will follow in the afternoon (Item II-D).

REVIEW ITEMS

- Kristi Geris sent an email to the Hatchery Committees on January 10, 2014, notifying them that the draft Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan is available for review. Edits and comments on the draft plan are due to Chelan PUD no later than Friday, January 31, 2014. Chelan PUD will be requesting approval of the draft plan at the Hatchery Committees' meeting on February 19, 2014 (Item IV-D).

FINALIZED DOCUMENTS

- There are no documents that have been recently finalized.

I. Welcome, Agenda Review, Meeting Minutes, and Action Items

Mike Schiewe welcomed the Hatchery Committees and asked for any additions or other changes to the agenda. The following revisions were requested:

- Mike Tonseth added a discussion on Section 8.3.2 of the Hatchery M&E Plan.
- Keely Murdoch added a discussion on coho trapping under the YN HGMP and future BiOp.
- Wes Tibbits (CCT) added to NMFS' HGMP Update a discussion on the permitting process and potential for steelhead broodstock collection in the Okanogan.

The Hatchery Committees reviewed the revised draft December 18, 2013 meeting minutes. Kristi Geris said that several comments and revisions were received from members of the Committees, which have been incorporated into the revised minutes. She said that only one revision is remaining to be confirmed regarding the discussion about Chelan PUD's 2013 Rocky Reach Trap Results. Keely Murdoch had made a comment regarding a sort-by-code system and also possibly combining efforts with the U.S. Geological Survey's (USGS's) activities in the Chewuch, and Mike Tonseth edited Murdoch's comment to provide clarification and distinction between these two separate thoughts. Murdoch approved Tonseth's edits, and also requested that a comment she made later in the discussion be omitted as it was not germane to the discussion. The Hatchery Committees members present approved the draft December 18, 2013 meeting minutes, as revised. Geris will finalize the meeting minutes and distribute them to the Committees.

Action items from the last Hatchery Committees meeting on December 18, 2013, and follow-up discussions were as follows: *(Note: italicized item numbers below correspond to agenda items from the December 18, 2013 meeting.)*

- *Kristi Geris will review the administrative record to compile a summary of how containment levels were established for Non-Target Taxa of Concern (NTTOC) modeling (Item II-B).*
  Geris provided a summary of the initial results of this search to the Hatchery Committees on December 20, 2013. This topic will be discussed further during today's NTTOC Report Update.
- *The HETT will review the technical approach previously identified by HETT to*

address cutthroat trout NTTOC risk assessment, focusing on the use of spatial overlap as a proxy for risk (Item II-B).

Greg Mackey provided an overview of the technical approach identified by the HETT to address cutthroat trout NTTOC risk assessment to Kristi Geris on December 20, 2013, which she distributed to the Hatchery Committees that same day. Geris also provided a summary of the initial results for this search to the Hatchery Committees on December 27, 2013. This topic will be discussed further during today's NTTOC Report Update.

- *Greg Mackey, Keely Murdoch, and Todd Pearsons will investigate how fry predation was handled in the NTTOC modeling (Item II-B).*

  This topic will be discussed during today's NTTOC Report Update.
- *Douglas PUD Information Systems (IS) Staff will provide a presentation on the Douglas PUD Extranet Site at the Hatchery Committees' meeting on January 15, 2014 (Item II-E).*

  The presentation will be provided during today's meeting.
- *Public comments on the Okanogan and Methow Spring Chinook HGMPs are due January 9, 2014 by 5:00 pm. The Federal Register Notice (FRN) and HGMPs for review can be accessed here:* http://www.westcoast.fisheries.noaa.gov/hatcheries/hgmp/Okanogan_and_Methow_salmon_hatchery_applications.html *(Item III-A).*

  Noted.
- *Chelan PUD will provide a formal Rocky Reach Trap Pilot Study report for consideration at the Hatchery Committees' meeting on January 15, 2014 (Item IV-B).*

  This topic will be discussed during today's 2014 Rocky Reach Trap Pilot Study Proposal agenda item.
- *Hatchery Committees representatives will submit edits and comments on the draft Chelan PUD Spring Chinook HGMP to Alene Underwood by January 10, 2014, for discussion at the Hatchery Committees' meeting on January 15, 2014 (Item IV-C).*

  The YN submitted comments on the draft HGMP on January 10, 2014, which Kristi Geris distributed to the Hatchery Committees that same day. WDFW also submitted comments on the draft HGMP on January 13, 2014, as distributed to the Hatchery Committees that same day. This topic will be addressed further during today's meeting.
- *Chelan PUD will provide the draft Chelan PUD 2014 HCP Rocky Reach and Rock*

Island Action Plan to Kristi Geris for distribution to the Hatchery Committees (Item IV-F).
Alene Underwood provided the draft Action Plan to Geris on January 10, 2014, which she distributed to the Hatchery Committees that same day. This topic will be discussed further during today's Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan agenda item.

- *Mike Tonseth will provide a brief written request from WDFW and NMFS for a change in the scope of work for the BPA-funded Wenatchee Spring Chinook RSS, to Kristi Geris for distribution to the Hatchery Committees (Item V-A).*
  Tonseth provided the request to Geris on January 9, 2014, which she distributed to the Hatchery Committees that same day. This topic will be discussed further during today's extension request for the Wenatchee RSS Study decision item.

II. Douglas PUD

A. NTTOC Report Update (Greg Mackey)

Greg Mackey said that development of the NTTOC Report is still underway. He said once complete, he plans to distribute the initial draft report to members of the HETT for review, prior to distributing the report for Hatchery Committees review. Bill Gale requested that Matt Cooper (USFWS) also be included in the initial review, and Keely Murdoch requested that Andrew Murdoch (WDFW) also be included in the initial review. Mackey said that he will include all those who ran the models in the first review.

Mackey said that Kristi Geris reviewed the administrative record and compiled a summary of discussions related to how containment levels were established for NTTOC modeling, which she distributed to the Hatchery Committees on December 20, 2013. He recalled the question was regarding why the containment objective for Chiwawa and Nason spring Chinook was 10%, and all other listed populations were lower at 5%. He said that he recommends 5% should be used to be consistent with all other listed NTTOC, but ultimately, the difference will not matter because all containment levels were below 5%. He said he will include a footnote with an explanation to clarify this issue.

Mackey said with regards to spatial overlap for cutthroat, the record indicates that it was decided to use spatial overlap as a proxy for cutthroat interaction with hatchery programs, and those data were compiled. He said that Todd Pearsons developed a brief section in the draft NTTOC Report that discusses those results.

Mackey said that regarding fry predation, and notably Wenatchee sockeye fry suffering mortality in locations where they would not be present (e.g., Nason Creek, etc.), the HETT had decided to exclude mortality of certain young of year NTTOC in the analyses. These age classes (typically young of year) are highly unlikely to occur in certain locations, but they were included in the model runs due to the structure of the input data. He noted that he does not believe this changed any exceedances of containment levels. He said that almost all mortalities happened at age 0, and he added that mortalities at older ages were rather rare. Mike Schiewe requested that Mackey identify those data he plans to omit from the report. Mackey agreed to do so, and added that most of the interactions had very low impacts. He said he will include documentation for everything.

Keely Murdoch said that initially the models were supposed to be run in tandem with the Delphi process. Tom Kahler read a portion of Objective 12 that states that the two methods (i.e., modeling and the Delphi process) will be compared to the acceptable hatchery impact levels that were determined previously by committees of resource managers and the PUDs.

Bill Gale asked how lamprey will be addressed in the report. Mackey said he will include a brief summary explaining that lamprey interactions are an unknown. He said that Pearsons developed a summary explaining that lamprey population sizes are unknown, and the way in which salmonid juveniles interact with lamprey is unknown.

Gale also asked if finalizing the NTTOC Report adequately addresses, or completes, Objective 12 in the Hatchery M&E Plan (formerly Objective 10). Keely Murdoch said she thought that completing the NTTOC modeling was a first step. She said if any issues are identified, the next step would be to further investigate any negative interaction(s). She also noted the Delphi process that has been discussed. Gale said there is evidence indicating potential lamprey distribution issues in the Wenatchee, and asked if Objective 12 addresses that topic. Keely Murdoch said she is uncertain that lamprey issues would apply to Objective 12 because they are not related to hatchery operations. Gale noted that before Tumwater Dam was renovated for salmon passage, lamprey were able to pass the dam; now that the dam has been renovated, lamprey are distributed below the dam, but not above it. Gale said that this therefore raises the question of whether lamprey can pass Tumwater Dam. Alene Underwood noted that the NTTOC interaction is not based on facilities. Schiewe clarified that Gale is asking about addressing a facility that may be impacting a species that cannot be modeled. He said this seems to be a separate issue, but is important to address if there is concern about it. Gale further explained that he does not want to approve a final NTTOC Report if approval of the report circumvents addressing the lamprey issue. He said that if the Hatchery Committees are interested, RD Nelle can present data on lamprey distribution in the Wenatchee River at a future meeting. Schiewe noted that those data would need to be presented in the context of operations at Tumwater Dam, as a management tool, because lamprey is not a Plan Species under the HCPs. Mike Tonseth suggested finalizing the NTTOC Report, with the inclusion of a recommendation on how and where to address lamprey. He added that anything that is not a Plan Species has typically been addressed in the Rocky Reach Fish Forum (RRFF). Gale agreed that a recommendation regarding lamprey should be included in the NTTOC Report. He added that installing lamprey passage at Tumwater Dam will likely be an inexpensive alternative to conducting a full study. Underwood agreed with Tonseth that the RRFF would be the most appropriate venue for Nelle to present data on lamprey distribution. She added that lamprey discussions are already ongoing in the RRFF. Gale said he will discuss with Nelle an appropriate venue for a presentation on lamprey distribution in the Wenatchee River, and then will discuss the outcome recommendation with Schiewe.

B. PRESENTATION: HCP Extranet Site (Tom Kahler and Julene McGregor)

Tom Kahler said that HCP files are currently stored on an ftp site hosted by Anchor QEA. He said that Douglas PUD began investigating alternative options for a HCP document repository that would simplify searching the historical record, and that would also move the repository to a location that could be more directly assessed by signatories to the HCPs. He said that last year, Douglas PUD IS Staff presented to the HCP Coordinating Committees a SharePoint Extranet option to possibly serve this purpose. The HCP Coordinating Committees supported the idea of an Extranet site, and so Douglas PUD moved forward with developing the site for the HCPs. Kahler noted that a similar site has been developed and implemented for Douglas PUD’s Aquatic Settlement Work Group. Kristi Geris explained that she will still distribute emails notifying Committee members of documents for review;

however, instead of attaching the document to the email, in many cases, the document will instead be uploaded to the Extranet site and instructions to access the document will be included in the email notification. Kahler added that the file name structure will remain the same, i.e., the dates in the file name will still correspond to the associated email date. He also noted that Chelan PUD management recently agreed to house Chelan PUD HCP documents on the Extranet site, which will be uploaded to the site soon.

Julene McGregor, Douglas PUD IS Staff, provided a HCP Hatchery Committee Extranet site help sheet (Attachment B) to the Hatchery Committees. She explained that, in order to log in, a person should navigate to https://extranet.dcpud.net and select "Forms Authentication" from the drop down menu (for non-Douglas PUD users), which will bring up the username and password page. She said that after the meeting, each Hatchery Committees member will receive an email with a username and instructions on how to create a password. She noted that this email is time-sensitive, and that previously, Douglas PUD IS Staff needed to reissue another email if the functions within the email expired before a password was set up. She said now, however, there is a "Forgot your password?" feature on the username and password page, as shown on Attachment B. She said that if at any time a password needs to be reset, selecting that hyperlink will cause another email to be distributed with instructions for resetting a password. Once a person has filled in their username and password, selecting "Sign In" will bring up the Douglas PUD Extranet site's home page.

McGregor said that from the Douglas PUD Extranet site's home page, a person should select "Natural Resources" from the left panel, and then from the Natural Resources Homepage, select "HCP HC" from the left panel. This will bring up the HCP Hatchery Committee Extranet site home page. This home page includes a document block, which lists the most recently modified documents, and also a contacts list, which is located along the right margin of the home page. A "Documents" menu is located along the left panel that contains different views based on document type (i.e., Action Items, Agendas, Agreements, etc.). McGregor noted that the column headers can be selected to sort file names in ascending or descending alphabetical and chronological order, similar to an Excel spreadsheet. She said that in order to view a document, a person should select the file name, which will open a read-only version. This read-only version can be saved to one's hard drive, which will also enable editing. She said that in order to edit meeting minutes, once the draft minutes have been saved to the hard drive and edited, as needed, they will need to be uploaded back onto the Extranet site via the "Document Drop" tool, located along the left panel. McGregor explained that documents uploaded to the "Document Drop" tool can only be viewed by Geris and the person who uploaded the document. Geris has an alert set up for the "Document Drop" tool that notifies her any time modifications are made to the "Document Drop" tool (i.e., when a document is uploaded; these alerts can be set up for most folders, or views, on the site). In the "Document Drop" view there is an "Incorporated Edits" column. Once Geris incorporates edits from a particular document, she will change that column from "No" to "Yes" to indicate that those edits have been incorporated into the revised meeting minutes.

McGregor noted the "Search this site" box in the upper right corner of the site. She said that files can be queried by any word that is included within that document. The search can be further filtered by document type, author, and modified date (located along the left panel of the "Search" page).

Bill Gale asked if the HCP Hatchery Committee Extranet site was compatible with mobile devices. McGregor replied that it is; however, the screen size may be a limitation with regards to viewing the site in its entirety. Gale also asked if both Chelan PUD and Douglas PUD documents will ultimately be stored on this site, and McGregor replied that they will be. She also noted the "Help Documents" view located below the "Document Drop." She said this view contains resources that help new users navigate the site, as well as instructions on how to create personalized views. McGregor quickly reviewed creating new views and modifying existing views.

Mike Schiewe said that, currently, the HCP Coordinating Committees will have access to all final HCP documents (i.e., Coordinating Committees, Hatchery Committees, and Tributary Committees documents). He said the Hatchery Committees and Tributary Committees, however, may only have access to their respective Committees' documents. Mike Tonseth noted that in the past, he has relied on the ability to access certain Coordinating Committees documents that are pertinent to the Hatchery Committees. Schiewe said this is something that will need to be discussed with the Coordinating Committees. Lynn Hatcher also agreed that having the ability to access Coordinating Committees documents would be beneficial.

Hatchery Committees representatives agreed to discuss with their respective agencies' Coordinating Committees representatives their recommendations regarding Hatchery Committees access to all HCP-related documents on the HCP Extranet site, including Coordinating, Hatchery, and Tributary Committees' documents; and Schiewe said that he will raise the issue during the HCP Coordinating Committees meeting on January 28, 2014. Gale asked about allowing access for the HETT, and Schiewe said that he will also obtain feedback from the Coordinating Committees regarding their thoughts on providing access rights to the HCP Extranet site to participants in the HETT.

Alene Underwood asked who to contact with questions regarding the site. McGregor said that both she and Geris have been fielding questions. Geris said that McGregor's contact information will be included on each email in case she needs to be reached. Tom Scribner asked if any pre-HCP documents will be available on the Extranet Site. Tom Kahler said that a select few are currently available on the HCP Coordinating Committees Extranet Site. He added that he will make sure that selected pre-HCP documents are available on the HCP Extranet Site; however, actions needed to fulfill this action item will be determined following discussions in the HCP Coordinating Committees regarding Committee access rights to HCP documents on the site.

Geris said that she will continue distributing emails and files per usual; however, she will now also incorporate instructions for accessing the Extranet site. After about one month, emails and file sharing will transition fully to the HCP Extranet site.

C. DECISION: Douglas PUD 2014 HCP Wells Action Plan (Greg Mackey)

Greg Mackey said that the draft Douglas PUD 2014 HCP Wells Action Plan was distributed to the Hatchery Committees by Kristi Geris on December 18, 2013. Mackey reviewed revisions made to the hatchery portion of the draft Action Plan, including: 1) the addition of an "Annual Report on genetic analysis" and "biological data in Annual M&E Report" and associated dates, under the Methow Steelhead RRS Study, per Kirk Truscott's comments; 2) the addition of a section on HGMPs and associated dates; and 3) the addition of a "Workshop on 30% design" and "final construction drawings" and associated dates, under the Wells Hatchery Modernization. Tom Kahler reminded the Hatchery Committees that the Action Plan is a planning document that may change throughout the year, as needed. Mackey said that the Wells HCP Tributary Committee has approved the Tributary Committee portion of the draft plan, and once the Hatchery Committee portion is approved, approval of the entire action plan will be requested from the Wells HCP Coordinating Committee. The Hatchery Committees representatives present approved the Hatchery Committee portion of the Douglas PUD 2014 HCP Wells Action Plan, as revised. Truscott provided the CCT's approval of the hatchery portion of the Action Plan via email on January 13, 2014.

D. Wells Hatchery Modernization Update (Greg Mackey)

Greg Mackey said that Douglas PUD is expecting to receive the Wells Hatchery Modernization 30% design drawings this week, which he will provide to Kristi Geris for distribution to the Hatchery Committees for review. He said that Douglas PUD would like to hold another workshop following the Hatchery Committees meeting on February 19, 2014, where HDR Engineering, Inc. will discuss the design aspects of the modernization. Mike Schiewe suggested, for convenience, to hold the February Hatchery Committees meeting at Douglas PUD, and then again in March to realign with the normal schedule. The Hatchery Committees representatives present agreed to hold the Hatchery Committees' meeting on February 19, 2014, at Douglas PUD in order to accommodate the Wells Hatchery Modernization Workshop that will follow in the afternoon.

E. Wells Hatchery Steelhead Broodstock Update (Greg Mackey)

Greg Mackey said that Wells Hatchery Staff started spawning steelhead last week. He said 14 females and 26 males are currently on station. Wells Hatchery Staff also started running the Wells volunteer channel; however, Mackey said that because of the late start, not many additional fish have been obtained. He noted that several adipose fin (ad)-present fish were observed, but not hatchery-origin (HO) steelhead. Mike Tonseth said that according to passive integrated transponder (PIT) tag data, about 1,400 to 1,500 HO steelhead are between Rocky Reach Dam and Wells Dam. He said once these fish start moving, staff will start operating the traps.

Tonseth said there has also been some discussion regarding angling in the Methow River. Mackey said that a hook-and-line method is being considered to obtain safety-net fish (about 50 HO fish). He said if this method proves efficient, hook-and-line efforts will continue in order to obtain any deficit that exists for other programs. Bill Gale suggested angling right around the town of Winthrop; however, he also noted that angling typically does not start until March, and historical data indicate that not many HO steelhead are left by then. Mackey said that if angling is agreed upon, then efforts would start soon. Gale asked if only ad-clipped fish will be targeted, and Mackey said that in the Methow, ad-present fish may also be retained if a fish is suspected to be of hatchery-origin based on fin condition and other marks or morphological features. The origin of these fish will then be confirmed with scale samples.

Gale said that another option would be to contract guides to obtain the broodstock. He added that this option may be more cost effective than using hatchery staff. Mike Schiewe asked if the weir at Wild Horse Springs is still being considered, and Lynn Hatcher said that option is still being considered for the Okanogan program. Mackey said that he will keep the Hatchery Committees posted as plans develop.

F. Methow Hatchery Spring Chinook Early Maturation Sampling (Greg Mackey)

Greg Mackey said that Grant PUD is conducting early maturation studies on spring Chinook, and Todd Pearsons asked Douglas PUD if Methow Hatchery spring Chinook could be included in this effort. Mackey noted that based on PIT tag data and snorkel surveys conducted by Charlie Snow in the Methow River, it appears that there has not been a high rate of early maturation in Methow Hatchery spring Chinook. However, these methods may not identify early maturing fish that do not re-ascend through the hydro system and are not present on the spawning grounds. Therefore, Grant PUD and Douglas PUD would like to confirm this by visual screening of pre-release smolts. Mackey said that Douglas PUD would like the Hatchery Committees' approval to sacrifice 300 juvenile, pre-release spring Chinook at Methow Hatchery in 2014 to examine gonadal development. Wes Tibbits asked if anyone had observed mini jacks on the spawning grounds in the Methow, and Mackey replied that precocious parr are not as prevalent near spawning areas in the Methow as they are in other places. Snow added that the few precocious fish observed during the snorkel surveys were so small that it was difficult to positively identify whether they were wild fish or residual hatchery yearlings. Bill Gale asked if precocious fish have been observed ascending to the Methow Hatchery. Snow said that behavior has not been reported; however, he noted that it could be that the smaller precocious fish cannot be trapped with the current infrastructure (i.e., grates too wide in the adult trap to retain juvenile fish). Snow said that he has observed large schools of mini-jacks while snorkeling in other locations, which is what prompted him to conduct surveys in the Methow. Tibbits noted that when he worked for USGS, he was involved in snorkel surveys in the Methow and Chewuch and also encountered only a handful of mini-jacks. Peter Graf said that Grant PUD has observed a lot of fish moving to the mainstem Columbia and then re-ascending. He added that survival back to the spawning grounds is likely low, so they are not contributing to spawning and may not be observed on the spawning grounds. He also added that detection of precocious fish may be low even though early maturation is really high. Mike Tonseth said that based on the work of Beckman and Larsen, early maturation sampling is the first step that needs to be taken to inform further evaluations. Mike Schiewe asked why not conduct a hormone test at the same time. Gale said that both gonadal examination and testosterone will provide a rate of early maturation; however, testosterone will not provide a direct measure of gonadal development. He added that a histological evaluation would also provide the stage of maturation. Mackey said that the early maturation sampling will be a quick indicator study to provide an idea of whether additional work would be warranted. He added that based on these results, enough may already be known to adjust management strategies without redoing several studies. Tonseth said that, in order to provide a bit of background, Grant PUD is considering conducting a size at release target study similar to what was conducted in the White River. He said this is the preliminary work needed to see if such a study is necessary. Mackey said that the sampling will need to occur in early April 2014. Tibbits asked if 300 fish would be statistically meaningful, and Mackey replied that it would. The Hatchery Committees representatives present approved Douglas PUD's request to sacrifice 300 Methow Hatchery spring Chinook juveniles for an early maturation study.

III. WDFW

A. DECISION: Extension Request for the Wenatchee RRS Study (Mike Tonseth)

Mike Tonseth said that the extension request for the Wenatchee RRS Study was distributed to the Hatchery Committees by Kristi Geris on January 9, 2014. He recalled that at the Hatchery Committees meeting on December 18, 2013, the Hatchery Committees were notified that WDFW and NMFS were requesting this extension in preparation for implementation of adult management of spring Chinook at Tumwater Dam. He explained that there has been a lack of resolution in these data with high percent hatchery-origin spawners (pHOS) and high fitness, and this extension will hopefully inform these data gaps.

Tonseth said comments were received from Kirk Truscott on January 13, 2014, and distributed to the Hatchery Committees that same day. Tonseth summarized that Truscott's recommendations included: 1) extending extensive spawning ground surveys through 2018 to correspond to the last DNA sampling of both HO and natural-origin (NO) spring Chinook; and 2) maintaining trapping and sampling protocols and assessments of delays at Tumwater Dam consistent with last year's operations and monitoring to ensure that unintended delays do not occur as a result of the trapping and sampling at Tumwater Dam. Tonseth said that, in response to Truscott's first comment, spawning grounds work will still continue, absent PIT tag detections on redds and habitat work. Regarding Truscott's second comment, Tonseth said that these activities will occur, per usual Tumwater Dam operations. Bill Gale asked if language has been added to address Truscott's comments, and Tonseth replied that it has not. He added that additional language will not be needed to address Truscott's second comment because his recommendation is already a part of Tumwater Dam typical operations. Tonseth said that no further comments were received on the request.

Alene Underwood asked if there will be any required modifications to the existing permit, and Tonseth replied that there will not. He added that the existing permit extends until 2026, so the proposed extension will conclude well within the timeline of the permit. Underwood noted that Chelan PUD and WDFW have been in close coordination to develop a solid facility agreement. Bill Gale said that Karl Halupka suggested incorporating language to address bull trout coverage, and Tonseth replied that he will do so. Tonseth also reminded the Hatchery Committees that ultimate approval of this extension is contingent on BPA's approval, which, he added, seems highly likely.

The Hatchery Committees representatives present approved the extension request from WDFW and NMFS for a change in the scope of work for the BPA-funded Wenatchee RRS Study, contingent on incorporation of edits discussed. Truscott provided the CCT's approval of the request via email on January 13, 2014. Tonseth said he will revise the extension request for the Wenatchee RRS Study, as discussed, and will provide the final request to Geris for distribution to the Hatchery Committees.

B. Section 8.3.2 of the Hatchery M&E Plan (Mike Tonseth)

Mike Tonseth said that under Section 8.3 (Fecundity at Size) of the Hatchery M&E Plan, Section 8.3.2 addresses measuring the natal mass. Tonseth said there have been discussions within WDFW about the protocol for measuring gonadal mass, and there are different opinions regarding what stage to take the measurement. He said that some argue for taking the measurement at the eyed egg stage, while others (including Tonseth) think the best approach is taking the measurement before the eggs are fertilized, at the green egg stage.

Tonseth said another issue is sample size. He suggested sampling 100% of the listed programs. For unlisted programs, Tonseth questioned whether a 100% sample of all females is necessary. He also noted that current sampling at Eastbank Fish Hatchery and Wells Hatchery involves different levels of effort, and asked the Committees to be mindful of this, as well. Tom Kahler noted the footnote under Section 8.3, which indicates “may not apply to all programs”; however, Greg Mackey said he believes that footnote applies to non-harvest programs.

Mackey said that fecundity can change in two ways: 1) egg size can change while the gonadal to somatic mass stays constant; or 2) the gonadal to somatic ratio can change (or both could occur). He said that a change in egg size probably occurs more readily than a change in gonadal to somatic ratio, and it can be affected by growth rates early in life. He said he envisioned that measurements would be taken at the green egg stage; however, he also noted that hatchery staff have been concerned with handling green eggs, such as weighing all green eggs in a colander. Mackey added that a main concern is to make sure methods are consistent. Tonseth said that taking measurements at the green egg stage has been done before, and it does not involve sampling all of the eggs; rather, it involves a subsample of eggs (typically 100) that can be used to estimate average egg weight and then fecundity is estimated when the all eggs form a female are weighed at the eyed egg stage (assumes egg weight does not change significantly between the green and eyed stages). He added that he has not observed negative impacts, and that eggs counted are returned to production.

Tonseth asked the Hatchery Committees for a recommendation regarding taking the weight of eggs, and sample size. Mackey said that the hatcheries already collect the data at the eyed egg stage, so collecting the data at the green egg stage would involve extra effort. Tonseth noted that if a sample of eggs is weighed at the green egg stage, those data would be representative of all of the eggs of the female. He said the mean egg weight can then be calculated and used to estimate the total number of eggs when they are weighed at the eyed egg stage. Bill Gale said if the goal is to identify a relationship between gonadal mass and somatic mass, he suggested sampling 100 eggs at the green egg stage. He said to obtain an estimate of variance, multiple samples will be needed, which would take more time but would also provide a more robust method.

Mike Schiewe suggested that Tonseth develop a written proposal for Hatchery Committees review. Tonseth agreed to develop a draft protocol for measuring fecundity at size, and he said he will provide the draft protocol to Kristi Geris for distribution to the Hatchery Committees to be discussed at the Hatchery Committees meeting on February 19, 2014.

IV. Chelan PUD

A. DECISION: Sockeye M&E Implementation Plan (Alene Underwood)

Alene Underwood said that a draft Sockeye Addendum to the final Chelan PUD 2014 Hatchery M&E Implementation Plan was distributed to the Hatchery Committees by Kristi Geris on December 11, 2013. Mike Tonseth said that WDFW is not yet ready to approve the draft addendum due to questions regarding data and reports previously reported and, in particular, problems replicating trap efficiencies in the reports. He indicated that trap efficiencies may be off by about 50%. He said that WDFW would like to be confident that the methods will be sound, and added that Andrew Murdoch has been discussing a few minor edits to make those data stronger. Tonseth said that he fully expects that a draft plan will be ready to approve next month.

Keely Murdoch said that, regarding Table 1 in the draft addendum (Chelan PUD's proposed Lake Wenatchee sockeye salmon M&E activities), it appears that juvenile freshwater productivity estimates are missing. Catherine Willard replied that in addition to the lower Wenatchee smolt trap, the acoustic trawling conducted by the Columbia River Inter-Tribal Fish Commission (CRITFC) would further evaluate juvenile freshwater productivity. Keely Murdoch noted that although CRITFC will be collecting those data, because of logistical complications during the winter months, she was concerned that those data may not always be available. She recommended that Chelan PUD coordinate with Jeff Fryer to review what data are available to date. She also noted the uncertainty regarding how long funding will last to support CRITFC's efforts. Tonseth said that Andrew Murdoch shared these same concerns. He said that Andrew Murdoch suggested instead using WDFW's Large Lake Crew who are also equipped to conduct acoustic work, because they would likely be less impacted by weather conditions. Tonseth said that Andrew Murdoch questioned whether trawl sampling would be needed, and he added that WDFW's Large Lake Crew is not equipped to conduct that type of work. Keely Murdoch said that trawl sampling is conducted to determine species composition and age-class data in order to develop sockeye estimates; so, if the goal is to determine productivity by age class, trawl sampling would be important. Tonseth said that Andrew Murdoch thought that acoustic surveys combined with lower Wenatchee trap data may be adequate to obtain life stage data.

Underwood said that because Chelan PUD does not have a hatchery supplementation program for sockeye, it would not be their responsibility to monitor productivity of the natural population; therefore, Chelan PUD would not be interested in funding this effort. She added that Chelan PUD is proposing to commit to trapping smolts at the lower Wenatchee smolt trap in order to obtain a juvenile abundance estimate, which provides an understanding of freshwater productivity, and Chelan PUD believes this would fulfill any obligation they have towards this effort. Keely Murdoch noted that if a sockeye hatchery program needs to be brought back at the next recalculation, the freshwater component will be key. She added that the Joint Fisheries Parties (JFP) had intended for the current M&E to continue. Underwood said that fact was not articulated within the Hatchery Committees. She said the meeting minutes were reviewed and expectations were not clear. She said Chelan PUD agreed to continue M&E, which is what the addendum proposes.

Underwood said that Chelan PUD has shown, and the Hatchery Committees agreed, that the hatchery contribution to natural spawners was negligible. Tonseth said that the Committees need to know how many sockeye are produced to determine Chelan PUD's mitigation obligation. Underwood agreed in part and said, however, that Chelan PUD's mitigation share was determined by survival studies for Plan Species at the hydroelectric projects. Mike Schiewe suggested that Chelan PUD coordinate with WDFW and the YN to further discuss and revise the draft Sockeye Addendum to the final Chelan PUD 2014 Hatchery M&E Implementation Plan.

Greg Mackey asked about the efficacy of the relocated smolt trap in the lower Wenatchee. Tonseth said the new location is still too new to know if it will be adequate in obtaining sockeye abundance estimates. He added that the sockeye migration window is narrow, and that water level and flow conditions need to be ideal for the trap to be effective. Lynn Hatcher asked if Chelan PUD plans to use the lower Wenatchee trap to count sockeye, and Underwood replied that they are, as they have done in the past. Tonseth noted that the situation is different now that the trap is not located at Monitor. He added that Andrew Murdoch is planning to contact Chelan PUD, and will also include the YN in those discussions.

B. 2014 Rocky Reach Trap Pilot Study Proposal (Alene Underwood)

Alene Underwood said that although a written proposal is not yet ready for distribution, she wanted to verbally review the main points of what is being proposed. She provided a handout with photos and a diagram of the Rocky Reach Trap (Attachment C). She said Chelan PUD still plans to install the trap improvements as discussed at the Hatchery Committees meeting on December 18, 2013. She reviewed that those improvements include: 1) replacing the solid trap door with a grated or perforated trap door; 2) adding underwater lighting; 3) installing an electrical control pendent to give the two operators the opportunity to operate the door depending on visibility; 4) painting the trap floor white; and 5) installing additional cameras. She said these improvements will also benefit a bull trout study that is being planned for 2018.

Underwood said that Chelan PUD's preferred option to obtain broodstock is via a separation-by-code monitoring system. She said Chelan PUD hopes to install this system at Rocky Reach Dam within the next few months. She said Biomark is scheduled to take measurements and investigate noise levels while the ladder is dewatered for winter maintenance. Underwood explained that downstream of the viewing windows, there are two PIT tag arrays (located at baffles #6 and #4). She said Chelan PUD is proposing to install an additional PIT tag array outside of the viewing window adjacent to the trap. She clarified that the separation-by-code system is not a gate; rather, the system will be manually activated. The array at baffle #6 is the first reader that will alert that a fish is ascending the ladder and the array at baffle #4 will be the second alert. The new PIT tag detector will now be the third alert that will sound after the fish has been viewed through the viewing window. Willard said that once the third alert sounds, the trap door will be manually opened by the operator.

Bill Gale asked if having the ability to trap with less visibility will increase the likelihood that non-target fish will be trapped. Underwood said that should not be an issue. Gale asked if Chelan PUD has run the analyses to back-calculate how many juveniles will need to be tagged in order to obtain adequate brood as they come back as adults. Underwood said Chelan PUD has not yet completed those analyses but planned to do so prior to the next meeting. Gale asked whether, based on the current numbers, there will be enough returning fish to obtain what Chelan PUD needs. Mike Tonseth replied that that there will be insufficient fish to collect brood in 2014. Underwood said that Chelan PUD will need to PIT tag additional natural-origin juveniles in the future for broodstock collection at the Rocky Reach Trap to work.

Underwood said that, in order to test how the separation-by-code system works, Chelan PUD has discussed potentially targeting natural-origin spring Chinook tagged by USGS at the Chewuch smolt trap or hatchery fish produced at Methow Hatchery. She said that Chelan PUD has also considered uploading Chiwawa spring Chinook tags, which would also provide the ability to manage strays potentially destined for the Entiat.

Underwood said that Chelan PUD does not have a timetable for when this system will be installed; however, she said it should be installed before fish begin arriving this year. She said that Chelan PUD is also fairly confident the system can be installed with the existing infrastructure. She proposed retention of any targeted Methow or Chewuch basin wild fish, and possibly PIT tagged hatchery fish, in combination with other efforts such as tangle netting, in order to obtain all broodstock in 2014. She added that because it is doubtful that enough fish will be collected at the trap, the idea is to supplement those collected at the trap with tributary-based collections.

Lynn Hatcher suggested focusing on additional trapping efforts before attempting to capture and retain Chewuch fish. Gale also suggested taking precautions to not impact ongoing studies by targeting other agencies' PIT tagged fish. Keely Murdoch agreed with Gale, and recommended that Chelan PUD coordinate with USGS if they plan to target their fish.

Murdoch asked Wes Tibbits (formerly with USGS) if USGS uses PIT tag data for adult or juvenile evaluations. Tibbits said those data are used to evaluate effectiveness of juvenile rearing. He said adult data are extra, and not used for habitat evaluations. Murdoch said that the YN does not favor tributary netting, and if fish are in-hand from operation of the Rocky Reach Trap, they should be used.

Tonseth asked what is proposed as far as timing and hours of operation for the Rocky Reach Trap Pilot, and Underwood said that Chelan PUD would like to discuss those details with WDFW. She said Chelan PUD is hoping to sort through those details and provide a draft proposal for Hatchery Committees review prior to the Hatchery Committees meeting on February 19, 2014. Gale asked what responsibilities the HCP Coordinating Committees have in terms of this pilot versus responsibilities of the Hatchery Committees. Mike Schiewe said the HCP Coordinating Committees will address passage issues, while the Hatchery Committees' concern will focus on the numbers collected and the appropriateness of the broodstock for the program.

Underwood asked Hatcher if NMFS would consider the Rocky Reach Trap as a broodstock collection location, and Hatcher said that NMFS is concerned with impacts to certain species. He said he agrees the method has potential; however, he also thinks there could be issues that have not yet been identified. Tonseth said the purpose of the pilot is to evaluate potential issues. He said that Chelan PUD is asking to have the option to keep fish that are trapped during this pilot for brood, an option that Tonseth expressed believing they should be able to do. He said that, otherwise, those fish will be released and potentially handled again at Wells Dam, and then again in the tributaries. He said the only mainstem approach is the Rocky Reach Trap, and the only tributary approach is tangle netting or hook-and-line; and all options come with risks. Hatcher asked if only hatchery fish can be targeted. Tonseth replied that Chelan PUD is already targeting hatchery fish; he noted, however, that this is a conservation program and requires wild fish. Gale said he thinks Hatcher was suggesting only targeting hatchery fish for the pilot, as opposed to wild. He added that from a USFWS perspective, he favors avoiding tangle netting in the tributaries. Greg Mackey noted that if Chelan PUD does not obtain any wild fish, they will only have hatchery fish for a conservation program. He added that they are trying to avoid risk and take advantage of captured fish by retaining a few wild fish at Rocky Reach. Mackey said that given the PIT tagging rate of natural origin fish and low SARs, there may only be single digit numbers of wild PIT tagged spring Chinook returning.

The possibility of tagging natural origin out migrants at the Methow smolt trap as a means of identifying returning adults for broodstock was discussed. Mackey noted that the trap also collects fish of Twisp origin, so PIT tagging fish at the trap would inadvertently include some proportion of Twisp fish that could later be included in the non-Twisp broodstock. Murdoch asked if the general consensus is to avoid using the Methow smolt trap to PIT tag outmigrants. Underwood said that Chelan PUD would like to exclude Twisp fish from their Methow spring Chinook broodstock. Murdoch said she would be interested in knowing what proportion of fish captured at the Methow smolt trap are Twisp fish. She said if it is a low proportion, then the YN would support using the trap to PIT tag fish and use the returning adults for broodstock for Chelan PUD's program. Gale asked about the rate of trapping at these traps, and Tibbits said that when he operated the Chewuch trap, trapping was near 20%. *(Note: Tibbits later clarified that, in reality, trapping efficiency is probably closer to 12 to 18% depending on flow and species.)* He added that back then, the trap was operated less than it is now (5 days per week versus 7 days per week, both 24 hours per day). Tonseth noted that for the juvenile run, the permits indicate only 20% can be harassed (i.e., captured); and for the adult run, 33% extraction cannot be exceeded. He said that even if 100% of smolts captured are PIT tagged, those percentages will not be exceeded because trap efficiency is so low. Tibbits noted that there is a better idea of what is returning once the run passes Bonneville Dam. Mackey suggested querying the PIT Tag Information System (PTAGIS) to get an idea of how many fish have been PIT tagged as juveniles and how many return, and Underwood said Chelan PUD plans to do so.

Underwood said that Chelan PUD will provide a formal Rocky Reach Trap Pilot Study Proposal for consideration at the Hatchery Committees' meeting on February 19, 2014.

C. Spring Chinook HGMP Discussion (Alene Underwood)

Alene Underwood said that Chelan PUD has received several comments on the Chelan PUD Spring Chinook HGMP. She added that the CCT also plan to provide comments by next week. Bill Gale said that he will provide Chelan PUD with USFWS' comments by close of business on Friday, January 17, 2014. Underwood said that instead of reviewing comments during today's meeting, she plans to contact each entity to discuss their respective comments individually. She said she plans to also have a revised HGMP available by the last week in January, and request a conference call during the first week in February to discuss any final comments, so approval can be requested at the Hatchery Committees' meeting on February 19, 2014. Bill Gale asked about a reference to "Addendum A" that is included in the draft HGMP, and Underwood said that reference no longer exists and will be removed from the revised draft. Gale asked if bull trout are addressed in the HGMP, and Underwood replied that they are; however, the language has not yet been reviewed by Karl Halupka (USFWS). Gale asked if the Rocky Reach Trap will be incorporated in the HGMP, and Underwood replied that details regarding the Rocky Reach Trap will be incorporated in the revised draft.

Kristi Geris distributed a meeting invite on January 16, 2014, for a WebEx conference call on February 6, 2014, from 9:00 am to 11:00 am, to discuss final comments on Chelan PUD's Spring Chinook HGMP.

D. Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan (Alene Underwood)

Alene Underwood said that Kristi Geris sent an email to the Hatchery Committees on January 10, 2014, notifying them that the draft Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan is available for review. Edits and comments on the draft plan are due to Chelan PUD no later than Friday, January 31, 2014. Chelan PUD will be requesting approval of the draft plan at the Hatchery Committees' meeting on February 19, 2014. Mike Schiewe noted that the action plan includes activities for all three HCP Committees, and added that the HCP Coordinating Committees plan to review the action plan during their meeting later this month.

Bill Gale asked about the status of reports on the recirculation pilot studies at Eastbank Fish Hatchery and Chiwawa Fish Facility, and Underwood said that she will look into their status and report back to the Hatchery Committees at the February 19, 2019 meeting.

V. NMFS

A. HGMP Update (Lynn Hatcher)

Lynn Hatcher said that all affected parties met on January 8, 2014. He said these meetings will continue to occur every two months.

Leavenworth Spring Chinook

Hatcher said that the Leavenworth Spring Chinook HGMP will be completed by spring 2014.

Wenatchee Steelhead

Hatcher said that the Wenatchee Steelhead HGMP will be completed by spring 2014. He added that NMFS is still waiting for a Steelhead Adult Management Plan. Alene Underwood clarified that Chelan PUD has not yet reviewed the draft Steelhead BiOp or Section 10 Permit.

Mid-Columbia Coho

Hatcher said that Keely Murdoch and Craig Busack are working on the draft Mid-Columbia Coho BiOp, which will be completed in February 2014.

Okanogan spring Chinook and Methow spring Chinook

Hatcher said that the Okanogan Spring Chinook and Methow Spring Chinook HGMPs will be completed by June 2014. He said that no public comments were received on either HGMP, and one comment was received on the Section 10(j) permit that indicated support for the permit. Hatcher said that Busack plans to coordinate with Chelan PUD on their Methow Spring Chinook HGMP.

Okanogan Steelhead and Methow Steelhead

Hatcher said that the Okanogan Steelhead and Methow Steelhead HGMPs for the PUDs will be completed by summer 2014.

CCT Permitting Process and Potential for Steelhead Broodstock Collection in the Okanogan

Hatcher said that the Okanogan Steelhead Environmental Assessment (EA) for the CCT will be published in the Federal Register (FR) by February 28, 2014. He noted that the CCT needs coverage by February. Wes Tibbits said that the CCT is finalizing the additional information that NMFS requested on their HGMP, and plans to provide their HGMP to NMFS by the end of January 2014. He added that the CCT plans to combine their HGMP with their Tribal Resource Management Plan (TRMP). Hatcher said that once the HGMP is received and approved, NMFS will distribute a letter of sufficiency to the CCT, and also a letter to Grant PUD and the CCT indicating coverage under the Endangered Species Act (ESA). Tibbits said this action, in turn, will enable the CCT to continue with their full program. He asked, however, if there happens to be a delay, whether the CCT's Okanogan Program still be covered under the Permit 1395 extension. Hatcher said that the 16 fish would be covered; however, the additional 42 fish Kirk Truscott has requested would not be covered. Tibbits asked if the additional 42 fish would be covered if consensus was obtained from the Hatchery Committees. Greg Mackey explained that the Hatchery Committees only govern the PUD facilities or agents under the permit; so this does not include the CCT programs. Mike Tonseth noted that it seems incumbent upon the CCT to submit the HGMP to NMFS by the end of January, and if NMFS can get those two letters out as planned, the CCT will get their fish.

Mackey reminded the Hatchery Committees about Truscott's Wells Steelhead Broodstock Replacement Proposal to use Okanagan adults to contribute to making up the shortfall at Wells Hatchery. The Hatchery Committees representatives present approved the CCT's Wells Steelhead Broodstock Replacement proposal.

Summer and Fall Chinook

Hatcher said that the summer and fall Chinook programs are still the lowest priority, but are planned to be addressed by early fall 2014.

VI. Yakama Nation

A. Coho Trapping under the YN HGMP and Future BiOp (Keely Murdoch)

Keely Murdoch said that the YN has been working closely with NMFS on the coho salmon draft BiOp. She said in the YN's HGMP that trapping is proposed at three facilities. She said the proposed trapping operations differ slightly from what is outlined in their current permit, so NMFS wants to make sure that agencies are aware of these changes and that there are no red flags. Murdoch said that at Tumwater Dam, the YN is currently permitted to trap coho from September 1 through December 1, three days per week, for 16 hours each day. She said, however, that during the Steelhead RRS Study, the YN has also been able to capitalize on that effort, so coho trapping has really been occurring 5 to 7 days per week. Murdoch said the YN is proposing to modify their permit to be authorized to trap 5 days per week, for 9 hours per day. She said with this modification, the cumulative hours will be fewer. Murdoch said the YN is also currently permitted to trap at Wells Dam 3 days per week, up to 16 hours per day from September 1 through October 10, with an increase in trapping to 7 days per week after October 10, 2014. She said the YN is requesting to change the trapping to 5 days per week, up to 9 hours per day for the time period between September 1 and October 10.

Murdoch said that the revised Master Plan was largely responsive to comments by the Independent Scientific Review Panel's (ISRP's) request to focus on local adaptation to the extent possible. She said that the YN proposes using existing weirs opposed to building new ones. She said that all trapping sites included in the original Master Plan and HGMP are currently being used with the exception of the Twisp Weir; which the YN is not currently permitted to operate. She said that the YN is concurrently undergoing consultation with NMFS and with USFWS, who has several issues with the YN operating the Twisp Weir, to the point that the decision was made to remove the Twisp Weir from consultation with USFWS. She said if the YN were to decide to use the Twisp Weir, which would depend on trapping at Wells Dam, consultation would need to be reinitiated with USFWS for that weir; however, the YN would like to include the Twisp Weir in the NMFS consultation.

Bill Gale asked what time of year would the YN be operating the Twisp Weir. Murdoch replied that the YN would operate the weir from September through November. She added that the YN is currently permitted through December 7; however, trapping typically ends around Thanksgiving. She said the YN has been working with Jeff Krupka regarding impacts to bull trout. She said if the weir is operated properly, stranding should not be an issue. Tom Kahler noted that Douglas PUD has PIT tag data for bull trout, and recommended contacting Andrew Gingerich if the YN is interested in those data. Murdoch said the YN would like to keep the Twisp Weir in the coho BiOp; however, they would only be able to operate it if USFWS approves it. She said that if the YN finds it necessary, they may reinitiate consultation to use the weir. Kahler said that Douglas PUD's bull trout coverage for all Douglas PUD activities is in the BiOp for the Wells project, so any take applies to the gross take for the operation of the Wells project. Therefore, Douglas PUD cannot absorb any take outside of its required program operations.

Mike Schiewe said this issue will also be discussed by the HCP Coordinating Committees because it is a fish passage issue; and he asked if Bob Rose has been briefed on this topic. Kahler suggested that Cory Kamphaus (YN) discuss the topic with Rose. Schiewe suggested that Kamphaus call into the HCP Coordinating Committees meeting on January 28, 2014, to support Rose because there were several questions about this issue in terms of fish passage delays. Mike Tonseth noted that the cumulative hour delay concern has come up in the past.

Lynn Hatcher asked how many coho are needed, and Murdoch replied that in the Methow, about 500 are needed. She said, however, that the number will change over time because the revised Master Plan is a phased plan. She explained that there is one generation of increased numbers, but as fish return, numbers will reduce. She added that numbers in the Wenatchee will remain consistent; however, numbers in the Methow will fluctuate.

Gale asked about the YN plans to transfer 200,000 coho from Eagle Creek to make up for this year's shortfalls. Murdoch replied that only 100,000 will be transferred, and all will be differentially marked. She said that this method will be used as an evaluation of locally adapted broodstock, and added that the details are outlined in the Master Plan. She said that a measure of broodstock development success is another request made by the ISRP, and the fish will be differentially marked and then set up as a side-by-side comparison study to evaluate smolt-to-adult ratios (SARs) compared to fourth generation brood. Murdoch added that the study will be used to estimate progress made with broodstock development, and the study fish will not be included in the broodstock if they are not needed.

Schiewe said the next step is to discuss this topic with the HCP Coordinating Committees. Hatchery Committees representatives agreed to discuss with their respective agencies' Coordinating Committees representatives their recommendations regarding the YN's proposed coho trapping under the YN HGMP and future BiOp.

VII. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees' meetings are on February 19, 2014 (Douglas PUD); March 19, 2014 (Douglas PUD); and April 16, 2013 (Chelan PUD).

List of Attachments

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Alene Underwood*	Chelan PUD
Catherine Willard	Chelan PUD
Greg Mackey*	Douglas PUD
Tom Kahler*	Douglas PUD
Julene McGregor	Douglas PUD
Peter Graf	Grant PUD
Lynn Hatcher*	National Marine Fisheries Service
Wes Tibbits	Colville Confederated Tribes
Tom Scribner*††	Yakama Nation
Keely Murdoch*	Yakama Nation
Bill Gale*	U.S. Fish and Wildlife Service
Mike Tonseth*	Washington Department of Fish and Wildlife
Charlie Snow†	Washington Department of Fish and Wildlife

Notes:

* Denotes Hatchery Committees member or alternate

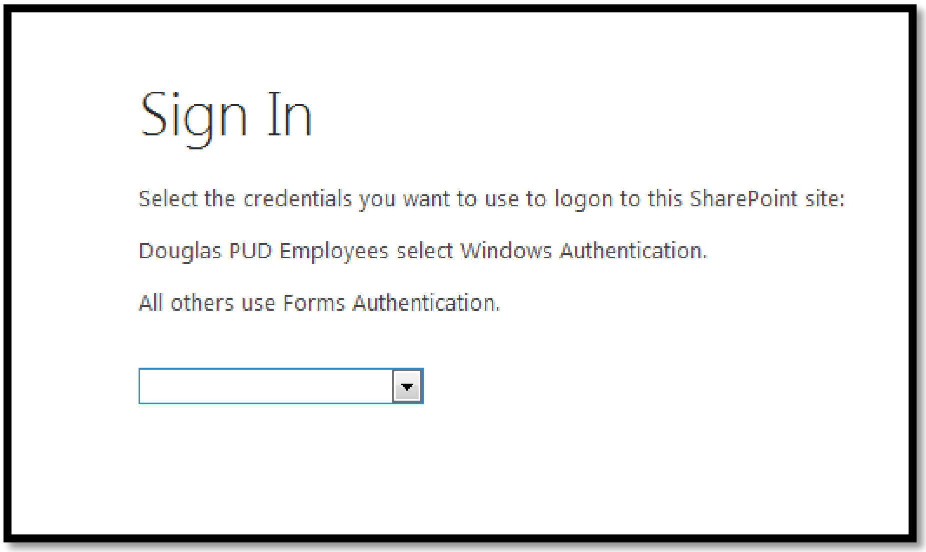
† Joined by phone

†† Joined by phone for the HCP Extranet Site Presentation and Extension Request for the Wenatchee RRS Study

HCP Hatchery Committee Extranet site

Site URL: https://extranet.dcpud.net

Select Forms Authentication on the Initial Sign In page.



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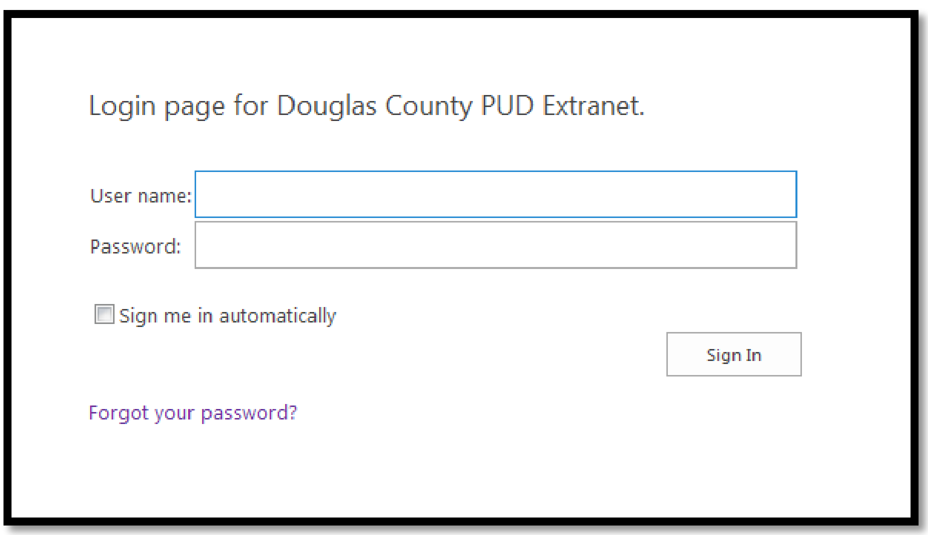

If you forget your password, navigate to the above sign-in page and click on "Forgot your password?" This will take you to the screen shown below where you will be able to enter your username OR your email address (the one used for registration on the Extranet site). A password reset email will be sent immediately.

Figure 1. Adult trapping facility at Rocky Reach Dam. The pneumatic arm (left and top right) activates a gate that guides fish into a holding vessel (bottom right, shown lifted). Trapped fish are either allowed to exit the holding vessel by opening the gate, or are lifted for processing.

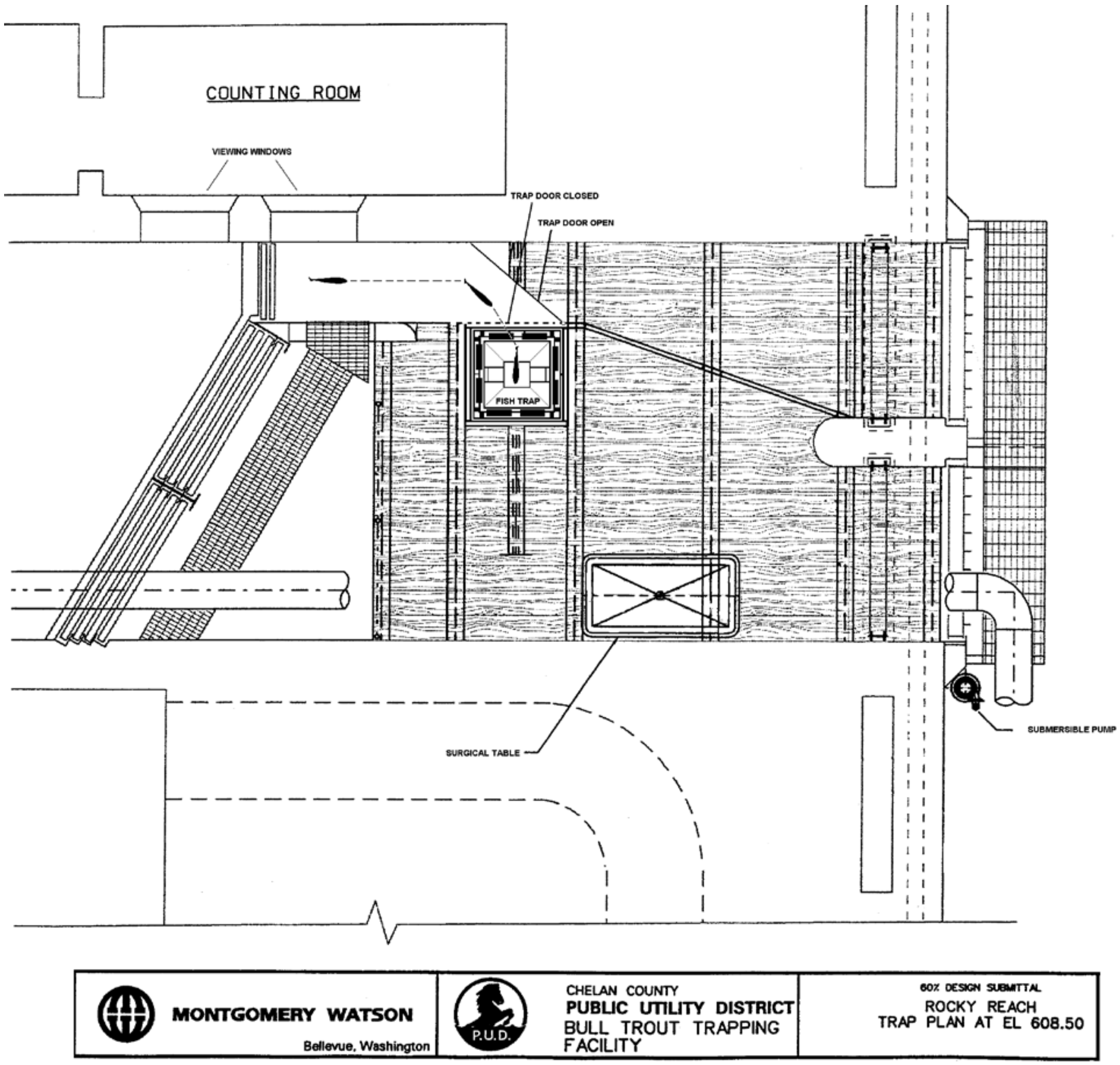

Figure 2. Rocky Reach Trap Layout

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Rocky Reach and Rock Island HCPs Hatchery Committees	**Date:**	March 21, 2013
From:	Mike Schiewe, Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the February 6, 2014 HCP Hatchery Committees Conference Call		

The Rocky Reach and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees' meeting was held by conference call on Thursday, February 6, 2014, from 9:00 am to 11:00 am. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- Lynn Hatcher will discuss with Craig Busack and Bryan Nordlund how to address the Rocky Reach Trap Pilot Study in terms of including the study in the Chelan PUD Methow spring Chinook Hatchery and Genetic Management Plan (HGMP; Item II-A).
- Chelan PUD will recirculate a revised Chelan PUD Methow spring Chinook HGMP to the Hatchery Committees prior to the meeting on February 19, 2014, when Chelan PUD will be requesting approval of the HGMP (Item II-A).

DECISION SUMMARY

- No decisions were approved at this meeting.

AGREEMENTS

- There were no agreements discussed during today's conference call.

REVIEW ITEMS

- There are no items that are currently out for review.

FINALIZED DOCUMENTS

- There are no documents that have been recently finalized.

I. Welcome, Agenda Review

Mike Schiewe welcomed the Hatchery Committees and said that the purpose of today's conference call, as agreed to at the last Hatchery Committees' meeting on January 15, 2014, is to review changes and accept additional comments on the draft Chelan PUD Methow spring Chinook HGMP.

II. Chelan PUD

A. Draft Chelan PUD Methow Spring Chinook HGMP (Alene Underwood)

Alene Underwood shared via WebEx the current draft Chelan PUD Methow spring Chinook HGMP (Attachment B), which was distributed to the Hatchery Committees by Kristi Geris on February 5, 2014. She said she planned to review the larger issues, and leave the editorial and formatting issues for members to review outside of this call. Discussions regarding each respective section were as follows:

Section 1.3 Responsible organization and individuals (page 2)

Comment [A1]: Regarding the use of the term "co-manager"

Underwood said that the term "co-manager" has been universally replaced by the term "JFP" (for Joint Fisheries Parties). This change was agreeable to all members.

Section 1.8.1 Legal Agreements and Requirements (page 4)

Comment [A2]: Regarding the role of U.S. v Oregon

Underwood said that the text in this section regarding the role of *U.S. v Oregon* has been deleted; however, the text regarding *U.S. v Oregon* in Section 3.2.2 will remain because of its relevance there.

Section 1.8.2 Program Summary (page 7)

Underwood said that a new table was added that summarizes the Methow Basin Management Framework, which describes managing for proportion of hatchery-origin spawners (pHOS).

Section 1.8.2 Program Summary (page 10)

Underwood said that, based on input from Lynn Hatcher, Chelan PUD agreed to limit information about the Rocky Reach Trap to its potential use, and to not include a lot of detail about testing the trap, in this section.

Section 1.12.2 Stray Rates (pages 18-19)

Comment [A11] – Comment [A23]: Regarding stray rates

Underwood said that errors in numbers were fixed, and revisions were made to clarify Chewuch stray rates.

Section 3.3.1 Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available (pages 57-58)

Underwood said that clarification was made to the statement about the role of Hatchery Scientific Review Group principles.

Section 3.5.1 Populations that could negatively impact the program (pages 59-60)

Comment [A34]: Regarding the Yakama Nation (YN) Coho Program

Underwood said that references to the YN Coho Program were removed.

Section 3.5.2 Populations that could be negatively impact by the program (page 63)

Underwood said that a table was added that summarizes coded-wire-tag recoveries.

Section 3.5.2 Populations that could be negatively impact by the program (pages 64-65)

Comment [A39]: Regarding bacterial kidney disease (BKD) management

Underwood said that information was corrected about BKD protocols.

Section 5.1 Broodstock collection facilities (or methods) (page 68)

Comment [A40]: Regarding broodstock collection locations

Underwood said that language was added noting the potential to collect Methow broodstock at Winthrop National Fish Hatchery (NFH) as well as the Methow Hatchery outfall.

Section 5.1 Broodstock collection facilities (or methods) (page 68)

Hatcher emphasized the importance of separating the Rocky Reach Trap test from the HGMP proper. This led to a discussion of whether the test had Endangered Species Act (ESA) coverage. Hatcher said that Bryan Nordlund had indicated it was covered under the HCP Biological Opinion. Hatcher said that another approach (if needed) is to discuss the Rocky Reach Trap in the "Research" section of the HGMP. He said that he would discuss with Craig Busack and Nordlund to confirm what is the best path forward.

Section 5.1 Broodstock collection facilities (or methods) (page 70)

Underwood noted that collecting broodstock in tributaries would only be temporary.

Section 5.7 Describe operational difficulties or disasters that led to significant fish mortality (pages 76-77)

Comment [A44]: Regarding the Chewuch Facility

Underwood said that language was added noting the loss of coho at Chewuch Acclimation Pond when a screen was plugged.

Underwood said that she will recirculate a revised Chelan PUD Methow spring Chinook HGMP to the Hatchery Committees prior to the meeting on February 19, 2014, when Chelan PUD will be requesting approval of the HGMP.

III. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees' meetings are on February 19, 2014 (Douglas PUD); March 19, 2014 (Douglas PUD); and April 16, 2013 (Chelan PUD).

List of Attachments

Attachment A	List of Attendees
Attachment B	Draft Chelan PUD Methow spring Chinook HGMP

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Alene Underwood*	Chelan PUD
Keely Murdoch*	Yakama Nation
Kirk Truscott*	Colville Confederated Tribes
Lynn Hatcher*	National Marine Fisheries Service
Bill Gale*	U.S. Fish and Wildlife Service
Mike Tonseth*	Washington Department of Fish and Wildlife

Notes:

* Denotes Hatchery Committees member or alternate

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Chelan PUD Methow Spring Chinook Program
Species or Hatchery Stock:	Upper Columbia River Spring Chinook (*Oncorhynchus tshawytscha*)
Agency/Operator:	Chelan County Public Utility District No. 1 (Chelan PUD) Washington Department of Fish and Wildlife (WDFW)
Watershed and Region:	Methow Sub-basin/Columbia Cascade Province
Date Submitted:	December 16, 2013
Date Last Updated:	February 5, 2014

Deleted: December 16, 2013

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List of Tables

Table 2-18. Percentages of hatchery-origin spring Chinook spawners in the Methow Basin, based on Table 2-14.

List of Figures

LIST OF ACRONYMS AND ABBREVIATIONS

BKD	bacterial kidney disease
CCT	Confederated Tribes of the Colville Indian Reservation
cfs	cubic foot per second
Chelan PUD	Public Utility District No. 1 of Chelan County
CI	confidence interval
CWT	coded wire tag
ELISA	enzyme-linked immunosorbent assay
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FDA	Food and Drug Administration
FERC	Federal Energy Regulatory Commission
FL	fork length
fpp	fish per pound
gpm	gallons per minute
HCP	Habitat Conservation Plan
HGMP	Hatchery and Genetic Management Plan
HRR	hatchery replacement rate
HOR	hatchery origin recruit
HSRG	Hatchery Scientific Review Group
ICTRT	Interior Columbia Basin Technical Recovery Team
IHOT	Integrated Hatchery Operations Team
ITS	incidental take statement
JFP	Joint Fisheries Parties
M&E	monitoring and evaluation
mg/kg	milligrams per kilogram
MPG	Major Population Group
NFH	National Fish Hatchery
NMFS	National Marine Fisheries Service
NNI	No Net Impact
NOR	Natural-origin recruit
NOS	natural-origin spawner
NPDES	National Pollution Discharge Elimination System
NRR	Natural Replacement Rate
NTTOC	non-target taxa of concern
O&M	operation and maintenance
OD	optical density
PFMC	Pacific Fisheries Management Council
pHOS	proportion of hatchery-origin spawners
PIT	passive integrated transponder
PNFHPC	Pacific Northwest Fish Health Protection Committee

PNI	Proportionate Natural Influence
pNOB	proportion of natural-origin broodstock
ppm	parts per million
RCW	Revised Code of Washington
S/S	spawner to spawner
SAR	Smolt-to-Adult Return
UCR	Upper Columbia River
UCSRB	Upper Columbia Salmon Recovery Board
USFWS	U.S. Fish and Wildlife Service
VSP	Viable Salmonid Population
WDFW	Washington State Department of Fish and Wildlife
WRIA	Water Resources Inventory Area
YN	Yakama Nation

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Chelan PUD Methow River Spring Chinook Program.

1.2) Species and population (or stock) under propagation, and ESA status.

Upper Columbia River Spring Chinook (*Oncorhynchus tshawytscha*), Endangered.

1.3) Responsible organization and individuals

Permit applicants:

Public Utility District No. 1 of Chelan County (Chelan PUD) and Washington State Department of Fish and Wildlife (WDFW).

Chelan PUD and WDFW are joint permit applicants with specific responsibilities under the proposed permit: 1) Chelan PUD as funder of facilities, operation and maintenance (O&M), and hatchery program monitoring and evaluation (M&E); and 2) WDFW as authorized fisheries manager and as Chelan PUD's current hatchery operator and implementing contractor for the M&E Plan. Future contractors for Chelan PUD, whether for hatchery operations or M&E, may conduct those activities under Chelan PUDs authorization.

Name (and title): Alene Underwood, Hatchery Program Manager
Agency or Tribe: Chelan PUD
Address: 327 North Wenatchee, Wenatchee WA 98801
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Agency or Tribe: WDFW
Address: 327 North Wenatchee, Wenatchee WA 98801
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Authorized Agent:

The Yakama Nation (YN) will play an important role in the implementation of the proposed permit. The YN operate facilities that may be used to acclimate Chelan PUD's Methow Spring Chinook salmon. The Yakama Nation is an Authorized Agent of Chelan PUD.

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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and

extent of involvement in the program:

- Rock Island and Rocky Reach Habitat Conservation Plan (HCP) Hatchery Committees: Oversee development of recommendations for implementation of the hatchery elements of the HCP; Hatchery Committee members include representatives from Chelan PUD, WDFW, Confederated Tribes of the Colville Indian Reservation, Confederated Bands and Tribes of the Yakama Nation, National Marine Fisheries Service (NMFS), and U.S. Fish and Wildlife Service (USFWS)
- Washington Department of Fish and Wildlife (WDFW): Co-manager; current contracted hatchery operator, co-permittee for the current permit (number 1196)
- Confederated Bands and Tribes of the YN:
- Confederated Tribes of the Colville Indian Reservation (CCT): NMFS: Administration of the Endangered Species Act
- USFWS: Administration of the Endangered Species Act
- Joint Fisheries Parties (JFP): USFWS, NMFS, WDFW, YN, and CCT

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1.4) Funding source, staffing level, and annual hatchery program operational costs.

Chelan PUD funds this program as authorized and obligated by the Rocky Reach and Rock Island HCPs. The total annual operational cost is expected to be between $250,000 and $750,000.

1.5) Location(s) of hatchery and associated facilities.

Several facilities will be involved in the implementation of this hatchery program, all located in the Columbia River basin in Washington (Table 1-1). See Section 5 for the activities to occur at each of these facilities.

Table 1-1. Facilities in Chelan PUD's Methow River Spring Chinook Hatchery Program.

Facility	Water body	River Mile	Basin Name	State	WRIA
Winthrop National Fish Hatchery	Methow River	45.0	Columbia River	WA	48
Eastbank Hatchery	Columbia River	473.0	Columbia River	WA	45
Carlton Acclimation Facility	Methow River	37.5	Columbia River	WA	48
Chewuch Acclimation Pond	Chewuch River	8.0	Columbia River	WA	48
Yakama Nation Expanded Acclimation sites such as Goat Wall (RM 68.0) and Mid Valley Pond (RM 54.4)	Various	Various	Columbia River	WA	48
Other locations as approved by the HCP Hatchery Committees	Various	Various	Columbia River	WA	48

Notes:
WRIA = Water Resources Inventory Area
HCP = Habitat Conservation Plan

1.6) Type of program.

Integrated Recovery Program.

1.7) Purpose (Goal) of program.

With respect to Chelan PUD, the purpose of this hatchery program is to satisfy the hatchery compensation requirements of the Rock Island and Rocky Reach Hydroelectric Projects HCPs. The HCPs were executed pursuant to Section 10 of the Endangered Species Act (ESA) as a vehicle to permit Chelan PUD to carry out its functions in a manner consistent with the ESA. The overriding goal of the HCPs—developed in accordance with the ESA's goals of conserving and facilitating the recovery of natural populations—is to achieve No Net Impact (NNI) on anadromous salmonids as they pass the Projects. NNI goals should be met in a manner consistent with the objective of rebuilding natural populations. Under the terms of the HCPs, and for the purpose of achieving NNI, Chelan PUD provides the funding and capacity required to meet hatchery compensation for all Plan Species for unavoidable losses at the projects.

Section 8 of the HCPs details the objectives, responsibilities, and requirements of hatchery programs required as mitigation for the operation of the project.

Section 8 includes the following objective:

8.1 Hatchery Objectives
8.1.2 The District shall implement the specific elements of the hatchery program consistent with overall objectives of rebuilding natural populations and achieving NNI. Species specific hatchery program objectives developed by the JFP [Joint Fisheries Parties] may include contributing to the rebuilding and recovery of naturally reproducing populations in their native habitats, while maintaining genetic and ecologic integrity, and supporting harvest.

In addition, the JFP developed program goal statements that have been documented in the *Conceptual Framework for Chelan PUD Hatchery Programs* (Murdoch and Peven 2007). The stated spring Chinook program goal is to support the recovery of ESA-listed species by increasing the abundance of the natural adult population, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity (Murdoch and Peven 2005).

1.8) Justification for the program.

The artificial propagation program for Methow spring Chinook specifically addresses the unavoidable losses associated with the operation of Rock Island and Rocky Reach Projects, and contributes to the long-term persistence of ESA-listed Upper Columbia River spring Chinook by increasing the abundance of the population. NMFS has determined that the program is likely necessary to prevent the extinction of the ESU until habitat conditions that limit the productivity of naturally produced spring Chinook in the region are improved.

1.8.1) Legal Agreements and Requirements

This application includes actions required of Chelan PUD pursuant to its Rock Island and Rocky Reach HCPs, which are included as conditions of Chelan's FERC license to operation these projects. To the extent the hatchery program that is the subject of this application is described in the *2008-2017 U.S. v Oregon Management Agreement*, program measures are considered orders of the *U.S. v Oregon* court and are binding on the parties thereto (Washington, Yakama Nation, NMFS, and USFWS). Program measures may be modified only by court action or consensus of the parties. Other actions that are beyond Chelan PUD's HCP obligations but represent important fishery management activities also may be implemented by the JFP. This section is intended to provide background and context to aid in the interpretation and application of the terms and obligations set forth below and in the existing Hatchery and Genetic Management Plan (HGMP). Specifically, this section: 1) identifies and describes the purposes and objectives of the HCPs, as relevant to the hatchery program; 2) outlines certain responsibilities and obligations of Chelan PUD based on the commitments and assurances provided in the HCPs; and 3) describes certain obligations and responsibilities applicable to the requested permit.

Commented [A2]: In response to the addition from the YN: While U.S v Oregon is relevant to production of fish in this basin, it has no authority over Chelan's proposed program as it pertains to this specific HGMP, as Chelan fulfills its hatchery obligations pursuant to conditions of the FERC licenses and is not a party to U.S. v Oregon. Chelan recommends deleting this.

See Section 3.2.2 for a relevant discussion of U.S. v Oregon.

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Chelan PUD's HCPs

Section 8 of the HCPs details the objectives, responsibilities, and requirements of hatchery programs required as mitigation for the operation of the Projects. Specifically, Section 8.1.1 indicates that Chelan PUD shall provide hatchery compensation for spring Chinook salmon originating upstream of the Rocky Reach and Rock Island Dams.

Adaptive Management & Section 10 Permits

Chelan PUD's spring Chinook hatchery program obligations under the HCPs are implemented through an adaptive management process set forth in the HCPs and overseen by the HCP Hatchery Committees. Specifically, the HCP Hatchery Committees may periodically adjust Chelan PUD's hatchery production levels (see HCPs at Section 8.4.3) and make program modifications to achieve program objectives, including changes to facilities, release methods, and rearing strategies necessary to achieve and maintain NNI (see HCPs at Section 8.6.1).

Commented [A3]: Changed from singular to plural. Technically speaking there are two committees, one for each of the HCHP (RR and RI) even though the same folks sit at the table for both.

CCPUD: Done

The HCPs' adaptive management processes are integral to the effective operation of the spring Chinook hatchery program described in this application. Any updated Section 10 permit and associated environmental reviews should incorporate, rely on, and anticipate compliance with the HCPs' adaptive management provisions. Incorporating adaptive management into the requested Section 10 permit, as contemplated by the HCPs, will minimize the need for future modification of the Section 10 permit and facilitate the efficient management and oversight of the program by the HCP Hatchery Committees. As an HCP Hatchery Committee member, NMFS plays a key role in this process.

The program described herein represents an attempt to use the adaptive management provisions of the HCP to address the Hatchery Scientific Review Group (HSRG 2009) recommendation wherein

Proportionate Natural Influence is greater than or equal to 0.67. The HSRG recognized that short-term Proportionate Natural Influence (PNI) goals may be difficult to meet when abundance levels are low, "The HSRG recommends that managers continue to operate the programs as currently planned in the near term. The HSRG acknowledges that managing for the recommended PNI values for a Primary population may not be possible or appropriate when abundance levels are low." Generally, under the HSRG recommendations, the proportion of hatchery-origin spawners (pHOS) should be reduced to extent practicable while the proportion of natural-origin broodstock (pNOB) should be maximized.

Roles and Responsibilities of Applicants:
In accordance with their respective obligations and authorities, the specific roles and responsibilities of Chelan PUD and WDFW in conducting permit activities are as follows:

The Chelan PUD will:

- Provide and maintain or acquire hatchery capacity for the Methow spring Chinook hatchery program.
- Fund or conduct hatchery operations related to spawning, incubation, rearing, and acclimation activities at locations approved by the HCP Hatchery Committee.
- Fund or conduct hatchery monitoring and evaluation under Section 8 of the HCPs.

The WDFW will:

- Collect broodstock, conduct hatchery operations, and implement M&E as a contractor to Chelan PUD[1].
- Take such actions as necessary to achieve pHOS and achieve PNI goals, in consultation with the JFP.
- Implement fishery-related management plans and activities, in consultation with the JFP.

Commented [A4]: YN added a parenthetical statement "WDFW, in consultation with the JFP,". Describing the activities in this way was intended to facilitate clear delineations for permit holders. I have suggested making edits to the following bullets.

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1.8.2) Program Summary

Chelan PUD and WDFW have distinct roles and responsibilities for implementing the actions described in this application. Chelan PUD has an independent responsibility to meet hatchery compensation obligations described in the HCPs. WDFW has the responsibility and authority to conduct activities necessary to manage fisheries resources of the State of Washington. Harvest is not addressed in the HCPs because it is not within the regulatory jurisdiction of the Federal Energy Regulatory Commission (FERC) license (NMFS 2007). Annual decisions related to the active management of adult returns, including fisheries and the disposition of collected adults, are subject to the authorities of the relevant fishery co managers and ESA regulators.

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Chelan PUD's Methow program will release 60,516 smolts representing about 10% of the total spring Chinook releases in the Methow River Basin (623,765 smolts). The Douglas and Grant PUDs

Deleted: is the smallest in the Methow River Basin with smolt release numbers (

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[1] The Chelan PUD currently funds WDFW to operate its hatcheries and conduct M&E activities under a separate agreement.

production groups comprise 26% (i.e., 163,249 smolts) and the USFWS comprises the remaining 64% (i.e., 400,000 smolts).

Chelan PUD's juvenile spring Chinook will be released into the Methow Basin from acclimation sites/facilities located on the Methow River or the Chewuch River.

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The purpose of releasing juvenile fish at acclimation sites is to improve adult homing, to natural spawning areas where they can ostensibly contribute to the abundance and productivity of natural populations.

The desire to have hatchery-origin fish contribute to the abundance of natural populations is the cornerstone of hatchery supplementation. "At the core of a conservation program is the objective of increasing the number of spawning adults (i.e., the combined number of naturally produced and hatchery fish) in order to affect a subsequent increase in the number of returning naturally produced fish or natural origin recruits (NOR). In order for the natural population to remain stable or to increase, the Natural Replacement Rate (NRR), or the ratio of NORs to the parent spawning population, must be at a level where parents are being replaced by their offspring as spawners in the next generation. It is possible to affect an increase in natural origin spawners through supplementation with a stable or decreasing NRR. However, if the NRR is below replacement (NRR<1.0) and prolonged, termination of the supplementation program will result in a declining natural population. The proportion of the hatchery-origin spawners (pHOS) that will increase natural production without creating adverse effects to the genetic diversity or reproductive success rate of the natural population is unknown, and may be dependent on how individual hatchery programs are operated, as well as available spawning and rearing habitat. Some programs may restrict pHOS to reduce the risk to the natural population with the intent of optimizing productivity, concomitantly reducing the overall number of spawners" (Hillman et al. 2013).

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Recognizing that allowing hatchery fish to spawn in areas with natural populations also poses an inherent risk of negative interactions with natural origin fish, Chelan PUD will provide WDFW with tools and resources to ensure that WDFW has the capability to remove at least the number of hatchery-origin fish that are expected to be produced by Chelan PUD's program (165 adults on average; Table 1-2).

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Table 1-2. Expected adult returns based on SAR data and program release quantities for Methow River releases (does not include Twisp program).

Methow Production	SAR (%)	Smolts Released	Expected Hatchery Returns (% of total)
Chelan Methow Program (Chelan PUD)	0.273 [1]	60,516	165 (9.9%)
Methow Hatchery (Douglas and Grant PUDs)	0.273 [1]	134,126	366 (22.1%)
Winthrop NFH (USFWS)	0.282 [2]	400,000	1128 (68.0%)
		Total Adult Returns:	1,659

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Notes:
1 = Source: Murdoch et al. 2012
2 = Source: USFWS 2012
SAR = Smolt-to-Adult Return; NFH = National Fish Hatchery; USFWS = U.S. Fish and Wildlife Service

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Achieving PNI goals, where PNI = pNOB /(pHOS + pNOB), will require decisions and actions to control the proportion of hatchery-origin spawners on the spawning grounds (i.e., pHOS). Chelan PUD will mark fish and provide funding and access to available infrastructure to ensure that WDFW, as an authorized manager, can conduct actions necessary to meet pHOS targets.

Commented [A5]: The goal is to achieve a PNI ≥0.67; pHOS is one of two metrics that can be manipulated (pNOB being the other) to achieving a PNI goal.

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WDFW will remove excess Methow River hatchery-origin spring Chinook to meet pHOS, at levels determined by the JFP (in coordination with other managers or regulatory agencies in the appropriate management venues). It is expected that pHOS management will be based on the abundance of hatchery- and natural-origin adult returns with emphasis on removing higher numbers of hatchery fish as natural origin escapements increase. It is expected that it may take several years to fully develop the operational approaches to remove excess hatchery-origin fish due to the uncertainty in effectiveness. Between now and 2017, the effectiveness of these approaches will be further challenged by larger adult returns from pre-recalculation production levels released from acclimation sites throughout the Methow subbasin.

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For production in the Methow River (and Chewuch River), the abundance of hatchery-origin returns and lack of within-basin collection opportunities for controlling pHOS complicates achieving PNI. The following operational parameters and management guidelines, originally included in the HCP Hatchery Committee-approved Methow spring Chinook HGMP (Douglas PUD 2010) and provided in the Methow Basin Management Frameworks for spring Chinook and Steelhead (NMFS 2013), are recommended for this program:

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Adult management will be used to manage overall basin pHOS, by the following sliding scale:

Natural-Origin Escapement	Management Response
<300	500 total spawners
301-500	pHOS ≤ 0.4
501-900	pHOS ≤ 0.3
901-1500	pHOS ≤ 0.2
1501-2000	pHOS ≤ 0.1
>2000	pHOS = 0

- Minimum escapement should not fall below 500 spawners. Under the Interior Columbia Basin Technical Recovery Team (ICTRT 2007) viability criteria, populations with fewer than 500 spawners are not considered viable. Hatchery production should be secondary in priority to achieving a spawning escapement of at least 500 spawners.
- The rate of extraction of natural-origin broodstock from all hatchery programs should never exceed 0.33 percent of the NORs to the Methow Basin.

- Escapement of NORs will not be restricted.

Deleted: <#>Maximize pNOB in years when spawning escapement will exceed 500 natural-origin spawners (NOSs) to the extent that it does not result in increasing pHOS above 0.50. Note, that in populations where escapement is dominated by hatchery origin recruits (HORs) and pHOS generally exceeds 0.30, increasing pNOB above 0.50 is relatively ineffective at maintaining PNI greater than 0.5 as compared with reducing pHOS.¶

Deleted: <#>Apply measures for adult management to control pHOS when and where appropriate. When the natural-origin spawning escapement is greater than or equal to 1,140, then the escapement of HORs to the Methow should be minimized (allowing for escapement of broodstock) and pNOB will be maximized. In return years when the total spawning escapement (including both hatchery and natural origin) is between 500 and 1,140, habitat seeding and genetic concerns must be balanced by the HCP Hatchery Committee in their determination determining of adult-management measures.¶

Table 1-3. Expected PNI and pHOS levels under different adult management scenarios.

Scenario	SAR % (From Murdoch et al. 2013)	Expected number of hatchery returns from Chelan PUD's program	Geometric mean of Methow and Chewuch natural-origin returns (Murdoch et al. 2012)	Total Escapement (hatchery + natural origin)	Geometric mean of Methow and Chewuch Natural-Origin returns (less 38 fish for broodstock)	Expected pNOB	Expected pHOS	Expected PNI
Average expected returns using Methow SAR	0.273	165	242	407	204	1.0	0.45	0.69
Average expected returns using Chewuch SAR	0.12	73	242	315	204	1.0	0.26	0.79
Average expected returns using Methow SAR (with 25% adult removal)	0.273	124	242	366	204	1.0	0.38	0.73
Average expected return using Chewuch SAR (with 25% adult removal)	0.12	55	242	297	204	1.0	0.21	0.83
Average expected returns using Methow SAR (with 50% adult removal)	0.273	83	242	325	204	1.0	0.29	0.78
Average expected return using Chewuch SAR (with 50% adult removal)	0.12	37	242	279	204	1.0	0.15	0.87

Notes:
PNI = proportionate natural influence
SAR = smolt-to-adult return
pHOS = proportion of hatchery-origin spawners
PNOB = proportion of natural-origin broodstock

It is expected that, despite the small size of Chelan PUD's program, adult management activities will be implemented. To facilitate the removal of excess hatchery-origin fish, Chelan PUD has identified the following tools and approaches:

- **Broodstock collection:** Excess hatchery-origin adults from the Methow conservation program may be used as broodstock for the Winthrop National Fish Hatchery (NFH) spring Chinook program and the Chief Joseph Hatchery (CJH) spring Chinook program when managing for pHOS. The number of broodstock available for other facilities will decrease commensurate with increasing escapement of hatchery returns to the natural spawning grounds in order to meet spawning escapement goals.
- **PIT tag and external marks:** Chelan PUD will passive integrated transponder (PIT) tag up to 25 percent of smolts released (or some other level as agreed upon by the HCP-HC) from Chelan PUD's program to ensure that up to 25 percent of returning adults can be readily identified and potentially removed using non-lethal sorting techniques at any traps located throughout the basin. Chelan PUD will also fund external marking required for conservation and harvest management. Chelan PUD will fund up to 100 percent external marking if necessary to support adaptive management and ESA compliance of the program. WDFW will determine annual external marking levels and coordinate or obtain approval from other managers as needed.
- **Rocky Reach Trap (RRT):** Based on previous efforts with steelhead and bull trout conducted in 2002 and between 2005 and 2007, respectively, the RRT can effectively remove externally marked fish, one fish at a time, without delaying unmarked fish or non-target species. Additionally, based on a 2013 pilot study, the RRT can effectively remove externally marked spring Chinook salmon, one fish at a time, without delaying non-target species. An additional pilot study will be conducted in 2014 that will evaluate the efficacy of trapping adult spring Chinook using separation-by-code technology. If this methodology proves successful, the RRT may be used for adult management, as approved by the JFP. Under a conservative trapping scenario, up to 165 excess hatchery-origin spring Chinook could be removed annually at Rocky Reach Trap. **Wells Trap: Hatchery-ori**gin returns may be managed at the ladder traps at Wells Dam in years when pHOS requires adjustment and minimum spawning escapement goals have been achieved (Douglas PUD 2010).
- **FTE funding to WDFW:** In order to ensure that WDFW has the capacity to manage excess hatchery origin spring Chinook from Chelan's program, Chelan PUD will provide funding to WDFW sufficient to support up to one full-time employee.
- **Fishery:** Implementation of fisheries may help reduce the number of hatchery-origin adults; however, under present marking agreements any fishery would be directed at Winthrop NFH returning adults, and not necessarily at fish originating from this program. Therefore, a fishery may help overall adult management in the basin, but may not have a substantial effect on adult management of Chelan PUD's spring Chinook production in the Methow basin unless alternate marking strategies were employed.

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Commented [A9]: The document states up to 165 excess HORs may be removed for adult management on page 84.

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1.9) List of program "Performance Standards".

See Tables 1-4 and 1-5 in Section 1.10.

1.10) List of program "Performance Indicators", designated by "benefits" and "risks."

1.10.1) "Performance Indicators" addressing benefits.

The performance indicators in Table 1-3 are from the M&E Plan developed and approved by the HCP Hatchery Committees, titled *Monitoring and Evaluation for PUD Hatchery Programs funded by Chelan PUD* (Hillman et al. 2013). In the context of benefits and risks, the target (Table 1-3) represents the opportunity for benefits to accrue, leading to a specific program goal (Table 1-4), whereas the failure to meet a target represents the risk of not meeting the stated goals. Additional performance indicators addressing operational and program risks are identified in Table 1-5.

Table 1-4. Program objectives, indicators, and goals for conservation hatchery programs including productivity and monitoring indicators (also applies to safety-net programs when used to support a conservation program).

Type	Objective	Indicator	Target	Goals
Productivity Indicator	Determine if the program has increased the number of naturally spawning adults	Abundance of natural spawners Adult productivity (NRR)	Increase No Decrease	Rebuild natural populations
Productivity Indicator	Determine if the proportion of hatchery fish affects freshwater productivity	Residuals vs. pHOS Juveniles per redd vs. pHOS	No relationship No relationship	Rebuild natural populations
Monitoring Indicator	Determine if run timing and distribution meets objectives	Migration timing Spawn timing Redd distribution	No difference No difference No difference	Rebuild natural populations and maintain genetic diversity
Monitoring Indicator	Determine if program has affected genetic diversity and population structure	Allele frequency (hatchery vs. wild) Genetic distance between populations Effective population size Age and size at maturity	No difference No difference Increase No difference	Maintain genetic diversity
Monitoring Indicator	Determine if hatchery survival meets expectations	HRR HRR	HRR>NRR HRR>Goal	Rebuild natural populations

Type	Objective	Indicator	Target	Goals
Monitoring Indicator	Determine if stray rate of hatchery fish is acceptable	Out of basin Within basin	≤5% ≤10%	Rebuild natural populations and maintain genetic diversity
Monitoring Indicator	Determine if hatchery fish were released at program targets	Size and number	= Target	Rebuild natural populations
Monitoring Indicator	Provide harvest opportunities when appropriate	Harvest	Escapement goals	Harvest opportunity

Notes:
HRR = hatchery replacement rate
NNR = natural replacement rate

1.10.2) "Performance Indicators" addressing risks.

Table 1-5. Performance Indicators Addressing Risks

Performance Standards	Performance Indicators	Monitoring and Evaluation
1. Artificial propagation activities comply with Endangered Species Act (ESA) responsibilities to minimize impacts and/or interactions to ESA-listed fish	Program complies with Section 10 permit conditions including juveniles are raised to smolt-size (approximately 15 to 18 fish/pound) and released at a time that fosters rapid migration downstream. Smolts will be 100% mass marked and CWT to identify them from naturally produced fish.	As identified in the Hatchery and Genetic Management Plan (HGMP): monitor size, number, date of release and mass mark quality. Additional monitoring metrics include straying, in-stream evaluations of juvenile and adult behaviors, natural-origin recruits (NOR)/hatchery-origin recruits (HOR) ratio on the spawning grounds, fish health documented. Required data are generated through the Monitoring and Evaluation (M&E) Plan and provided to NMFS as required per annual report compliance.
2. Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring.	All facilities meet WDFW water-right permit compliance and National Pollution Discharge Elimination System (NPDES) requirements (NPDES permit No.WAG-5011).	Flow and discharge reported in monthly NPDES reports. Environmental monitoring of total suspended solids, settle-able solids, in-hatchery water temperatures, in-hatchery dissolved oxygen, nitrogen, ammonia, and pH will be conducted and reported as per permit conditions.
3. Water intake systems minimize impacts to listed wild salmonids and their habitats.	Intake screens designed and operated to assure approach velocities and operating conditions provide protection to wild salmonid species.	Intake system designed to deliver permitted flows. Operators monitor and report as required. Hatcheries participating in the programs will maintain all screens associated with water intakes in surface water areas to prevent impingement, injury, or mortality to listed salmonids.
4. Hatchery operations comply with all ESA permit requirements.	Section 10 annual reports are submitted in compliance with permits.	Section 10 annual reports are submitted in compliance with permits.

Performance Standards	Performance Indicators	Monitoring and Evaluation
5. Artificial production facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols including Integrated Hatchery Operations Team (IHOT), co-managers Fish Health Policy, and drug usage mandates from the Federal Food and Drug Administration.	Hatchery goal is to prevent the introduction, amplification, or spread of fish pathogens that might negatively affect the health of both hatchery and naturally reproducing stocks and to produce healthy smolts that will contribute to the goals of this facility.	Pathologists from WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites, and/or pathological changes, as needed.
6. The risk of catastrophic fish loss due to hatchery facility or operation failure is minimized.	Staffing allows for rapid response for protection of fish from risk sources (such as water loss or power loss). Backup generators to provide an alternative source of power to supply water during power outages. Protocols in place to test standby generator and all alarm systems on a routine basis. Alarm systems installed and operating at each rearing vessel to detect loss of or reduced flow and reduced operating head in rearing vessels. Densities at minimum to reduce risk of loss to disease. Sanitation – all equipment is disinfected between uses on different lots of fish including nets, crowders, boots, raingear, etc.	Hatchery engineering design and construction accommodate security measures. Operational funding accommodates security measures. Training in proper fish handling, rearing, and biological sampling for all staff. Staff are trained to respond to alarms and operate all emergency equipment on station. Maintenance is conducted as per manufacturer's requirements and according to hatchery maintenance schedules.

Performance Standards	Performance Indicators	Monitoring and Evaluation
7. Broodstock collection and juvenile hatchery releases minimize ecological effects on listed wild fish.	Hatchery spring Chinook reared to sufficient size such that smoltification occurs within nearly the entire population, reducing residence time in streams after release (CV length ≤ 10%, condition factor 0.9 to 1.0). Smolts acclimated and imprinted on surface water from the natal steam to enhance smoltification and reduce residence time in the tributaries and mainstem migration corridors. All spring Chinook encountered in hatchery broodstock collection operations will be held for a minimal duration in the traps; generally less than 24 hours and follow permit protocols. Spring Chinook trapped in excess of broodstock collection goals will be released upstream or returned to natal streams immediately.	Fish culture and evaluation staff, monitor behavior, coefficient of variation in length, and condition. Fish health specialists will certify all hatchery fish before release. Up to three downstream juvenile smolt traps will be used to monitor the outmigration of hatchery and wild fish. Outmigration may also be monitored through PIT tag detection systems at mainstem passage facilities. Broodstock collection protocols developed each season and reviewed by the HCP Hatchery Committees.

Notes:
CV = coefficient of variation
CWT = coded wire tag

1.11) Expected size of program.
60,516 smolts

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).
38 natural origin adults at a sex ratio of 1:1 (see Section 7.4).

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.
See Tables 1-2 and 5-1.

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

1.12.1) Number of Adults Produced
The number of adults produced by this program is expected to range from 13 to 320 fish with a geometric mean of 165. Tables 1-6, 1-7, and 1-8 provide expected and historic production information for the program, respectively.

Table 1-6. Expected range of adult production originating from Chelan PUD's Methow spring Chinook obligation based on HCP SAR target and observed SARs.

SAR Origin	SAR %	Source of SAR	Expected Number of Adults Produced (from 60,516 smolt release)
HCP target	.300	Table 6 in Appendix D in Murdoch and Peven 2005	182
Historical geometric mean for Methow program	.273	Murdoch et al. 2012	165
Historical geometric mean for Chewuch program	.120	Murdoch et al. 2012	73
Min SAR (since 1993 brood year)	.022	Murdoch et al. 2012	13
Max SAR (since 1993 brood year)	.528	Murdoch et al. 2012	320

Notes:
SAR = smolt-to-adult return
HCP = Habitat Conservation Plan

Table 1-7. Historical Methow SARs from Chelan PUD-funded Methow program (Murdoch et al. 2012).

Brood Year	Smolts Released	Adult Returns	SAR %
1993	210,849	192	0.091
1994	4,477	1	0.022
1995	28,878	122	0.422
1996	202,947	500	0.246
1997	332,484	821	0.247
1998	435,670	2300	0.528
1999	180,775	145	0.08
2000	266,392	852	0.32
2001	130,787	508	0.388
2002	181,235	599	0.331
2003	48,831	57	0.117
2004	65,146	316	0.485
		Mean	**0.273**

Note:
SAR = smolt-to-adult return

Table 1-8. Historical Chewuch SARs from Chelan PUD-funded Chewuch program (Murdoch et al. 2012).

Brood Year	Smolts Released	Adult Returns	SAR %
1992	40,881	39	0.1
1993	284,165	116	0.04
1994	11,854	2	0.02
1996	91,672	37	0.04
1997	132,759	295	0.22
2001	261,284	738	0.28
2002	254,238	699	0.27
2003	127,614	61	0.05
2004	204,906	194	0.09
		Mean	**0.12**

Note:
SAR = smolt-to-adult return

1.12.2) Stray Rates

The number of strays originating from Chelan PUD's program is expected to be low because: 1) Chelan PUD will acclimate juveniles on Methow River water, which will maximize homing fidelity; and 2) the number of adults produced by the program is expected to be very small based on release sizes and empirical smolt-to-adult return (SAR) data. Based on comparisons with existing programs, the proportion of strays within and among populations is expected to remain below the 10 percent and 5 percent target levels, respectively.

The ecological effect (and genetic risk) of straying is a function of the number of fish that stray to a receiving population. The size of a program (in smolts released) and the associated historic smolt to adult returns (SAR) for a given program provide basic parameters for estimating the abundance of adult returns and, therefore, the magnitude of their contribution as strays in the future. In the description below, the numerical abundance of strays, relative to historic Methow and Chewuch releases (i.e., smolts released) and SARs are examined for comparisons to Chelan PUD's proposed program.

The size of the proposed Chelan PUD Methow Spring Chinook Program (60,516 smolts) would be 16.5 percent of the combined historical Methow and Chewuch spring Chinook production programs combined (60,516/366,666 = 16.5 percent) and 18.7 percent of the mean number of smolts released annually from the combined programs (i.e., 323,160) during brood years reported from the *Five Year Monitoring and Evaluation Report* (60,516/323,160 = 18.7 percent; Murdoch et al. 2012). In the future, the proposed Douglas and Grant PUD programs are expected to release 134,126 smolts, which will result in cumulative program releases slightly larger than half the size of the historic Methow and Chewuch programs (194,642/366,666 = 53.1 percent [based on historic release goals]; and 194,642/323,160 = 60.2 percent [based on mean number of smolts released annually]). The SAR rate is expected to be the same (0.273 percent and 0.12 percent, for Methow and Chewuch, respectively; Murdoch et al. 2012).

For the Chewuch program, within population stray rates were higher than the Methow program (Murdoch et al. 2012): "Analysis of stray rates within and between independent populations did not begin until 2000 due to lack of spawning ground data in prior years. Surveyors recovered Chewuch spring Chinook carcasses on both the Methow and Twisp rivers, where Chewuch spring Chinook comprised an average of 10.5% and 0.7% of the spawning population, respectively. The proportion of the Chewuch spring Chinook spawning populations comprised in the Twisp River was significantly lower (t-test: $P < 0.0001$) than the maximum target of 10% and no different from that target in the Methow River (t-test: $P = 0.57$)." However, Chelan PUD would be releasing fewer than 36% of the number of smolts that were released previously and this would reduce the number of adult strays accordingly. Scaling the expected number of adult returns with release sizes and SARs (i.e., 60,516 planned smolt release compared with 172,189 historic mean smolt release and expected SAR of 0.12%) suggests that the expected number of strays from Chewuch would be based on a basis population of 73 returning adults as opposed to 206 returning adults, historically. From the

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Based on the results of the *Five Year Monitoring and Evaluation Report* (Murdoch et al. 2012) within population stray rates for the Methow program have been below HCP target of 10% percent: "Methow spring Chinook have been recovered as carcasses in both the Chewuch and Twisp rivers, and comprised an average of 4.5% and 0.3%, respectively, of the spawning populations. The proportion of the spawning populations that Methow spring Chinook comprised in the Chewuch and Twisp rivers was significantly lower (t-tests: $P < 0.001$, and $P < 0.0001$, respectively) than the maximum target of 10%." A similar level of within population straying is expected from future Methow releases.¶
¶
Based on the results of the *Five Year Monitoring and Evaluation Report* (Murdoch et al. 2012) among population stray rates for the Methow program have been below HCP target of 5 percent: "The only independent populations where Methow spring Chinook have been recovered on the spawning grounds were the Similkameen River, Entiat River and Chiwawa River. An estimated 14 fish spawned in the Similkameen River which is a tributary with very abundant summer Chinook spawning and thus posed little to no genetic risk. An additional two fish were estimated to have spawned in the Chiwawa River in 2006. Methow spring Chinook routinely are recovered on the Entiat River in 5 of the last 11 years, but at very low levels. When recovered in the Entiat River, Methow spring Chinook have comprised less than 2% of the spawning population, a significantly lower value than the maximum acceptable level of 5% (t-test: $P > 0.007$)." A similar level of among population straying is expected from future Methow releases.¶

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perspective of a potential receiving population, smaller numbers of adults from the hatchery program translate to fewer potential strays and a proportionally smaller effect on the receiving population.

For the Chewuch program, among population stray rates were very low (Murdoch et al. 2012): "The only other independent population from which Chewuch spring Chinook have been recovered on the spawning grounds was the Similkameen River in 2001. An estimated five fish spawned in the Similkameen River. This likely posed little genetic risk to the Similkameen summer Chinook population due to the fact that spring Chinook are unlikely to cross breed with summer Chinook due to difference in spawn timing, and the Similkameen has a very high abundance of summer Chinook spawning." Among population straying would be further reduced by the small program size and is unlikely to exceed the 5 percent target if Chelan PUD's program is released in the Chewuch River.

In the event that stray rates exceed the HCP targets, Chelan PUD will fund additional in-basin imprinting opportunities such as 1) development of new water sources within the basin; 2) early life history acclimation (i.e., incubation and fry); or 3) other measures approved by the HCP Hatchery Committees as part of the adaptive framework of the HCPs.

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1.13) Date program started (years in operation), or is expected to start.

The historic Methow spring Chinook program at the Methow Hatchery began in 1992. The Upper Columbia River (UCR) spring Chinook salmon evolutionarily significant unit (ESU) was listed as endangered on March 24, 1999 (NMFS 1999) with supplementation activities as conditioned by Section 10 permit No. 1196 starting at Methow Hatchery with brood year 2000 fish. The proposed program as described in this HGMP would commence with brood year 2013 (release year 2015).

1.14) Expected duration of program.

The program is intended to continue for the remaining 50-year term of the Rocky Reach and Rock Island HCPs, which were approved by the FERC in 2004. The HCP Hatchery Committees agreed to current production levels for the 2014 to 2023 release years on December 14, 2011.

1.15) Watersheds targeted by program.

Methow Sub-basin/Columbia Cascade Province, Water Resources Inventory Area (WRIA) 48.

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

This hatchery program is adaptively managed by the Rocky Reach and Rock Island HCP Hatchery Committees, which have agreed to the collective goal of recovery and sustainability of the population within the context of meeting the HCP standard of NNI. The HCP Hatchery Committees therefore aim for a program of adequate size and characteristics to meet this goal. During the development and implementation of the HCPs, many alternatives were, and will continue to be, considered for this program. The HCP Hatchery Committees have concluded that a larger program would not be consistent with the HSRG's recommendations (HSRG 2009) to reduce artificial production in the Methow Basin, while a smaller or non-existent program may fail to support recovery as described in the Recovery Plan (UCSRB 2007). Thus, the HCP Hatchery Committees developed the program described in this HGMP to meet the current biological, agency, and HCP goals.

SECTION 2. PROGRAM EFFECTS ON NMFS ESA-LISTED SALMONID POPULATIONS.

(USFWS ESA-Listed Salmonid Species and Non-Salmonid Species are addressed in Addendum A)

2.1) List all ESA permits or authorizations in hand for the hatchery program.

2.1.1) Section 10(a)(1)(A) Permit Number 1196

Artificial production of UCR spring Chinook is presently covered under Section 10(a)(1)(A) Permit No. 1196, initially set to expire January 20, 2014, but continues to be covered by an extension of the permit (issued September 9, 2013) until a new permit is issued for this program as described in this HGMP. Activities described in the application for this permit have been previously authorized under terms and conditions of the *Biological Opinion on Artificial Propagation in the Columbia River Basin* (NMFS 1999). WDFW submits annual reports as conditioned by Section 10 permit No. 1196 covering the period from January 1 to December 31 each year.

2.1.2) Rocky Reach and Rock Island Habitat Conservation Plans

In 2002, the Rocky Reach and Rock Island HCPs were signed by WDFW, USFWS, NMFS, and the Colville Confederated Tribes, and approved by FERC on June 21, 2004. The Yakama Nation signed the HCPs in March of 2005. The overriding goal of the HCPs is to achieve NNI on anadromous salmonids as they pass Rocky Reach and Rock Island Dam. One of the main objectives of the hatchery component of NNI is to provide species-specific hatchery programs that may include contributing to the rebuilding and recovery of naturally reproducing populations in their native habitats, while maintaining genetic and ecologic integrity, and supporting harvest. The HCPs are intended to be a comprehensive 50-year adaptive management plan for anadromous salmonids and their habitat as affected by the Rocky Reach and Rock Island Hydroelectric Projects. The HCPs were designed to address Chelan PUD requirements for FERC licensing and as such included all of the parties' terms, conditions, and recommended measures related to regulatory requirements to conserve, protect and mitigate plan species pursuant to ESA, the Federal Power Act, the Fish and Wildlife Coordination Act, the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act, the Pacific Northwest Electric Power Planning and Conservation Act, and Title 77 Revised Code of Washington (RCW). The HCP also obligates the parties to work together to address water quality issues.

2.2) Provide descriptions, status, and projected take actions and levels for NMFS ESA-listed natural populations in the target area.

2.2.1) Description of NMFS ESA-listed salmonid population(s) affected by the program.

Adult Age Class

Methow Spring Chinook Major Population Group (MPG)

Most Columbia River adult spring Chinook spend 2 years in the ocean before migrating back to their natal streams (Mullan 1987; Fryer et al. 1992; Chapman et al. 1995; Snow et al. 2008).

In the Methow River basin, the average age class for naturally produced adults since 2001 has been approximately 7% age 3, 56% age 4, and 37% age 5 (Table 2-1). Age structure does not appear to vary much between major spawning aggregates, ranging between approximately 3 to 10% for age 3, 53 to 57% for age 4, and 37 to 40% for age 5 (Table 2-1). These estimates of age for spring Chinook sampled in the UCR comport well with spring Chinook sampled at Bonneville Dam where approximately 50% are estimated at age four and between 20% and 40% are age-5 (Chapman et al, 1995).

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Table 2-1. Age structure of Methow Basin spring Chinook salmon per major spawning area (based on Chapter 5 Appendices D-J, Snow et al. 2008).

	Number				Percent		
Subbasin/year	**1.1**	**1.2**	**1.3**	**Total**	**1.1**	**1.2**	**1.3**
Methow							
2001	16	286	292	594	2.7	48.1	49.2
2002	1	21	64	86	1.2	24.4	74.4
2003	5	1	2	8	62.5	12.5	25.0
2004	3	196	0	199	1.5	98.5	0.0
2005	0	182	39	221	0.0	82.4	17.6
2006	0	101	27	128	0.0	78.9	21.1
2007	6	42	104	152	3.9	27.6	68.4
Average	4	118	75	198	10.3	53.2	36.5
Chewuch							
2001	8	641	83	732	1.1	87.6	11.3
2002	0	23	55	78	0.0	29.5	70.5
2003	4	2	19	25	16.0	8.0	76.0
2004	0	46	0	46	0.0	100.0	0.0
2005	2	206	11	219	0.9	94.1	5.0
2006	0	86	49	135	0.0	63.7	36.3
2007	1	14	59	74	1.4	18.9	79.7
Twisp							
Average	2	145	39	187	2.8	57.4	39.8
2001	18	439	49	506	3.6	86.8	9.7
2002	66	115	181	362	18.2	31.8	50.0
2003	6	4	15	25	24.0	16.0	60.0
2004	16	227	0	243	6.6	93.4	0.0
2005	0	73	14	87	0.0	83.9	16.1
2006	0	45	20	65	0.0	69.2	30.8
2007	2	0	38	40	5.0	0.0	95.0
Average	15	129	45	190	8.2	54.4	37.4
Total Basin							
2001	42	1366	424	1832	2.3	74.6	23.1

Subbasin/year	Number				Percent		
	1.1	1.2	1.3	Total	1.1	1.2	1.3
2002	67	159	300	526	12.7	30.2	57.0
2003	15	7	36	58	25.9	12.1	62.1
2004	19	469	0	488	3.9	96.1	0.0
2005	2	461	64	527	0.4	87.5	12.1
2006	0	232	96	328	0.0	70.7	29.3
2007	9	56	201	266	3.4	21.1	75.6
Average	22	393	160	575	6.9	56.0	37.0

Methow Summer Steelhead MPG

Chapman et al. (1994) summarized information for 459 naturally produced adult steelhead collected at Wells Dam, Wells Reservoir, and the Methow River between 1987 and 1993 (Table 2-2). They found that the majority of both males and females had spent 2 years in the ocean (Table 2-2; Figure 2-1). Between 1997 and 2006, 478 naturally produced fish were sampled at Wells Dam. The majority of these fish had spent 1 year in the ocean (see Table 2-2, Figure 2-1). It is uncertain why this inconsistency exists, although salt water ageing was estimated from otoliths between 1987 and 1993 and with scales between 1997 and 2006. In addition, sample sizes were small in many years.

In previous summaries of hatchery-origin age structure (Mullan et al. 1992; Chapman et al. 1994), most hatchery-origin fish were designated as 1-salt. While this still appears to be true for males, females appear to have shifted to more 2-salt, which is more similar to wild fish between 1987 and 1993 (Table 2-3).

Table 2-2. The number and percentage of steelhead by saltwater age and sex from Chapman et al. (1994) for years 1987 to 1993, and Snow et al. (2008) for years 1997 to 2006.

Brood year	Male				Female				Total
	1-salt		2-salt		1-salt		2-salt		
	#	%	#	%	#	%	#	%	
1987	12	16.9	8	11.3	16	22.5	35	49.3	71
1988	9	13.4	12	17.9	9	13.4	37	55.2	67
1989	16	18.2	25	28.4	16	18.2	31	35.2	88
1990	5	5.7	24	27.3	12	13.6	47	53.4	88
1991	16	22.5	9	12.7	28	39.4	18	25.4	71
1992	2	5.9	8	23.5	1	2.9	23	67.6	34
1993	5	12.5	13	32.5	3	7.5	19	47.5	40
Total	65	14.2	99	21.6	85	18.5	210	45.8	459
1997	18	31.6	10	17.5	14	24.6	15	26.3	57

Brood year	Male				Female				Total
	1-salt		2-salt		1-salt		2-salt		
	#	%	#	%	#	%	#	%	
1998	5	41.7		0.0	4	33.3	3	25.0	12
1999	5	18.5	4	14.8	5	18.5	13	48.1	27
2000	13	31.7	4	9.8	13	31.7	11	26.8	41
2001	14	53.8	2	7.7	7	26.9	3	11.5	26
2002	3	16.7	1	5.6	5	27.8	9	50.0	18
2003		0.0	9	33.3		0.0	18	66.7	27
2004	53	45.3		0.0	55	47.0	9	7.7	117
2005	15	22.7	9	13.6	15	22.7	27	40.9	66
2006	21	24.1	16	18.4	8	9.2	42	48.3	87
Total	147	30.8	55	11.5	126	26.4	150	31.4	478

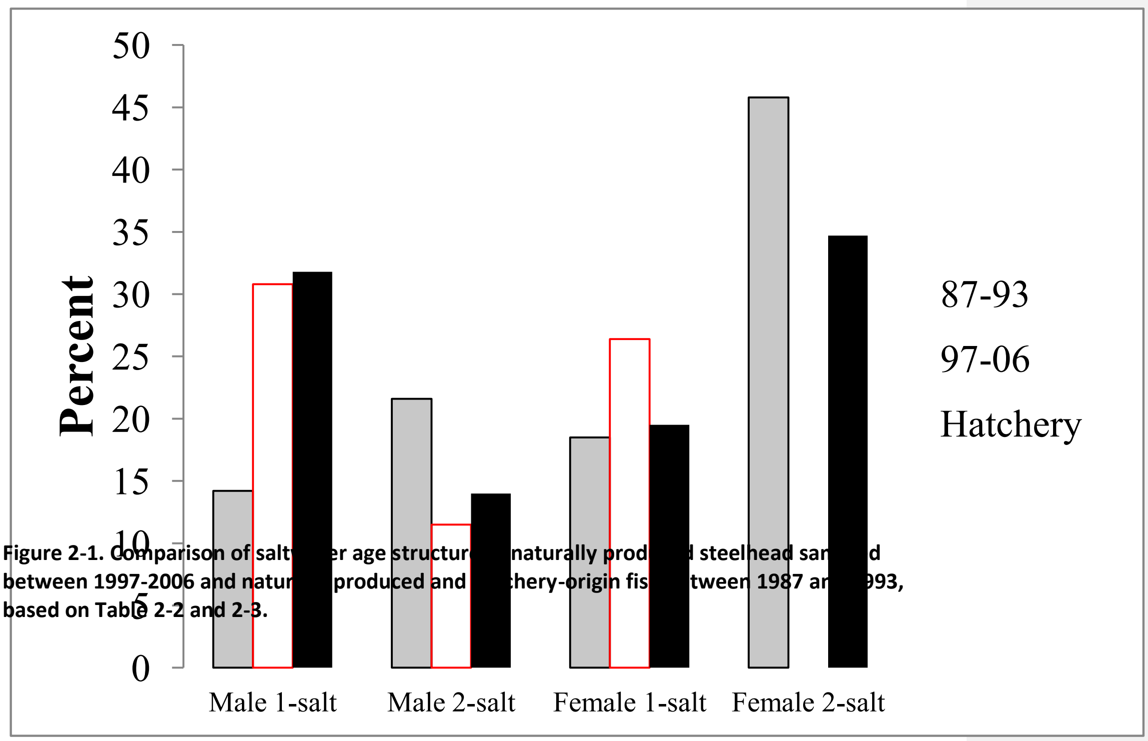

Figure 2-1. Comparison of saltw er age structur naturally prod d steelhead san d between 1997-2006 and natur produced and chery-origin fis tween 1987 ar 993, based on Table 2-2 and 2-3.

Table 2-3. Numbers and percentages of steelhead by sex, saltwater age, and origin sampled at Wells Dam between 1997 and 2006 (based on Appendix C, Chapter 1 of Snow et al. 2008).

Brood year	Male				Female				Total
	1-salt		2-salt		1-salt		2-salt		
	#	%	#	%	#	%	#	%	
1997	145	46.5	20	6.4	94	30.1	53	17.0	312
1998	122	28.2	64	14.8	78	18.0	169	39.0	433
1999	123	33.2	41	11.1	66	17.8	141	38.0	371
2000	113	34.7	28	8.6	87	26.7	98	30.1	326
2001	12	5.7	27	12.8	66	31.3	106	50.2	211
2002	106	28.3	68	18.2	50	13.4	150	40.1	374
2003	30	11.2	89	33.1	17	6.3	133	49.4	269
2004	183	59.0	3	1.0	118	38.1	6	1.9	310
2005	93	29.5	53	16.8	31	9.8	138	43.8	315
2006	98	32.6	58	19.3	22	7.3	123	40.9	301
Total	1,025	31.8	451	14.0	629	19.5	1,117	34.7	3,222

Methow Core Area Bull Trout

Mullan et al. 1992 found that headwater male bull trout (potentially non-migratory ecotype) in the Methow River began to mature at age 5, and were all mature by age 6. Females from the same area began to mature at age 7 and were all mature by age 9. Mullan et al. (1992) found bull trout that did not mature until 9 years of age which are the oldest (at first maturity) reported within the literature. The oldest bull trout sampled in the Methow River was 12 years (Mullan et al. 1992).

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2.2.1.2) Sex Ratio

Methow Spring Chinook MPG

Mullan (1987) presented data compiled from Howell et al. (1985) on the number of returning male and female hatchery spring Chinook in the mid-Columbia. From those data, the sex ratios for Leavenworth, Entiat, and Winthrop populations were calculated. The range (female to male) for the three stocks was 1.27:1 to 1.86:1 (based on lethal biological sampling).

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Sampling at Wells Dam in 2007 and 2008, estimates of sex ratio (using ultrasound) ranged (males to females) from 1.5:1 to 1.9:1 for hatchery fish and 1.1:1 to 1.5:1 for wild fish (C. Snow, pers. comm). It is important to note that determining sex of fish from Wells Dam months prior to sexual maturity is not considered accurate for spring Chinook, which may explain the difference between these data and those described above from Chapman et al. (1994).

Methow Summer Steelhead MPG

Based on the most recent information available (Appendix C, Chapter 1 of Snow et al. 2008), the female to male ratio for hatchery-origin and naturally produced fish is 1.2:1 and 1.3:1, respectively. This is similar to what has been reported previously (Mullan et al. 1992; Chapman et al. 1994).

Methow Core Area Bull Trout

In Mullan et al. (1992), the overall female to male ratio was 1.11:1, but for mature fish, almost twice the percentage of the population of males was mature (14.6 percent of the females and 24.3 percent of the males).

2.2.1.3) Fecundity

Methow Spring Chinook MPG

Fecundity from wild and hatchery spring Chinook salmon has been measured in recent years as part of the hatchery supplementation evaluation program. In the Methow River basin, fecundity (hand-counted) averaged 5,100 (range: 2,600 to 8,100) between 1992 and 1994 (Chapman et al. 1995). Since 2000, four-year-old wild females averaged about 4,000 eggs, while 5-year-old wild fish averaged about 4,800 eggs (Table 2-4). For hatchery fish, 4-year-old fish averaged about 3,800 eggs, and 5-year-old fish averaged about 4,400 (Table 2-4). As shown in Table 2-4, there are gaps between years, primarily for wild fish, especially 5-year-olds.

Table 2-4. Fecundity of Methow Basin spring Chinook (from Chapter 1, Appendix D of Snow et al. 2008).

Stock/year	Age 4		Age 5	
	Wild	**Hatchery**	**Wild**	**Hatchery**
Met Comp				
2000		3,759		
2001	3,753	3,949		
2002		3,905		3,318
2003		3,795		4,839
2004	3,565	3,510		3,510
2005	3,823	3,475		3,261
Average	3,714	3,732		3,732
Twisp				
2000		3,820		5,292
2001	4,720	3,922	4,941	4,469
2002		4,653		
2003		3,195		5,867
2004	3,811	3,496		
2005	4,216		4,745	4,745
Average	4,249	3,817	4,843	5,093
Average for Basin				

Stock/year	Age 4		Age 5	
	Wild	Hatchery	Wild	Hatchery
	3,981	3,771	4,843	4,413

*Methow Summer Steelhead MP*G

For fish sampled at Wells Dam between 2000 and 2006, 1-salt naturally produced fish average fecundity was higher than 1-salt hatchery-origin fish, while for 2-salt fish, hatchery-origin fish had slightly higher fecundity (Table 2-5).

Table 2-5. Mean fecundity by salt-age and origin of 2006 brood summer steelhead sampled at Wells Complex hatchery facilities (Appendix D, Chapter 1 from Snow et al. 2008).

Year	1-salt		2-salt	
	Hatchery	Wild	Hatchery	Wild
2000	4,837	5,760	6,049	
2001	4,356	3,865	6,624	6,714
2002	4,786	4,721	6,744	6,586
2003	4,241		6,545	6,954
2004	4,543	4,517	5,865	4,832
2005	4,547	5,370	6,575	6,627
2006	4,652	4,203	6,858	6,397
Average	4,566	4,739	6,466	6,352

Methow Core Area Bull Trout

Fecundity of bull trout varies with size. Fraley and Shepard (1989) found that fecundity averaged almost 5,500 eggs (up to over 12,000 in one individual) for migratory bull trout from the Flathead River. Martin et al. (1992) noted females between 271 and 620 millimeters (mm) long produced 380 to over 3,000 eggs in southeastern Washington streams. Mullan et al. (1992) found one bull trout that was 300 mm in the Methow Basin had a fecundity of fewer than 200 eggs.

2.2.1.4) Size Range

Methow Spring Chinook MPG

Juveniles

In 2007, wild smolt length averaged 100.7 mm fork length (FL) (Table 2-6). Wild parr (fall-run) averaged almost 90.7 mm FL. Little variation in smolt length occurred between years (C. Snow, pers. comm.).

Table 2-6. Summary of length and weight of migrating Chinook juveniles in the Methow River in 2007 (from Chapter 3, Table 1 Snow et al. 2008).

		Fork Length (mm)			Weight (g)			
Brood	**Origin/Stage**	**Mean**	***N***	**SD**	**Mean**	***N***	**SD**	**K-factor**
2005	Wild smolt	100.7	395	8.6	11.6	393	2.9	1.1
2005	Hatchery smolt	129.9	186	17.5	27.8	186	11.2	1.3
2006	Wild fall parr	90.7	67	10.8	8.9	67	3.1	1.2

Notes:
N = number of observations
SD = standard deviation
K-factor = condition factor

Adults

Length measurements (FL) from wild and hatchery spring Chinook salmon have been measured in recent years as part of the hatchery evaluation program (Table 2-7). There appears to be little difference between streams or between wild and hatchery fish (Table 2-7).

Table 2-7. Mean fork length by age, sex, and brood of spring Chinook collected for the Methow Hatchery program, 1998 to 2005 (from Chapter 1, Appendix C of Snow et al. 2008).

	Age - 3		Age - 4		Age - 5	
Stock/Sex/Year	**Hatchery**	**Wild**	**Hatchery**	**Wild**	**Hatchery**	**Wild**
Met Comp - male						
1998	54.0	52.0	79.0	74.9	94.0	92.7
1999	52.0		78.0	76.4		100.0
2000	52.1		73.3			
2001	60.0		80.6			
2002	48.3		79.0		100.0	
2003	49.0	51.0			96.7	
2004	48.3		72.0			
2005	52.1		72.3			
Average	*52.0*	*51.5*	*76.3*	*75.7*	*96.9*	*96.4*
Met Comp - female						
1998			76.3	76.1	87.2	89.0
1999			78.0	77.6		86.5
2000			74.5			
2001			76.9			
2002			76.3		87.3	
2003			75.3			
2004			73.4	75.0	76.0	
2005			74.3	71.0	81.0	

Stock/Sex/Year		Age - 3 Hatchery	Age - 3 Wild	Age - 4 Hatchery	Age - 4 Wild	Age - 5 Hatchery	Age - 5 Wild
Average				*75.6*	*74.9*	*82.9*	*87.8*
Twisp - male							
1998				79.5		87.0	
1999		50.8					
2000		52.0	45.0	71.0			98.0
2001		63.0	52.5	79.3	75.3		
2002		46.3					
2003		50.7	50.0		67.0		
2004		49.0	45.7	72.2	71.6		
2005		49.6			82.0		
Average		*51.6*	*48.3*	*75.5*	*74.0*	*87.0*	*98.0*
Twisp - female							
1998				77.0		90.5	
1999					78.5		89.3
2000				75.1			91.0
2001				76.9	79.6	92.5	88.0
2002				75.0			
2003				70.7			93.4
2004				73.0	75.8		
2005					81.0		88.5
Average				*74.6*	*78.7*	*91.5*	*90.0*
Total Basin Average - male							
1998		54.0	52.0	79.3	74.9	90.5	92.7
1999		51.4		78.0	76.4		100.0
2000		52.1	45.0	72.2			98.0
2001		61.5	52.5	80.0	75.3		
2002		47.3		79.0		100.0	
2003		49.9	50.5		67.0	96.7	
2004		48.7	45.7	72.1	71.6		
2005		50.9		72.3	82.0		
Average		*52.0*	*49.1*	*76.1*	*74.5*	*95.7*	*96.9*
Total Basin Average - female							
1998				76.7	76.1	88.9	89.0
1999				78.0	78.1		87.9
2000				74.8			91.0
2001				76.9	79.6	92.5	88.0

Stock/Sex/Year		Age - 3		Age - 4		Age - 5	
		Hatchery	Wild	Hatchery	Wild	Hatchery	Wild
2002				75.7		87.3	
2003				73.0			93.4
2004				73.2	75.4	76.0	
2005				74.3	76.0	81.0	88.5
Average				*75.3*	*77.0*	*85.1*	*89.6*

Methow Summer Steelhead MPG

Juveniles

In the Upper Columbia Basin, naturally produced steelhead smolts sampled at Rock Island Dam have averaged between 163 to188 mm FL (Peven and Hays 1989; Peven et al.1994). In the Methow Basin, smolt trapping has been ongoing since the mid-1990s. In general, length frequency of juveniles does not vary greatly between years (C. Snow, pers. comm.) and averages between from approximately 130 to 180 mm FL (this includes “transitional” juveniles that may or may not be smolting; Table 2-8).

Table 2-8. Mean length and weight at migration age of wild transition and smolt summer steelhead captured at the Methow and Twisp smolt traps in 2007 (Tables 2 and 4, respectively, from Chapter 3 of Snow et al. 2008).

Age	N (%)	Fork (mm)			Weight (g)			K-factor
		Mean	*N*	SD	Mean	*N*	SD	
Methow								
1	6 (4.3)	138.7	6	17.8	32.6	6	14.4	1.2
2	122 (86.5)	175.2	122	20.1	55.3	117	20.1	1.0
3	12 (8.5)	181.5	12	22.4	58.4	10	22.7	1.0
4	1 (0.7)	174.0	1	--	51.3	1	--	0.9
Twisp								
1	7 (2.4)	128.6	7	14.6	24.3	6	7.8	1.1
2	231 (80.8)	162.2	229	17.4	42.7	226	12.9	1.0
3	43 (15.0)	180.6	43	20.5	58.6	43	17.7	1.0
4	5 (1.7)	177.2	5	9.6	56.8	5	11.1	1.0

Notes:
N = number of observations
SD = standard deviation
K-factor = condition factor

Adults

Chapman et al. (1994) reported that female steelhead sampled at Wells from 1982 to 1992 ranged from 57 to 81 centimeters (cm) and 67 to 75 cm for fish spending 1 and 2 years in the ocean, respectively. Males ranged from 59 to 66 cm and 69 to 77 cm for 1-year and 2-year ocean fish.

The length frequency of broodstock captured in 2006 for the Wells steelhead program comports well with previous sampling at Wells Dam above (Table 2-9). In general, hatchery-origin fish are similar in size to naturally produced fish.

Table 2-9. Mean fork length (cm) by saltwater age, sex, and origin for broodstock sampled at Wells Hatchery Complex facilities, 1997 to 2006 (Chapter 1, Appendix C from Snow et al. 2008).

Brood year	Male				Female			
	1-salt		2-salt		1-salt		2-salt	
	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild
1997	64.2	63.8	76.6	74.5	62.3	61.6	71.9	74.3
1998	64.8	65.6	79.3		62.1	64.0	75.3	74.3
1999	63.3	64.0	80.0	80.8	62.3	61.8	74.3	73.8
2000	63.4	62.9	77.8	76.0	61.4	62.5	73.8	76.8
2001	61.2	60.9	76.1	82.5	60.2	59.4	72.9	73.3
2002	64.3	63.7	78.3	76.0	62.9	63.8	73.6	74.7
2003	61.9		78.6	81.6	60.4		74.7	75.8
2004	60.9	64.2	73.0		60.1	62.2	67.5	73.4
2005	60.4	62.1	74.0	75.6	59.4	62.5	71.8	73.4
2006	60.3	65.2	75.6	77.4	59.7	61.4	70.9	72.7
Average	62.5	63.6	76.9	78.1	61.1	62.1	72.7	74.3

Methow Core Area Bull Trout

Juveniles

Length at age of bull trout found in Methow River tributaries by Mullan et al. (1992) were the shortest by age group of any other lengths reported in the literature (Goetz 1989; Wydoski and Whitney 2003). Table 2-10 shows the age range of all bull trout sampled by Mullan et al. (1992) in the 1980s. Considering that males began maturing at age 5 and females by age 7 (see above), all lengths shown in Table 2-10 for fish aged 5 and younger can be considered juveniles, and all of those older than that may be juveniles or adults (assume that older than age 8 would be adults). Juvenile mean length ranged from between 51 and 195 mm FL.

Table 2-10. Mean fork length (mm) of bull trout sampled in the Methow Basin (Mullan et al. 1992).

	Age											
Stream	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Methow River				188.0	257.0							
Gold Creek					230.5							
Wolf Creek	58.3	86.8		168.2	199.5		229.5	250.0				
Early Winters Creek	52.6	89.7	124.0	136.2	174.5	198.0	200.0	186.0	210.0	188.7		205.0
Lake Creek	49.0				152.0							
WF Methow River	50.8	82.4			190.0		207.0					
Chewuch River						255.0						
EF Buttermilk Creek	48.3	87.4	112.0	130.0	204.0	231.0				324.0		
Monument Creek	42.3				179.0							
Lost Creek				195.0								
Cedar Creek	51.6				172.0							
Twisp River	58.3	97.6	120.5	163.8								
South Creek			116.0									
Average	51.4	88.8	118.1	163.5	195.4	228.0	212.2	218.0	210.0	256.4		205.0

Notes:
EF = east fork
WF = west fork

Adults

BioAnalysts (2002) compared a sample of resident and fluvial fish from the Methow subbasin and found that the fluvial fish were two to three times larger than resident fish of the same age. BioAnalysts (2004) tagged adult migratory bull trout at Rock Island, Rocky Reach, and Wells Dam in 2001 to 2003. For fish tagged in 2002 at Wells Dam, bull trout averaged 57.3 cm FL. Most of the fish tagged at Wells Dam eventually headed to the Methow River basin (some fish tagged at both Rocky Reach and Rock Island also headed in some years to the Methow Basin).

2.2.1.5) Migration Timing

Methow Spring Chinook MPG

Mainstem Columbia River

Adult spring Chinook destined for areas upstream from Bonneville Dam (upriver runs) enter the Columbia River beginning in March and reach peak abundance (in the lower river) in April and early

May (WDF and ODFW 1994). Fifty percent of the spring Chinook run passes Priest Rapids and Rock Island dams by mid-May, while most pass Wells Dam somewhat later (Howell et al. 1985). Chinook that pass Rock Island Dam are considered "spring-run" fish from the beginning of counting (mid-April) through approximately the third week of June (French and Wahle 1965; Mullan 1987).

Methow River

Methow basin spring Chinook migrate past Wells Dam and enter the sub-basin in May and June, peaking after mid-May. Differences in migration timing have been observed between, but not within, age classes. Hatchery 3-year-olds migrated to Wells Dam later than hatchery 4- and 5-year-olds (Snow et al. 2008). The Lower Columbia River fishery routinely commences during the earliest part of the run, which may have contributed to a decline in 5-year-old hatchery returns, which are available for harvest.

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Methow Summer Steelhead MPG

Mainstem Columbia River

Adults return to the Columbia River in the late summer and early fall. A portion of the returning run over-winters in the mainstem reservoirs, ascending UCR dams in April and May of the following year.

In 2006, naturally produced fish began their migration earlier than hatchery-origin fish (Table 2-11). The run timing observed in 2006 followed a typical beginning (July) and ending (October) for a calendar year. However, a portion of the fish that spawned upstream of Wells Dam passed the dam in the following spring after over-wintering in the mainstem Columbia River which may be a result of intermittent availability of adult fish passage from roughly December through February.

Table 2-11. Migration of hatchery and wild steelhead to Wells Dam between 31 July and 26 October, 2006 (Table 6, Chapter 4 from Snow et al. 2008).

Origin	*N*	Cumulative Migration Date			
		25%	50%	75%	100%
Hatchery	6,002	7-Sept	19-Sept	28-Sept	26-Oct
Wild	489	27-Aug	11-Sept	28-Sept	26-Oct

Methow River

Currently, data on Methow-specific information on run timing is limited. Steelhead are known to enter the river in late summer (August), through the following May, based on observations from trout and steelhead fisheries and radio telemetry studies (English et al. 2001, 2003). The recent installation of a PIT tag array infrastructure in the Methow River and its tributaries, combined with ongoing juvenile and adult PIT tagging programs should provide data regarding migration patterns/timing for steelhead.

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Commented [A25]: However, recent PIT tag array infrastructure placement has occurred in the Methow River and its tributaries that when combined with ongoing juvenile and adult PIT tagging programs should provide significant information regarding migration patterns/timing for listed spring Chinook and steelhead in the near future.

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Methow Core Area Bull Trout

The focus of this discussion is on fluvial bull trout. Bull trout were tagged by BioAnalysts (2004) between May 1 and the first week of June in a 3-year study (2001-2003). Most bull trout entered the Methow by the end of June and were found in possible spawning locations (usually in August) well before the initiation of spawning. Most tagged bull trout left tributary streams by late November.

During the study period (2001 to 2003) bull trout entered Mid-Columbia tributaries from April to September, but most (94 percent) entered tributaries during May, June, and July. At the time bull trout entered tributary streams, the mean daily temperatures in the mainstem Columbia River varied from 5.4°C to 19.6°C. Similarly, tributary mean daily temperatures ranged from 7.5°C to 17.2°C. Most bull trout (92.3 percent) entered tributaries before the Columbia River reached a mean temperature of 15°C.

2.2.1.6) Spawning Range

Methow Spring Chinook MPG

Methow Subbasin spring Chinook spawn primarily in the upper reaches of the Chewuch, Twisp, and Methow rivers, including the Lost River, Early Winters, and Wolf Creek tributaries. In descending order of numbers, redds were counted in the mainstem Methow, Twisp, Chewuch, Lost rivers, and Early Winters Creek. No significant differences have been detected in the distribution of hatchery and wild carcasses (females) within each subbasin (Snow et al. 2008).

Methow Summer Steelhead MPG

In the Methow Subbasin, steelhead currently spawn in the Twisp River, mainstem Methow River, Early Winters Creek, Lost River, Chewuch River, Beaver Creek, Black Canyon Creek, Buttermilk, Boulder, Eight-Mile, Suspension, and Little Suspension, and Lake creeks (Snow et al. 2008).

Methow Core Area Bull Trout

Bull trout are currently known to spawn in Lost, Chewuch, West Fork Methow, and Twisp rivers, Little Bridge, Early Winters, Goat, Wolf, East Fork Buttermilk, Blue Buck (in Beaver Creek watershed), Gold, and Lake creeks (Douglas PUD 2010).

2.2.1.7) Spawning Timing

Methow Spring Chinook MPG

Spawning occurs late July through mid-September. There have been no significant differences in spawn timing between hatchery and wild fish (females) within or among sub-basins, although it appears hatchery fish spawn earlier than wild fish (Snow et al. 2008).

Methow Summer Steelhead MPG

Spawning occurs in the late spring following entry into the river of the previous calendar year and usually ranges from mid-late March through May. Spawn timing within the index areas shows that the peak spawn timing in 2007 in the Chewuch watershed occurred during the week of April 15. Peak spawning in the remaining three watersheds all occurred between April 15 and 30. Differences in spawn timing between hatchery and wild fish has not been assessed because many hatchery fish do not possess an externally visible mark (i.e., ad-clip[1]), thus confounding the surveyors' ability to determine the origin of spawning adults (Snow et al. 2008).

Methow Core Area Bull Trout

Bull trout are strongly influenced by water temperature during all life stages and for all ecotypes. Most bull trout spawn from mid-September through October, with timing related to declining water temperatures. Spawning sites are commonly found in areas of groundwater interchange, both from the subsurface to the river and from the river to the subsurface. Association with areas of groundwater interchange can promote oxygen exchange and mitigate severe winter temperatures including the formation of anchor ice.

Within the Methow subbasin, spawning begins in headwater streams in late September and continues through October, with commencement closely tied to water temperature between 9°C and 11°C (Brown 1992). After spawning, fluvial and adfluvial kelts return to their more moderate environments, while resident forms seek winter refuge. In Methow drainage tributaries, bull trout spawning and early rearing is confined to streams cold enough (less than 1,600°C annual temperature units) to support them in areas below barrier falls (Mullan et al. 1992). In most cases, such reaches are very short (less than 5 miles).

2.2.1.8) Juvenile Life History Strategy

Methow Spring Chinook MPG

Fry emerge the spring following spawning and typically smolt as yearlings; however, fall parr migrations from upper reaches have also been observed (Hubble 1993; Hubble and Harper 1999; Snow et al. 2008). Rearing location of these fall migrants prior to smolting the next spring is unknown.

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Fryer et al. (1992) summarized age information of spring Chinook sampled at Bonneville Dam from 1987 through 1991. No adult scales with two stream annuli (2.x) were found, although in every year there were some fish estimated to have entered the ocean in their first year of life (0.x was probably from the Snake River Basin). Adults sampled in the UCR tributaries have shown only shown a 1.x life history.

Individuals that never migrated to the ocean make up some portion of the spawning population (Healey 1991; Mullan et al. 1992). Mullan et al. (1992) indicate that precocious maturation of male spring Chinook is common in the mid-Columbia basin and is characteristic of both hatchery and wild stocks. Generally the largest males show evidence of early maturity (Rich 1920). This may explain

[1] All hatchery-origin fish are externally marked, but a portion have only elastomer tags, which would not be readily visible to surveyors. It is also important to note that since steelhead are iteroparous, and they spawn during a period of increasing

why large numbers of hatchery fish mature precociously, since they are typically larger at age than their wild counterparts.

Harstad et al. (in review) measured the proportion of minijacks among males released from several spring-run and summer-run Chinook salmon hatchery programs throughout the Columbia River Basin for brood years 1999 through 2010. The hatcheries surveyed included both segregated (only hatchery-origin broodstock) and integrated (some natural-origin broodstock) programs. Minijacks were found in all programs monitored, and rates varied approximately 10-fold across release groups ranging from 7.9 - 71.4% of males in spring Chinook salmon programs. Mullan et al. (1992a) examined 20,000 wild juvenile Chinook in tributaries of the mid-Columbia River from 1983 to 1988 and found that precocious males made up about 1 percent of the sample. However, if jacks (age-2 males that return after 1 year in the ocean) are included, the percentage of males that mature precociously would be much greater than 10 percent.

The extent that precocious males contribute to reproduction is unknown. In the Upper Columbia Basin, males that mature in freshwater during their first or second summer may contribute to reproduction and may contribute more than jacks under certain conditions. For example, Leman (1968) and Mullan et al. (1992b) observed only precocious males attending large female Chinook in small headwater streams that were accessible only at high water. In Marsh Creek and Elk Creek, Idaho, precocious males occurred most frequently where there was active spawning (Gebhards 1960). These fish usually lay within the depressions of redds with an adult female or male and female pair. Gebhards (1960) reported seeing between 4 and 30 precocious males within redds. Apparently these fish frequent spawning areas to reproduce, not to forage on eggs. Gebhards (1960) analyzed the stomach contents of several precocious males and found that only 5 percent had consumed eggs. Furthermore, most (85.1 percent) of the dead precocious males found were partly or completely spent.

The mechanism that dictates the life history tactic of Chinook is not well understood (Gross 1991), however, recent studies have indicated that growth rates can be a large factor determining the incidence of precocial and residualism rates in hatchery fish (Larsen et al. 2004, 2006; Sharpe et al. 2007). In the wild, juvenile size is determined by many variables, such as genotype, egg size, time of hatching, water flow, water temperature, territory quality, stream productivity, predation pressure, and population density. Changes in these variables may therefore affect the life history of Chinook.

Precocious males may play a significant role in reproduction in the Upper Columbia Basin, spawning successfully not only as "sneakers" in the presence of older males, but as the sole male present in some areas and in some years when spawner numbers are very low. Precocious males may play a greater role in spawning in years when numbers of spawners were low (i.e., 1994 and 1995) that adult females were widely dispersed.

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stream discharge, examination of carcasses, as in the case of spring Chinook salmon, is not possible.

Methow Summer Steelhead MPG
The life-history pattern of steelhead in the Upper Columbia Basin is complex (Chapman et al. 1994). In the Upper Columbia region, Peven et al. (1994) observed smolt ages ranging from 1 to 7 years, with the highest percentages at ages 2 and 3. Female smolts (63 percent of fish sampled) were older and larger for most age classes than males.

Steelhead can residualize in tributaries and never migrate to the ocean, thereby becoming resident rainbow trout. Conversely, progeny of resident rainbow trout can migrate to the ocean and thereby become steelhead. This dynamic expression of life-history characteristics makes *O. mykiss* very challenging to understand and manage. Upstream distribution is limited by low heat budgets (about 1,600°C temperature units) (Mullan et al 1992a). The potential response of steelhead/rainbow in these cold water temperatures may be residualism, presumably because growth is too slow within the time window for smoltification. However, these headwater rainbow trout may contribute to anadromy via emigration and displacement to lower reaches, where warmer water improves growth rate and subsequent opportunity for smoltification.

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Methow Core Area Bull Trout
Migratory juveniles usually rear in natal streams for 1 to 4 years before emigration (Goetz 1989; Fraley and Shepard 1989; Pratt 1992). Methow sub-basin juvenile bull trout rear in the coldest headwater locations until they reach a size that allows them to compete with other fish (75 to 100 mm; Mullan et al. 1992). Non-migratory forms above barrier falls probably contribute a limited amount of recruitment downstream; nevertheless, this recruitment contributes to fluvial and adfluvial productivity. The fluvial forms migrate to the warmer mainstem Methow and Columbia rivers (e.g., Twisp River, Wolf Creek), while the adfluvial populations (e.g., Lake Creek, Cougar Lake) migrate to nearby lakes.

2.2.1.9) Smolt Emigration Timing

Methow Spring Chinook MPG
Smolt trapping has occurred in the Methow Basin since the mid-1990s as part of the hatchery evaluation program. In general, yearling spring Chinook (smolts) migrate down the Methow River between early March and the end of May to early June. The peak of the migration in 2007 appeared later in the Twisp River compared to the Methow River site (Figures 2-2 and 2-3), although trap efficiencies and periods when traps are inoperable may influence the absolute numbers of fish caught on a given date.

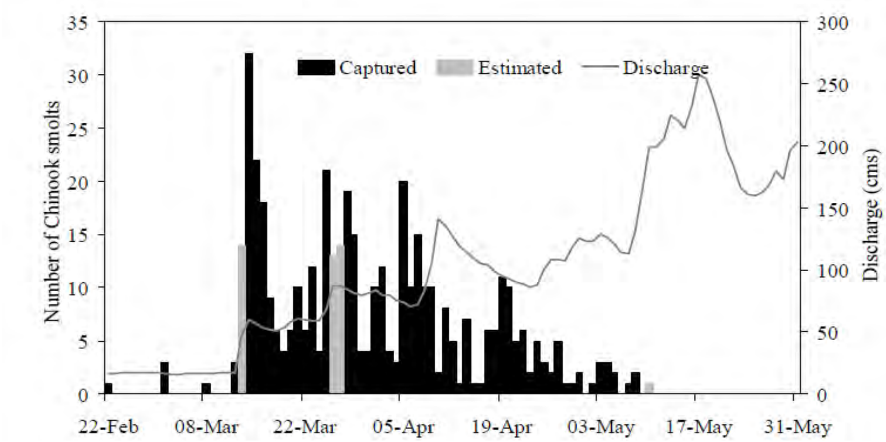

Figure 2-2. Daily capture of wild Chinook salmon smolts from the Methow River trap in 2007 (Figure 3, Chapter 3 from Snow et al. 2008).

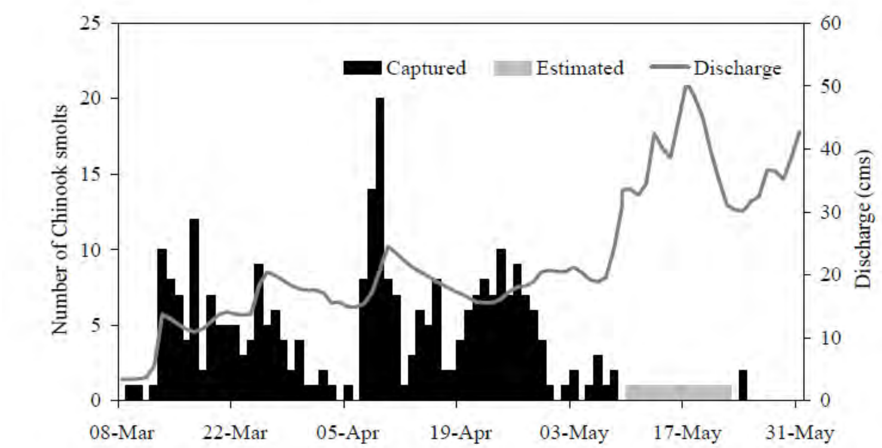

Figure 2-3. Daily capture of wild Chinook salmon smolts from the Twisp River trap in 2007 (Figure 6, Chapter 3 from Snow et al. 2008).

As previously stated, a substantial parr migration occurs within the Methow subbasin, and appears in two main phases—throughout the summer and then again in the fall (Figure 2-4).

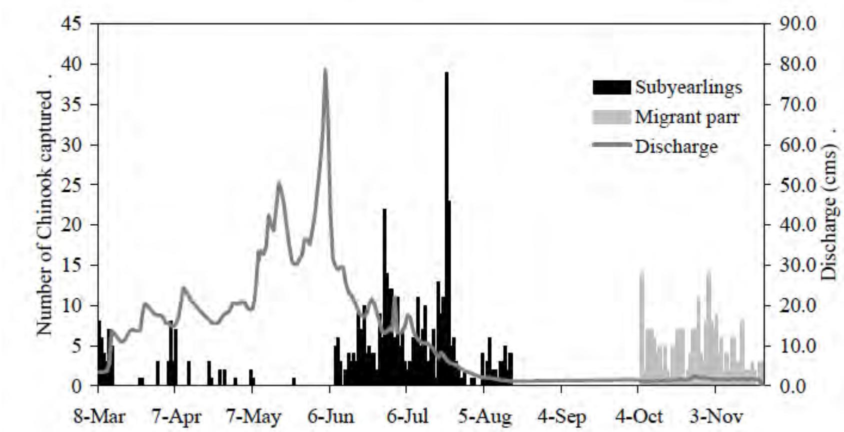

Figure 2-4. Daily capture of sub-yearling wild spring Chinook and migrant parr at the Twisp River trap in 2007 (Figure 7, Chapter 3 from Snow et al. 2008).

Methow Summer Steelhead MPG

Smolt trapping has occurred in the Methow subbasin since the mid-1990s as part of the hatchery evaluation program. In general, *O. mykiss* juveniles[1] migrate down the Methow River between early March and the end of May to early June. The peak of the migration in 2007 appeared later in the Twisp River compared to the Methow River site (Figures 2-5 and 2-6), although trap efficiencies and periods when traps are inoperable may influence the absolute numbers of fish caught on a given date.

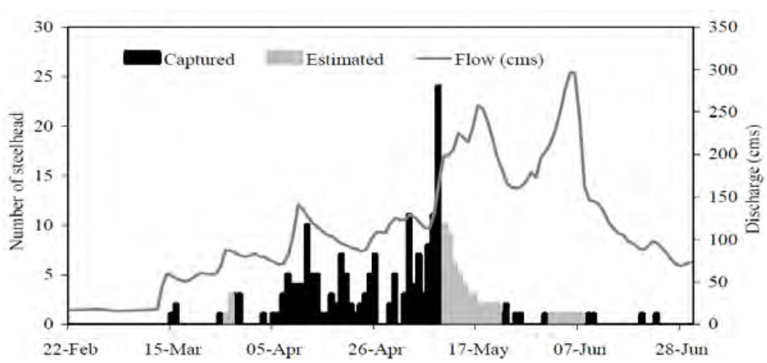

Figure 2-5. Daily capture of wild steelhead smolts and transitional parr from the Methow River trap in 2007 (Figure 5, Chapter 3 from Snow et al. 2008).

[1] Because it is not possible to determine whether juvenile O. mykiss are “trout” or “steelhead,” we refer to them by their scientific nomenclature.

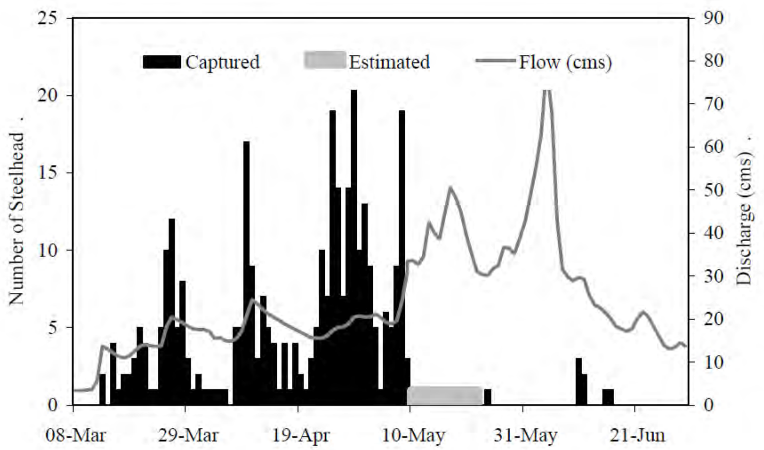

Figure 2-6. Daily capture of wild steelhead smolts and transitional parr from the Twisp River trap in 2007 (Figure 8, Chapter 3 from Snow et al. 2008).

As previously stated, a substantial parr migration occurs within the Methow Basin, and appears in two main phases—throughout the summer and then again in the fall (Figure 2-7).

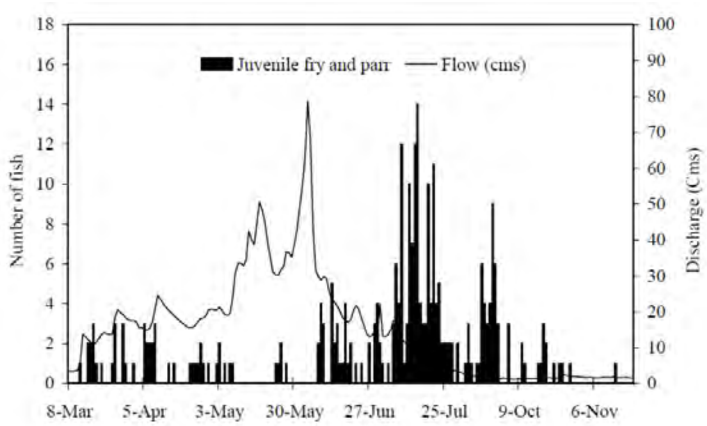

Figure 2-7. Daily capture of natural-origin steelhead fry and parr at the Twisp River trap in 2007 (Figure 9, Chapter 3 from Snow et al. 2008).

Methow Core Area Bull Trout
All of the fish that BioAnalysts (2004) tagged in their 3-year study appeared to have spent a minimum of three years in their natal stream prior to migrating to the Columbia River.

2.2.1.10) Spatial and Temporal Distribution of Spawners in Relation to Fish Release Location

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Methow Spring Chinook MPG
Snow et al. (2008) found no significant differences in spawn timing between hatchery and natural-origin fish (females) within or among subbasins. However, hatchery fish tended to spawn earlier than naturally produced fish, except in the Twisp River (which had the lowest proportion of hatchery-origin spawners).

Snow et al. (2008) found no significant differences in the distribution of hatchery and natural-origin carcasses (females) within each major spawning area. However, hatchery fish tended to spawn lower in each of the spawning areas than naturally produced fish.

Methow hatchery spring Chinook are typically released in three locations in the Methow River basin. All current acclimation sites use surface water for rearing prior to release to increase homing fidelity. Despite this, an estimated 49 percent of the Twisp-released fish spawning in the Methow Basin spawned in areas other than the Twisp River. However, because abundance of Twisp-stock fish is relatively low, their prevalence typically comprises a small proportion of the escapement within other spawning areas (i.e., Methow and Chewuch rivers). Similarly, an estimated 43 percent of the Chewuch-released fish spawned in areas other than the Chewuch River, but because release numbers are much greater, contribution of these fish to other spawning areas can be high. Conversely, an estimated 28 percent of Methow-released fish spawned in areas other than the Methow River (Snow et al. 2008).

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Methow Summer Steelhead MPG
There is currently no way to differentiate steelhead by origin on the spawning grounds; this issue has been identified by the Upper Columbia Regional Technical Team as an important data gap.

Methow Core Area Bull Trout
There are currently no hatchery programs for bull trout in the Methow River.

– Identify the NMFS ESA-listed population(s) that will be <u>directly</u> affected by the program.

Methow Spring Chinook MPG

Common Name	Endangered Species Act	Natural population targeted for integration
Spring Chinook salmon (UCR)	Endangered	Methow River spring Chinook

Methow Summer Steelhead MPG

Common Name	Endangered Species Act	Natural population targeted for integration
Steelhead trout (UCR)	Threatened	Methow River summer steelhead

Methow Core Area Bull Trout
There are currently no hatchery programs for bull trout in the Methow River.

– Identify the NMFS ESA-listed population(s) that may be incidentally affected by the program.

Common Name	Endangered Species Act
Spring Chinook salmon (UCR)	Endangered
Steelhead trout (UCR)	Threatened
Bull trout (Columbia River)	Threatened[a]

[a] USFWS listed

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2.2.2) Status of NMFS ESA-listed salmonid population(s) affected by the program.

2.2.2.1) Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds

Methow Spring Chinook MPG
The ICTRT (2007) has classified the Methow River spring Chinook as a "Very Large" population in size based on its historic habitat potential. A "Very Large" population is one that requires a minimum abundance of 2,000 natural-origin spawners and an intrinsic productivity of greater than 1.75 spawner to spawner (S/S) to be viable. The Recovery Plan (UCSRB 2007) incorporated the abundance goal of 2,000 naturally produced spawners (geometric mean over 12 years), but incorporated an earlier recommendation from the ICTRT of an intrinsic productivity of 1.2.

Methow spring Chinook currently are considered to have a greater than 25 percent chance of becoming extinct within 100 years.

Methow Summer Steelhead MPG
The ICTRT (2007) has classified the Methow River summer steelhead as an "Intermediate" population in size based on its historic habitat potential. An "Intermediate" population is one that requires a minimum abundance of 1,000 natural-origin spawners and an intrinsic productivity of greater than 1.1 S/S to be viable. The Recovery Plan (UCSRB 2007) incorporated the abundance goal of 1,000 naturally produced spawners (geometric mean over 12 years) and an intrinsic productivity of 1.1.

Methow summer steelhead are currently considered to have a greater than 25 percent chance of becoming extinct within 100 years.

Methow Core Area Bull Trout

Because of a lack of detailed information on the population dynamics of bull trout in the Upper Columbia Basin, a different approach was used to estimate Viable Salmonid Population (VSP) parameters for bull trout (UCSRB 2007). Bull trout abundance was estimated as the number of redds times 2.0 to 2.8 fish per redd. This approach provided a range of abundance estimates for bull trout within each core area (USFWS 2004, 2005). Productivity was based on trends in redd counts, while diversity was based on general life-history characteristics of bull trout (resident, fluvial, and adfluvial) within each core area. Although these parameters were less rigorous than the parameters used to estimate status of spring Chinook and steelhead, they provide relative indices of abundance, productivity, and diversity.

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In the final listing rule (63 FR 31647), USFWS identified eight bull trout sub-populations in the Entiat, Wenatchee, and Methow river basins (USFWS 1998). USFWS identified eight sub-populations within this recovery unit: Lake Wenatchee, Ingalls Creek, Icicle Creek, Entiat system, Methow River, Goat Creek, Early Winters Creek, and Lost River. USFWS considered half of these to be “at risk of stochastic extirpation” due to: a) their inability to be re-founded, b) presence of a single life history form, c) limited spawning areas, and d) relatively low abundance. In the 5-year review (USFWS 2008), the USFWS determined that the Methow core area was at high risk of extinction.

2.2.2.2) Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.

Methow Spring Chinook MPG

During the period 1960 to 1999, returns per spawner for spring Chinook in the Methow sub-basin ranged from 0.05 to 5.21 (UCSRB 2007). The 12-year geometric mean of returns per spawner during this period ranged from 0.41 to 1.02. The geometric mean at the time of listing (1999) was 0.51.

Since 1999, the natural replacement rate (the number of adult recruits from successive return years that originated from the same brood year, divided by the sum of the number of spawners for that brood year) has varied, but remains low, especially in the Methow River spawning area (Table 2-12). The most recent geometric mean of productivity remains near 0.51, (which is the same as the time of ESA listing for the Chewuch and Twisp spawning areas). Approximately half of the productivity is located in the Methow spawning area, which coincidentally has the highest proportion of hatchery-origin spawners.

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Table 2-12. The natural replacement rate (NRR) of Methow River basin spring Chinook between the 1992 and 2001 brood years (data from Chapter 5, Appendix A from Snow et al. 2008).

Year	NRR		
	Chewuch	Methow	Twisp
1992	0.11	0.10	0.30
1993	0.52	0.17	0.13
1994	0.30	0.20	0.34
1995	5.53	2.83	3.23
1996	12.75	17.89	8.64
1997	12.68	5.98	17.25
1998	12.66	3.73	17.75
1999	0.11	0.07	0.31
2000	1.10	0.52	1.72
2001	0.13	0.04	0.18
2002	0.32	0.15	0.48
Geometric mean	*1.00*	*0.53*	*1.16*

Methow Summer Steelhead MPG

In UCSRB (2007), the returns per spawner were expressed as either a hatchery spawner effectiveness of 100 percent or 0 percent. The geometric mean of returns per spawner is 0.09 if hatchery spawner effectiveness was 100 percent, and 0.84 if hatchery spawner effectiveness was 0 percent (brood years 1960 to 1996).

More recently, Snow et al. (2008) estimated that the total (not accounting for hatchery spawner effectiveness) average return per spawner was 0.30 for brood years 1996 to 2001 (Table 2-13); which falls between the two values reported in UCSRB (2007).

Table 2-13. The natural replacement rate (NRR) of Methow River basin steelhead between the 1996 and 2001 brood years (data from Chapter 4, Table 16 from Snow et al. 2008).

Parent Brood	Recruits	NRR
1996	315	0.56
1997	684	0.28
1998	730	0.30
1999	167	0.11
2000	848	0.40
2001	595	0.16
Average	557	0.30

Methow Core Area Bull Trout

Numbers of redds counted in the Methow sub-basin appear to have increased since the mid-1990s. This reflects both an actual increase in redds and an artifact of improved survey methods. Data from recent years of surveys (2000 to 2007), with similar, indicate an increasing trend in redds, ranging from 147 in 2000 to 231 in 2007 (see below).

2.2.2.3) Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

Methow Spring Chinook MPG

From 1960 to 2003, abundance of age 3+ naturally produced spring Chinook in the Methow sub-basin ranged from 33 to 9,904 adults. During this period the 12-year geometric mean (1988-1999) of spawners in the sub-basin ranged from 480 to 2,231 adults. The 12-year geometric mean at the time of listing (1999) was 480 spawners (UCSRB 2007).

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CCPUD: 1988-19999

More recently (1992 to 2008), the estimated escapement of naturally produced spring Chinook has ranged from approximately 58 (2003) to 1,832 fish (2001), with a geometric mean of 363 (Table 2-14).

Table 2-14. Estimated escapement of spring Chinook in the Methow River, 1992 to 2008 (based on Appendices A and D, Chapter 5, from Snow et al. 2008 and unpublished 2009 WDFW data).

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Return Year	Estimated Escapement							
	Chewuch		Methow		Twisp		Total	
	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild
1992		422		924		316		1,662
1993		184		537		426		1,147
1994		63		172		74		309
1995		6		27		12		45
1996								
1997		123		155		72		350
1998								
1999		21		70		25		116
2000	52	83	546	611	235	256	833	950
2001	1,761	732	6,994	594	384	506	9,139	1,832
2002	588	78	1,644	86	60	181	2,292	345
2003	465	25	597	8	18	25	1,080	58
2004	289	46	622	199	98	243	1,009	488
2005	289	219	526	221	34	87	849	527
2006	378	135	942	128	100	65	1,420	328
2007	203	74	545	152	65	40	813	266
2008	166	86	468	172	126	40	760	298

Return Year	Estimated Escapement							
	Chewuch		Methow		Twisp		Total	
	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild
Geometric mean	310	84	873	158	86	92	1,342	363

Methow Summer Steelhead MPG

Between 1988 and 2007, the run of naturally produced steelhead returning to the Methow River has ranged from 66 (1995) to 669 (2004). The most recent 12-year average (1996 to 2007) geometric mean is estimated at 329 fish (Table 2-15).

Table 2-15. Estimated return of naturally produced steelhead to the Methow River, 1988-2009. Information based on UCSRB (2007) and Snow et al. (2008) and unpublished WDFW data.

Return year	Estimated naturally produced return	12-year running geometric mean of return
1988	316	116
1989	401	126
1990	315	160
1991	552	184
1992	252	242
1993	130	240
1994	165	275
1995	128	250
1996	222	247
1997	96	224
1998	186	221
1999	350	229
2000	436	236
2001	702	247
2002	651	262
2003	847	272
2004	638	294
2005	558	331
2006	472	362
2007	762	420
2008	898	472

Methow Core Area Bull Trout

Bull trout redd surveys in the Methow sub-basin began in the early 1990s. Total numbers of redds within the sub-basin have ranged from 4 to 231 (Table 2-16). , Using 2.0 and 2.8 fish per redd (UCSRB 2007), abundance ranged between 22 and 647 fish per year in the Methow Basin (Table 2-17).

Table 2-16. Bull trout redds from the Methow Basin between 1992 and 2007 (pers. comm., Barb Kelly and Gene Shull, USFWS and USFS, respectively).

Stream/ Watershed[1]	Methow River Basin															
	1992	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Lower Methow watershed					2	2	1	0		0	1	0		14	4	4
Twisp watershed	4	5	4	25	0	2	86	101	105	76	93	86	101	87	89	108
Chewuch watershed				22	13	9	8	0	18	31	22	20	10	43	54	46
Upper Methow watershed	7			28	29	18	40	30	42	47	79	21	58	71	63	73
Redd Total:	11	5	4	75	44	31	135	131	165	154	195	127	169	215	210	231
Miles Surveyed Total:				18.7	25.6	20.2	26.7	27.8	22.9	42.5	28.7	30.6	30.7	33.3	32.3	32.8

[1] Lower Methow includes Crater Creek, Middle Methow includes Wolf and Goat Creeks, and Upper Methow includes the upper mainstem subbasin (Early Winters subwatershed, and lower Lost River subwatershed).

Note: Not all bull trout redd counts were complete, and length of stream surveyed has varied between some surveys, in many cases with new survey reaches being added in recent years. Please refer to the annual spawning survey reports for more complete information.

Table 2-17. The number of bull trout estimated to spawn in the Methow Basin between 1992 and 2007, based on Table 2-16 and using either 2.0 fish per redd (f/r) or 2.8.

Year	Total Redds	Fish @ 2.0 f/r	Fish @ 2.8 f/r
1992	11	22	31
1993	5	10	14
1994	4	8	11
1995	75	150	210
1996	44	88	123
1997	31	62	87
1998	135	270	378
1999	131	262	367
2000	165	330	462
2001	154	308	431
2002	195	390	546
2003	127	254	356
2004	169	338	473
2005	215	430	602
2006	210	420	588
2007	231	462	647

2.2.2.4) Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

Methow Spring Chinook MPG

The proportion of hatchery-origin fish on the spawning grounds has been increasing since 2001, and in particular, in the Chewuch and Methow spawning areas since 2005 (Table 2-18). Except for 2007, the proportion of hatchery-origin fish spawning in the Twisp has remained consistently below 30 percent (Table 2-18).

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CCPUD: The reported period of data is consistent with other program HGMPs in the basin.

Table 2-18. Proportions of hatchery-origin spring Chinook spawners in the Methow Basin, based on Table 2-14.

Return Year	Proportions							
	Chewuch		Methow		Twisp		Total	
	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild
2001	41.4	58.6	48.0	52.0	30.1	69.9	42.1	57.9
2002	46.9	53.1	48.7	51.3	24.9	75.1	45.7	54.3
2003	48.7	51.3	49.7	50.3	29.5	70.5	51.4	48.6
2004	46.9	53.1	48.7	51.3	19.9	80.1	43.0	57.0

Return Year	Proportions							
	Chewuch		Methow		Twisp		Total	
	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild
2005	56.9	43.1	70.4	29.6	28.1	71.9	61.7	38.3
2006	86.3	13.7	75.8	24.2	28.7	71.3	65.4	34.6
2007	73.3	26.7	78.1	21.9	61.9	38.1	69.5	30.5
2008	65.9	34.1	73.1	26.9	75.9	24.1	71.8	28.2
Average	*58.3*	*41.7*	*61.6*	*38.4*	*37.4*	*62.6*	*56.3*	*43.7*

Methow Summer Steelhead MPG

Using the proportion of natural-origin fish sampled at Wells Dam as a surrogate for the percentage of natural-origin fish on the spawning grounds shows that the proportion of hatchery steelhead on the spawning grounds is typically greater than 90 percent (Figure 2-8). The long-term average percentage of naturally produced fish sampled at Wells Dam is approximately 8 percent (Figure 2-8).

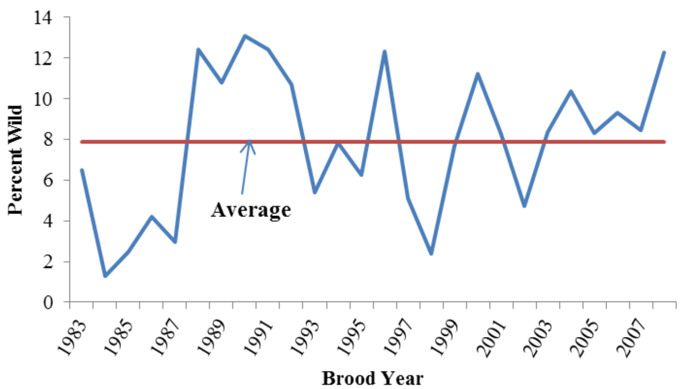

Figure 2-8. Percent of naturally-produced steelhead sampled in the run at large at Wells Dam for the 1983 to 2008 brood years (Data from UCSRB 2007 and C. Snow, pers. Comm)

Methow Core Area Bull Trout

There are currently no hatchery programs in the Methow Basin.

2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of NMFS listed fish in the target area, and provide estimated annual levels of take

See Tables 2-19 and 2-20 for estimated levels of annual take.

Hatchery Program Activities.

These activities include:

- Collection of broodstock (up to 38 natural-origin adults) may occur through trap operations at Wells Dam, Rocky Reach Dam (as approved by the HCP Hatchery Committees), or other locations as approved by the HCP Hatchery Committees, or by other methods such as angling, seining or tangle netting in tributaries (as approved by the HCP Hatchery Committees) for natural-origin Methow spring Chinook salmon. See Table 5-1.
- Transfer of natural and hatchery-origin adults and fertilized eggs between the trapping locations and spawning/incubation facilities at Eastbank Hatchery and/or Winthrop NFH; and holding/artificial spawning of collected adults at these hatcheries.
- Propagation and incubation from the fertilized egg through the smolt life stage at the hatcheries.
- Transfer of fingerlings and pre-smolts from the hatcheries for rearing in acclimation facilities as outlined in Table 5-1.
- Release of smolts into the Methow Basin from acclimation facilities/locations in the Methow Basin as approved by the HCP Hatchery Committees.
- Monitoring of the programs in the hatchery environment using standard techniques such as growth and health sampling as detailed in the M&E Plan (Hillman et al. 2013).
- Monitoring of the programs in the natural environment using standard techniques such as juvenile fish traps, adult spawner surveys, etc., as described in detail in the M&E Plan (Hillman et al. 2013).

Adult Management Activities

Take of hatchery and natural origin spring Chinook may also occur as a result of adult management of hatchery spring Chinook to meet spawning escapement objectives (abundance of hatchery/wild origin composition on the spawning grounds). These activities may occur at Rocky Reach Trap, Wells Trap, and/or at the hatchery outfalls and weirs throughout the Methow Basin (or other locations as determined by the HCP-HC).

Harvest

Adult Removal at Trapping Facilities/Locations

- **Funding:** Chelan PUD will provide funding for up to one full-time employee (for all spring Chinook hatchery programs) for adult management activities associated with Chelan PUD's NNI hatchery compensation. This funding includes manual adult management activities up to the point at which spring Chinook are removed at the trapping facilities and placed in holding containers. WDFW is responsible for coordinating the funding for adult

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<#>**Permit Holder:** WDFW¶
<#>**Agent:** WDFW¶

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management activities from the point at which fish are placed in holding containers when removed and/or for a fishery. The JFP will determine the disposition of the fish placed in the holding containers.

- **Permit Holder:** Chelan PUD and WDFW will be co-permit holders for adult management activities up to the point at which spring Chinook are removed from the trapping facilities and placed in holding containers. WDFW will be the permit holder for adult management activities from the point at which fish are placed in holding containers or upon implementation of selective fisheries.
- **Agent:** WDFW as co-permittee, is currently under contract with Chelan PUD and will remain so until the contract expires and is not renewed or renegotiated.

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Table 2-19. Estimated levels of take of Upper Columbia River (UCR) spring Chinook by hatchery activity.

Listed species affected: UCR Spring Chinook **ESU/Population:** Methow Population **Activity:** Implement Hatchery Program				
Location of hatchery activity: Eastbank and hatchery facilities in the Methow River; other M&E activity locations in the Methow River and its Tributaries **Dates of activity:** Broodstock collection: May-August; screw traps spring thaw to ice up **Hatchery program operator:** Currently WDFW				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	**Juvenile/Smolt**	**Adult**	**Carcass**
Observe or harass (a)			Up to 100% of run at-large to support broodstock sorting and adult management	Up to 100%
Collect for transport (b)			Up to 38 NORs or 45 HORs-if needed to support bacterial kidney disease (BKD) management	
Capture, handle, and release (c)		Release up to 60,516 hatchery smolts	Up to 100% of run at-large to support broodstock sorting and adult management	
Capture, handle, tag/mark/tissue sample, and release (d)		Trap up to 20% natural and hatchery population from any Methow tributary	Up to 100% of the natural and hatchery returns	100%
Removal (e.g. broodstock) (e)			Up to 38 NORs or 45 HORs-if needed to support BKD management	
Intentional lethal take (f)		Bio-sampling for research	Up to 38 NORs or 45 HORs-if needed to support BKD management; up to 100% hatchery returns for pHOS control	
Unintentional lethal take (g)			Up to 3 (5% of broodstock)	
Other Take (specify) (h)				

Notes:

a. Observation and/or harassment of listed fish associated with stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled, and released upstream or downstream.
d. Take associated with tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other take not identified above as a category.

Table 2-20. Estimated levels of take of Upper Columbia River (UCR) Summer Steelhead by hatchery activity.

Listed species affected: UCR Summer Steelhead **ESU/Population:** Methow and Okanogan Populations **Activity:** Implement Hatchery Program				
Location of hatchery activity: Eastbank and other hatchery facilities in the Methow River; other M&E activity locations in the Methow River and its tributaries **Dates of activity:** Broodstock collection: May-August; screw traps spring thaw to ice up **Hatchery program operator:** Currently WDFW				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	**Juvenile/Smolt**	**Adult**	**Carcass**
Observe or harass (a)				
Collect for transport (b)				
Capture, handle, and release (c)			Up to 100 adults	
Capture, handle, tag/mark/tissue sample, and release (d)		Trap up to 20% natural and hatchery population from any tributary	Trap up to 20% NOR and HOR population from any tributary	
Removal (e.g. broodstock) (e)				
Intentional lethal take (f)				
Unintentional lethal take (g)			Up to 9 adults; not exceed 1% of trapped steelhead	
Other Take (specify) (h)				

Notes:

a. Observation and/or harassment of listed fish associated with stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled, and released upstream or downstream.
d. Take associated with tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan or other regionally accepted policies Explain any proposed deviations from the plan or policies.

The objectives of this program are established in the Rocky Reach and Rock Island HCPs and described in Section 1. Implementation of the HCPs is a cornerstone of recovery efforts for the UCR spring Chinook and as such, has been imbedded in the Recovery Plan (UCSRB 2007). The Upper Columbia Salmon Recovery Board (UCSRB) led the development of the Recovery Plan which was adopted by NMFS as a final ESA recovery plan for UCR spring Chinook and steelhead on October 9, 2007. The UCSRB coordinates recovery planning in the UCR region with funding from the Washington State Governor's Salmon Recovery Office. A link to the NMFS webpage describing the plan is at http://www.nwr.noaa.gov/Salmon-Recovery-Planning/Recovery-Domains/Interior-Columbia/Upper-Columbia/Index.cfm.

Section 5.3.1 of the Recovery Plan describes the hatchery programs currently being implemented in the Upper Columbia ESU. Implementing entities include CCT, YN, USFWS, WDFW, Chelan PUD, Douglas PUD, and Grant PUD. Coordinating and technical bodies have been established to guide implementation of Chelan, Douglas and Grant County PUDs' hatchery programs (Coordinating Committees and Hatchery Committees), required by the PUD HCPs and by Grant County PUD's Biological Opinion (2008). The HCP and Priest Rapids Coordinating and Hatchery Committees include participation by the relevant PUD(s) and CCT, YN, USFWS, NMFS, and WDFW. This HGMP, to the extent consensus can be reached by the HCP-HC, will also be consistent with the principles advocated by the Hatchery Scientific Review Group on UCR spring Chinook artificial supplementation programs (HSRG 2009). These principles will be reflected in the program production size and duration, M&E, and in the artificial production strategies.

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3.1.1) HSRG – Upper Columbia Review

The HSRG, as part of the Pacific Salmon Hatchery Reform Project, has completed a review of 178 hatchery programs and 351 salmonid populations in the Columbia River Basin. The project was conducted by the Columbia River HSRG, composed of 14 members, nine of whom were affiliated with agencies and tribes in the Columbia River Basin. The remaining five members were unaffiliated biologists. The objective was to produce recommendations that are based on broad policy agreements and are supported by consistent technical information about hatcheries, habitat, and harvest. The Upper Columbia Hatchery Programs Regional Review began in April 2008, and the final HSRG recommendations were published January 31, 2009 in Appendix E to the Columbia River Hatchery Reform System-Wide Report (HSRG 2009). Principles of the HSRG are incorporated into this HGMP to the extent agreements have been reached within the HCP-HC process.

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3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

3.2.1) Rocky Reach and Rock Island Habitat Conservation Plans

Biological Opinions with incidental take statements (ITSs) were issued for the Rocky Reach and Rock Island hydroelectric projects HCPs on August 12, 2003. The Rocky Reach FERC license was also consulted upon by NMFS on July 9, 2007. The amended Incidental Take Permit No.1196 (NMFS 2004) added Chelan PUD to the permit as a joint permit holder with WDFW and Douglas PUD on January 20, 2004. The artificial propagation activities of this program are included within the HCPs; see Sections 1.7 and 1.8 for more detailed information regarding the HCPs. The production levels specified in the HGMP are consistent with those currently in place under the HCP Hatchery Committees; therefore this HGMP is consistent with the HCPs.

3.2.2.) 2008-2017 / United States v. Oregon / Management Agreement

The purpose of this Management Agreement is to provide a framework within which the signatory parties can use their authorities to protect, rebuild, and enhance UCR fish runs while fairly sharing harvestable fish between Treaty and non-Treaty fisheries. The Management Agreement specifies harvest limits and artificial production measures for stocks of salmon and steelhead originating above Bonneville Dam. The hatchery production goal for the Methow Composite stock of spring Chinook as shown in Appendix B, Table B1 of the Management Agreement (released from Twisp and Chewuch River acclimation Sites as well as Methow Hatchery itself) is 550,000 yearling juveniles initially incubated and reared at the Methow Hatchery.

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These production programs are implemented and/or adjusted based on modifications to productions levels through processes established under the mid-Columbia HCPs, the Priest Rapids Salmon and Settlement Agreement, and discussions associated with Part III.H of the Management Agreement. The current program involves the release of smolts from the Methow Hatchery; some Methow Hatchery production is acclimated at ponds located in the Twisp and Chewuch watersheds. The Management Agreement is entered as an order of the 7th US District Court in /*US v. Oregon*/ and, as such, its terms are binding on the parties. The mitigation production levels specified in this HGMP are identical to those of the Management Agreement; therefore, this HGMP is consistent with *US v. Oregon*.

This program does not affect the management, assessment, or goals of fisheries that occur outside of the Methow River basin. Low numbers of Methow spring Chinook are harvested in ocean fisheries. Impacts of ocean fisheries are regulated under authority of the Pacific Salmon Commission and the Pacific Fishery Management Council. Fisheries under these jurisdictions have been reduced in recent years in response to ESA listings. Mainstem Columbia River fisheries are regulated under a co-management framework pursuant to litigation in *US v Oregon*. The *2008-2017 United States v Oregon Management Agreement* provides the harvest management framework for spring Chinook fisheries below McNary Dam. The harvest schedule is designed to allow some level of harvest, while protecting the majority of ESA-listed NOR adults passing through the fisheries.

Allowable harvest rates are scaled to the abundance of the total run projected to pass Bonneville Dam and the abundance of NOR spring Chinook projected to enter the Snake River. The allowable harvest rates for Treaty and non-Treaty fisheries are designed to achieve a 50/50 sharing of harvestable fish in the non-selective Tribal fisheries and mark-selective non-Tribal fisheries in accordance with Treaty fishery case-law standards. Total allowable fishery impacts in combined mainstem fisheries range from less than 5.5 percent on total runs of less than 27,000 fish to a maximum of 17 percent on runs of 488,000 fish or more. Nevertheless, lower-mainstem commercial and recreational fisheries annually commence prior to confirmation of the forecasted run-size by actual fish counts at Bonneville Dam, potentially resulting in a disproportionate harvest of the early returning component of the UCR spring Chinook run, which historically comprised older, more-fecund fish (i.e., Age-5 fish) (Eldridge et al. 2010).

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Fisheries in the UCR basin are currently limited by the need to protect ESA-listed UCR spring Chinook salmon and UCR steelhead. Fisheries in the migration corridor and ocean are also limited to protect these populations and to minimize harvest impacts on other listed salmon and steelhead returning to other Columbia River basin and Snake River basin areas as noted above. NMFS evaluates and authorizes annual fisheries proposed by the JFP in the action area each year through separate Section 7 biological opinions.

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Until the spring of 2000—when a relatively large run of hatchery spring Chinook salmon returned and provided a small commercial Tribal fishery in the lower Columbia River—no commercial season for spring Chinook salmon had taken place since 1977. Present Columbia River harvest rates are very low compared with those from the late 1930s through the 1960s (NMFS 2008).

Harvest actions outside the action area, such as in the ocean, mainstem Columbia River, and other basin areas will be managed through the *U.S. v Oregon* and Pacific Fisheries Management Council (PFMC) planning and management processes, with guidance from NMFS. Proposed releases of spring Chinook salmon, summer Chinook salmon, sockeye salmon, and coho salmon juveniles into the UCR basin are not expected to create any substantial harvest complications with listed species. NMFS involvement with the co-managers in the PFMC and *U.S. v Oregon* fishery planning processes will adequately limit harvest effects on listed salmon and steelhead. Proposals for future fisheries will continue to be addressed by NMFS through separate Section 7 consultation processes.

3.3) Relationship to harvest objectives.

3.3.1) Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

There have been no recreational fisheries on Methow spring Chinook in the Methow River since the stock was listed in 1999. Neither formal creel survey nor punch card data were available to estimate total catch or effort in fisheries prior to 1999. The primary goal of the hatchery program is to support recovery of listed Methow spring Chinook and to contribute to the recovery of the UCR spring Chinook ESU and to the extent possible contribute to harvest opportunities. Implementation of a mark-selective non-Treaty fishery is not the purview of Chelan PUD and is thus a specific

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fisheries plan is not included in this HGMP. Implementation of fisheries may help reduce the number of hatchery-origin adults; however, under current marking agreements, a fishery would be directed at Winthrop NFH returning adults, and not necessarily at fish originating from this program. Therefore, a fishery may help overall adult management in the basin, but may not have a substantial effect on adult management of Chelan PUD's spring Chinook production in the Methow basin unless alternative marking strategies were employed.

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3.4) Relationship to habitat protection and recovery strategies.

Although habitat in much of the upper reaches of the Methow basin is in near pristine condition, habitat complexity, connectivity, water quantity, and riparian function have been compromised by human activities in other parts of the Methow basin, including portions where the majority of spring Chinook spawn. The Recovery Plan (UCSRB 2007) details specific objectives and actions for habitat protection and restoration necessary for the recovery of UCR salmon and steelhead populations.

Chelan PUD also provides funding for projects for the protection and restoration of HCP Plan Species habitat. The PUD provides this funding as a requirement of the Rocky Reach and Rock Island HCPs to compensate for up to two percent unavoidable project mortality. This HCP requirement, combined with the survival standards and hatchery compensation, satisfies Chelan PUDs mitigation obligation for passage losses due to the operation of Rocky Reach and Rock Island Dams.

3.5) Ecological interactions.

Potential effects of the Methow Hatchery spring Chinook hatchery program on salmonids and non-salmonids; salmonid and non-salmonid physical environments; potential effects of other supplementation programs; and natural-origin fish have been evaluated in the NMFS Biological Opinion (2004) and Environmental Assessment (NMFS 2002) for a multi-year authorization for an annual take of UCR spring Chinook salmon and UCR steelhead associated with the spring Chinook supplementation program (Permit 1196). Potential effects from the program are regulated by existing policies regarding hatchery operations, maintenance protocols, fish health practices, genetic effects, ecological interactions, and fish cultural practices, as prescribed in the 1994 IHOT annual report (IHOT 1995).

3.5.1) Populations that could negatively impact the program.

Predation

Fish, mammals, and birds are the primary natural predators of spring Chinook in the Upper Columbia Basin. Several fish species may consume spring Chinook. Northern pikeminnow (*Ptychocheilus oregonensis*), walleye (*Sander vitreus vitreus*), and smallmouth bass (*Micropterus dolomieu*) have the potential to negatively affect the abundance of juvenile Chinook (Gray and Rondorf 1986; Bennett 1991; Poe et al. 1994; Burley and Poe 1994). Adult salmonids within the

Upper Columbia Basin are opportunistic feeders and are therefore capable of preying on juvenile spring Chinook. Those adult salmonids likely to have some effect on the survival of juvenile salmonids include (in order of greatest likely impact), adult bull trout, rainbow trout, cutthroat trout, brook trout, and brown trout.

Juvenile hatchery spring Chinook salmon are liberated as yearling smolts through volitional releases. Because fish are released as yearling smolts, potential predation by native and non-native predators is thought to be reduced compared to sub-yearling releases.

Predation by piscivorous birds on juvenile salmonids may also represent a large source of mortality. The NMFS (2000) identified gulls *(Larus* spp.), cormorants (*Phalacrocorax* spp.), and Caspian terns *(Sterna caspi*a) as the most important avian predators in the Columbia River Basin. In the Columbia River estuary, avian predators consumed an estimated 16.7 million smolts (range, 10 to 28.3 million smolts), or 18 percent (range, 11 to 30 percent), of the smolts reaching the estuary in 1998 (Collis et al. 2000, as cited in Douglas PUD 2010). Caspian terns consumed primarily salmonids (74 percent of diet mass), followed by double-crested cormorants *(P. auritu*s; 21 percent of diet mass) and gulls (8 percent of diet mass).

Predation and delayed mortality for returning adult salmon as a result of wounding by marine mammals may negatively affect spring Chinook salmon. The incidence of wounds noted at Lower Granite Dam during 1991 was 20.9 percent for adult spring migrants and 9.4 percent for summer migrant salmon (Park 1993). In 1992, the numbers were 17.4 percent and 7.6 percent, respectively. Although UCR Chinook do not pass Lower Granite Dam, the losses there may be similar to losses experienced by UCR Chinook along their migration route.

Competition and potentially predation could also occur between juvenile spring Chinook and hatchery steelhead that reside in the mainstem Columbia River and in the Methow subbasin. Although the degree of steelhead residualism is unknown, it is thought to average between 5 and 10 percent of the number of fish released (USFWS 1994, as cited in Douglas PUD 2010).

Pathogens and Parasites

To improve imprinting and subsequent homing fidelity, the hatchery program commonly utilizes surface water to provide long and short term acclimation. Pathogens can be present in the surface water and can be transmitted horizontally from natural origin spring Chinook (e.g., bacterial kidney disease) and/or from decaying carcasses, which may shed parasites (e.g., *Dermocystidium*). Pathogens and parasites present in the surface water may be transported through the water intake, which can pose a significant risk to the program.

3.5.2) Populations that could be negatively impacted by the program.

The potential ecological effects of Methow spring Chinook on natural salmonid populations is broken down into three sections: 1) effects associated with juvenile releases; 2) effects associated

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Deleted: juvenile coho. During the feasibility phase of the YN Mid-Columbia Coho Restoration program (Yakama Nation Fisheries Resource Management 2008), the YN completed two predation evaluations of spring Chinook juveniles by hatchery coho juveniles in the Wenatchee sub-basin. Methods for both studies were similar and are detailed in Murdoch and LaRue (2002) and Murdoch et al. (2005). ¶
¶
The two predation evaluations, both in Nason Creek, estimated predation on spring Chinook at 0.96 percent (95 percent confidence interval [CI] 0.12 percent to 3.5 percent) of the total spring Chinook fry population in Nason Creek in 2001 and 0.14 percent (95 percent CI 0.03 percent to 0.4 percent) of the total spring Chinook fry population in Nason Creek, in 2003, respectively. For coho juveniles scattered planted as surrogates of naturally produced coho, the predation rates on spring Chinook fry were nearly double those observed by hatchery coho (Murdoch et al. 2005). This observation could be expected considering the greater temporal overlap of the scatter-planted natural-surrogate coho with newly emerging spring Chinook fry, and the observations by others (Hawkins 2002) that naturally produced coho smolts were more effective predators of Chinook fry than hatchery coho smolts. Predation rates by naturally produced coho juveniles on spring Chinook fry in the Methow or Wenatchee sub-basins cannot be accurately measured until adequate numbers of naturally produced coho become available for study. Nevertheless, using YN estimates of future natural production of coho and available spring Chinook fry in Nason Creek in 2003 and the observed predation rate by natural-surrogate coho in 2003 from Murdoch et al. (2005), calculations of potential consumption rates of natural-origin coho on spring Chinook fry equate to 9.1 percent of estimated spring Chinook fry available in Nason Creek (Kahler 2005).¶
¶
Both introduced (e.g., walleye and smallmouth bass) and native predators (e.g., northern pikeminnow) consume large numbers of juvenile salmonids as they migrate through the Columbia River system (Poe et al. 1991; Rieman et al. 1991; Tabor et al. 1993). Exacerbating this impact of predation are observations that northern pikeminnow are able to rapidly adjust their diet and foraging habits to key in on the opportunity presented by the release and seaward migration of large numbers of hatchery fish (Shively et al. 1996). Furthermore, pikeminnow predation is typically concentrated downstream of mainstem hydropower facilities where juvenile fish are less dispersed than normal and potentially disoriented and/or stressed following navigation through the hydro facility. Ongoing programs designed to control the size of predator populations and to redesign juvenile bypass facilities to avoid the aggregation of large numbers of predators below mainstem dams are attempting to minimize the impacts of predation and increase the survival of seaward migrating juvenile salmonids.¶

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with adult returns; and 3) effects associated with both juveniles and adults. Effects to non-salmonid species are unknown at this time, but will be addressed as part of Objective 12 of the M&E Plan (Hillman et al. 2013).

Juvenile Releases

Hatchery-origin juvenile spring Chinook from this program can potentially interact with natural-origin spring Chinook and steelhead juveniles. These species are present year-round in the UCR mainstem and tributary areas. Natural-origin spring Chinook salmon in the UCR initiate seaward migration as yearling fish between March and June (Chapman et al. 1995). Natural-origin steelhead fry emerge from the gravel in the late spring through August and disperse to downstream rearing areas in the late summer and early fall. UCR steelhead begin seaward migration as age 2+ (43.2 percent) or 3+ (46.4 percent) smolts (Peven 1990) during April and May at an average size of 136 to 188 mm (Chapman et al. 1994).

After initial incubation and rearing on well water at the Eastbank Hatchery, yearling juvenile spring Chinook salmon will be acclimated on and released into natal waters. Fish not leaving acclimation ponds volitionally will be forced out in May. Historically, it has been seldom necessary to force fish. The target release size of 15 to 18 fish per pound (fpp) for hatchery-origin spring Chinook yearlings is specified in the M&E Plan. This target for release size is intended to produce rapidly migrating juveniles that, because of their rapid migration, should not compete for resources with naturally produced spring Chinook or other species.

Adult Returns

Little is known about interactions between individual stocks of spring Chinook released into the Columbia River system from this hatchery program and other salmonids between the time they leave the estuary and return as adults to spawn. Available information is inferred from coded wire tag (CWT) data taken from fish harvested from the ocean. Based on this available data, it is assumed that ocean harvest of upper Columbia spring Chinook will continue to be minimal (2008 to 2017 US v. OR Management Agreement) and for practical purposes is assumed to be zero (FCRPS/Three Treaty Tribes MOA 2008). These data, however, do not give us insight into fish behavior nor inter-specific interactions among stocks in the ocean. However, given the assumed zero harvest of Methow spring Chinook in ocean fisheries, the Methow spring Chinook hatchery program is not a factor in determining ocean harvest regulations and quotas that could affect listed species.

Returning adult hatchery spring Chinook that stray to natural spawning areas may compete for spawning gravel and/or breed with native fish, potentially altering genetic fitness and influencing their ability to survive in the ecosystem. Guidance on acceptable out-of-basin stray rates of hatchery fish is 5 percent or less of total brood return (HSRG 2009). Due to the chronically low abundance of NORs in the Methow Basin, hatchery-origin spawners may be necessary to provide an adequate number of spawners on the spawning grounds; however, strays from out-of-basin hatchery programs are undesirable. Overall, 14.5 percent of the estimated number of hatchery fish

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spawning in the Methow River basin in 2007 strayed from other independent populations (Entiat, Chiwawa, and Dworshak Hatchery releases). These fish comprised 26.6 percent of the hatchery fish spawning in the Chewuch River basin, and 17.2 percent of those spawning in the upper Methow; no out-of-basin strays were recovered in the Twisp River (Snow et al. 2008). Methow Hatchery stocks have comprised less than 5 percent of the estimated spawning escapement in the Entiat River between run years 1997 to 2006 (Snow et al. 2008).

The concept of within-basin straying in the Methow Basin is controversial because hatchery spring Chinook of Methow/Chewuch-composite origin have been assigned arbitrarily to release location, either directly from the Methow Hatchery or from the Chewuch acclimation pond, with the goal that greater than 90 percent of them will return to the spawning grounds, rather than to the hatchery. Nevertheless, any fish recovered by the hatchery program M&E staff is classified as a within-basin stray if it is not within the stream in which it was released, regardless of the origin of its parents or length of acclimation at the release site. Table 3-1 summarizes the proportion of CWT recoveries by hatchery stock in the Chewuch, Methow and Twisp Rivers from run years 2000 to 2012. Stray rates of Twisp and Chewuch hatchery spring Chinook salmon were high for the 1998 and 2000 broods examined. Releases in both these watersheds were accomplished through the use of acclimation ponds supplied with local irrigation withdrawal from the Twisp and Chewuch rivers. Stray rates may decrease with a longer acclimation time, but longer acclimation at the current facilities may only be possible with eliminating dependence on water withdrawal from the ditch by obtaining a dedicated surface water and groundwater right that would extend the acclimation period.

Annual monitoring and evaluation, as required in the HCP, will be used to assess and direct future hatchery program operations to avoid exceeding the acceptable levels of strays from this hatchery program. Assuming that extended acclimation would translate into reduced straying; the current 30-day rearing period (if not zero days due to debris or ice) is apparently not adequate to control stray rates from these sub-basins (C. Snow, WDFW, pers. comm.). However, stray rates are not known for natural-origin fish in the Methow Basin; thus, it is uncertain whether or not the rates of straying observed for fish originating from the Methow Hatchery differ from the rates within the natural population.

Potential adverse impacts to steelhead and bull trout during spring Chinook broodstock collection are negligible; WDFW has established specific procedures for handling non-target species to reduce negative effects (NMFS 2002). In addition, impacts to bull trout from the supplementation of spring Chinook are expected to be negligible (NMFS 2002).

Table 3.1. Proportion of CWT recoveries comprising estimated spawning escapement in the Methow Basin. Percent of spawning escapement comprised by NOR fish is not included. Recoveries from 1998 and 2000 brood MetComp releases are listed as MetComp because no specific release location could be assigned (Chewuch and Methow subbasin releases).

Estimated spawning escapement	Hatchery stock (% of spawning escapement)

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Run Year	HOR	NOR	Total	Chewuch	Methow	Twisp	Winthrop	MetComp	Out-of-basin
				Chewuch River					
2000	52	31	83	8.4	8.4	0.0	8.7	--	18.5
2001	1,761	732	2,493	33.8	2.0	0.2	10.4	2.1	0.2
2002	588	78	666	3.6	0.0	0.0	7.9	69.7	0.0
2003	465	25	490	0.0	1.5	0.0	2.6	78.5	0.5
2004	289	46	335	5.1	1.1	0.0	3.0	70.7	0.0
2005	289	219	508	41.9	3.6	0.4	2.1	4.0	3.8
2006	378	135	513	28.8	3.2	0.9	5.5	- -	7.4
2007	203	74	277	20.0	8.4	0.0	8.9	- -	19.4
2008	166	86	252	26.7	4.5	0.0	17.3	- -	10.4
2009	500	271	771	30.8	9.9	1.5	16.0	- -	1.5
2010	341	155	496	39.0	6.7	0.4	14.7	- -	2.5
2011	499	370	869	39.2	4.1	0.0	7.6	- -	13.0
2012	281	81	342	51.8	3.2	2.3	2.3	- -	5.0
				Methow River					
2000	574	65	639	2.5	38.0	2.9	25.5	- -	0.0
2001	6,994	594	7,588	7.9	27.8	0.4	45.6	1.8	0.4
2002	1,644	86	1,730	0.6	4.6	1.1	28.3	47.1	0.0
2003	597	8	605	0.0	5.1	4.0	26.3	43.3	0.6
2004	622	199	821	3.6	4.5	4.4	16.9	35.6	0.0
2005	526	221	747	32.2	16.2	1.6	11.7	1.2	1.7
2006	942	128	1,070	22.8	25.2	4.6	19.1	- -	7.0
2007	545	152	697	12.3	6.8	7.2	36.6	- -	6.9
2008	468	172	640	11.8	16.2	0.4	38.9	- -	3.1
2009	1,480	261	1,741	10.9	27.2	2.3	36.8	- -	3.4
2010	1,370	251	1,621	10.8	34.9	0.8	29.2	- -	0.4
2011	1,391	432	1,823	28.1	21.4	3.9	23.2	- -	5.1
2012	691	63	754	28.0	40.2	8.1	7.8	- -	2.5
				Twisp River					
2000	235	21	256	0.0	0.0	72.6	2.2	- -	0.0
2001	384	506	890	1.5	0.8	19.6	0.8	0.0	0.0
2002	60	181	241	0.0	0.0	9.1	12.1	3.1	0.0
2003	18	25	43	0.0	0.0	30.2	0.0	0.0	0.0
2004	98	243	341	0.0	0.0	19.7	1.2	1.3	4.4
2005	34	87	121	2.6	0.0	15.8	0.0	0.0	0.0
2006	100	65	165	0.0	2.5	40.0	2.8	- -	0.0
2007	65	40	105	0.0	0.0	55.2	0.0	- -	0.0
2008	126	40	166	2.7	0.0	60.1	0.0	- -	4.0
2009	97	32	129	0.0	0.0	55.6	3.4	- -	3.4
2010	96	156	252	1.4	0.0	30.1	2.8	- -	1.4
2011	85	159	244	2.5	0.0	17.4	0.0	- -	32.4
2012	146	56	202	2.2	1.1	62.4	1.1	- -	1.1

Both Juveniles and Adults

Negative effects to other species that may result from the program could occur from impacts to water quantity and water quality. To limit impacts to water quantity, the program complies with water-right permits established for the hatchery to prevent over appropriation of surface water.

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Hatchery surface water intakes are screened to current criteria. Water quality will be affected by effluent from the hatchery, but the hatchery facility is required to operate under NPDES permits issued by Washington State Department of Ecology. Hatchery effluent standards and state criteria for point-source discharge are set forth in the permit to protect aquatic life and the habitat in the area below the discharge point. Considering that the effluent produced from the hatchery facility complies with Environmental Protection Agency standards, coupled with the low percentage of effluent to discharge (dilution factor), there are probably minimal impacts to other species.

Hatchery-raised fish may be a source of pathogen transmission to natural-origin fish in the natural environment. This impact may occur from release sites in headwater spawning and/or rearing areas and throughout the entire migration corridor (e.g., BAMP 1998). Pathogens responsible for diseases are present in both hatchery and natural populations, although hatchery fish are probably more susceptible to disease pathogens because of the high rearing densities and resultant stress.

To mitigate for potential BKD transmission to fish in the natural environment, the HCP Hatchery Committees approved the following BKD management protocols:

- Hatchery-origin eggs/progeny with ELISA titers of OD ≥ 0.12 will be culled.
- Wild-origin eggs/progeny with ELISA titers of OD ≥ 0.12 will be raised at lower density of 0.06.
- All hatchery- and natural-origin eggs/progeny with ELISA titers of OD > 0.19 will be culled from the program.
- At the first signs of infection with BKD, juvenile spring Chinook will be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.
- When less than 5 percent of the program production is in the 0.12 ≤ OD ≤ 0.19 range, the Hatchery Committees may elect not to rear these fish to program size and instead utilize the available hatchery space for other purposes.

3.5.3) Populations that have a positive impact on the program.

Chinook, steelhead, and coho carcasses of both hatchery and natural-origin fish deposited within the Methow sub-basin are likely to have a positive influence on nutrient levels within the basin. Increased nutrient levels are likely to provide a more productive environment within which the natural-origin and hatchery spring Chinook can rear and migrate. Marine-derived nutrients brought to the Methow Basin by adult spring Chinook should benefit all species there (Stockner 2003).

3.5.4) Populations positively impacted by the program.

The Methow Basin native fish assemblage is expected to benefit from nutrients derived from carcasses of returning adult Methow Hatchery spring Chinook at dispersed locations throughout the sub-basin (Stockner 2003). This hatchery program is designed to promote natural spawning of spring Chinook salmon in a more widely dispersed manner (relative to the unsupplemented condition) consistent with available spawning habitat in the Methow River watershed and its sub-watersheds. The dispersed spawning will likely have a positive effect on bull trout, resident

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•Hatchery-origin eggs/progeny with ELISA titers of OD ≥ 0.12 will be culled.

•Wild-origin eggs/progeny with ELISA titers of OD ≥ 0.12 will be raised at lower density of 0.06.

•All hatchery- and natural-origin eggs/progeny with ELISA titers of OD > 0.19 will be culled from the program.

•At the first signs of infection with BKD, juvenile spring Chinook will be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

•When less than 5 percent of the program production is in the 0.12 ≤ OD ≤ 0.19 range, the Hatchery Committee may elect not to rear these fish to program size and instead utilize the available hatchery space for other purposes.

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rainbow trout, and westslope cutthroat trout populations scattered throughout the Methow sub-basin because these salmonids will consume salmon eggs, fry, and parr (and flesh from carcasses).

SECTION 4. WATER SOURCE

Responsibilities: Chelan PUD is responsible for funding and carrying out the activities described in Section 4. Chelan PUD and WDFW will be co-permit holders for the activities described in Section 4.

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

Eastbank Hatchery

Water is supplied by the Eastbank Aquifer, a high quality groundwater source with connectivity to the Columbia River. Both the Eastbank Hatchery Complex and the Regional Water System, which provides municipal water to the customers of Chelan PUD, the City of Wenatchee, and the East Wenatchee Water District, use the Eastbank Aquifer. The Eastbank Hatchery water right permit provides for 55 cubic foot per second (cfs) of instantaneous water supply. On an annual basis, temperatures range from approximately 45.5°F to 59.0°F. Spring Chinook are held for broodstock, incubated, and early-reared on this water. Water can be chilled to meet specific growth and incubation criteria.

Carlton Acclimation Facility

Surface water supply to the facility is from the Methow River through a screened surface water-pumped intake located on the right bank of the Methow River. The existing screen system consists of a pair of 30-inch diameter tee screens with a high pressure air backwash cleaning system. A total of 14.9 cfs is available for rearing from November through May. Additionally, a 12-inch groundwater well provides water to the surface water intake to minimize the formation of frazil ice on the intake screens during low temperatures. Well water is also tied into the main water supply line for emergency use.

Chewuch Pond

Water for the Chewuch Pond is diverted from the Chewuch Canal Company irrigation ditch via an easement for delivery of water (6 cfs) from February 1 through May 1.

Winthrop NFH

The USFWS HGMP for the Winthrop NFH contains information on water source for the hatchery.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

Water withdrawal for use in hatcheries is monitored through the Washington State Department of Ecology and the Washington State Chapter 90.03 RCW water code. None of the hatchery facilities employed to carry out the proposed artificial propagation programs de-water river reaches used by listed fish for migration, spawning, or rearing. Water intakes into artificial propagation facilities shall be screened in compliance with 1995 NMFS screening criteria and as per the 1996 addendum to those criteria (NMFS 1996). As an alternative, they will comply with transitional criteria set forth by NMFS in 2000 for juvenile fish screens constructed prior to the establishment of the 1995 criteria, to minimize risks to listed salmon and steelhead. WDFW will inspect and monitor the water intake screen structures at their hatchery facilities to determine if listed salmon and steelhead are being drawn into the facility.

Eastbank Hatchery and Carlton Acclimation Facility
At Eastbank Hatchery and Carlton Acclimation Facility, water withdrawal for hatchery use is regulated by the Washington State Department of Ecology under Chapter 90.03 of the RCW (water code). None of the hatchery facilities employed to carry out the proposed artificial propagation programs de-water river reaches used by listed fish for migration, spawning, or rearing. All hatcheries owned and/ or operated by WDFW discharge water in compliance with NPDES General Permit No. WAG 13, valid through August 1, 2015. This permit is administered in Washington by the Washington State Department of Ecology under agreement with the United States Environmental Protection Agency.

Winthrop NFH
The USFWS HGMP for the Winthrop NFH contains information on water source for the hatchery.

SECTION 5. FACILITIES

Responsibilities: Chelan PUD is responsible for providing the funding for the activities described in this section. WDFW is currently responsible for conducting the activities described in this section. Consistent with these responsibilities, Chelan PUD and WDFW will be co-permit holders for the activities described in this section with WDFW designated as an agent under a current contract between Chelan PUD and WDFW and until this contract expires or is not renewed or renegotiated.

Several facilities will be used in the implementation of this hatchery program, depending on activity type (Table 5-1).

Table 5-1. Facilities and activities in Chelan PUD's Methow River spring Chinook hatchery program.

Activity	Facility
Broodstock Collection	Wells Dam, Rocky Reach Dam Trap[1], Winthrop NFH outfalls and other locations approved by HCP Hatchery Committees
Adult Holding	Eastbank Hatchery and Winthrop NFH and other locations approved by HCP Hatchery Committees
Spawning	Eastbank Hatchery and Winthrop NFH and other locations approved by HCP Hatchery Committees
Incubation	Eastbank Hatchery and Winthrop NFH and other locations approved by HCP Hatchery Committees
Early Rearing	Eastbank Hatchery and other locations approved by HCP Hatchery Committee
Overwinter Rearing	Carlton Acclimation Facility and other locations approved by HCP Hatchery Committees

Final Acclimation	Chewuch Acclimation Pond (DCPUD), Proposed Yakama Nation Expanded Acclimation sites: Goat Wall Acclimation Site, Mid Valley Pond, Chewuch River (future YN site), and other locations approved by the HCP Hatchery Committees

[1] The use of this facility for broodstock collection will be contingent on HCP Hatchery Committees approval.

Table 5-2. Three-year hatchery life-history for Chelan PUD's spring Chinook Methow production depicting residence at different facilities.

	January	February	March	April	May	June	July	August	September	October	November	December
Year 1					Brood Collection (Wells or RR)			Incubation (Eastbank)				
Year 2	Incubation		Early Rearing (Eastbank)							Overwinter (Carlton)		
Year 3	Overwinter		Acclimation (Chewuch)									

5.1) Broodstock collection facilities (or methods).

Broodstock may be collected at any of the following locations in a given year: Wells Dam, Rocky Reach Dam Trap, Winthrop National Fish Hatchery (in the event sufficient NORs are not available for the program, HORs from the conservation programs could be used for broodstock if collected at WNFH), or on tributary spawning grounds.

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Wells Dam Trap

Trapping at Wells Dam generally occurs at the east and west ladder traps beginning in early May, or at such time as the first spring Chinook are observed passing Wells Dam, and continues through about the third week of June. The trapping schedule consists of 3 days per week (Monday through Wednesday), and up to 16 hours per day. Non-lethal tissue samples (fin clips) for genetic analysis and scale samples will be obtained from adipose present, non-CWT, non-ventral clipped spring Chinook (suspected natural-origin spring Chinook) collected at Wells Dam for origin analysis.

Rocky Reach Trap (RRT)

Commented [A41]: Alene, I took at stab at this section. Please review carefully.

As one of several broodstocking and adult removal options, Chelan PUD proposes to use the RRT to obtain broodstock for its Methow program (Figure 5-1). Based on the average distribution of the most recent 10 years of data (DART) the first 5 percent of the spring Chinook run passes Rocky Reach by April 18, and the 95 percent passage date is June 17; therefore, 90 percent of the run passes during an approximately 60-day period. Trapping will begin in late April and will continue through about the third week in June. Trapping will occur up to 5 days per week (Monday through Friday), and up to 6 hours per day, with unrestricted passage during non-trapping periods.

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The RRT was used historically to capture listed steelhead and bull trout (in 2002 and 2005-2007, respectively), as part of studies required for implementation of the Rocky Reach License (Alexander et al. 2003; Stevenson et al. 2009) without causing delays to non-target fish. Based on the previous efforts with steelhead and bull trout, the RRT can effectively remove externally marked fish, one fish at a time, without delaying unmarked fish or non-target species. Additionally, based on a 2013 pilot study, the RRT can remove externally marked spring Chinook salmon, one fish at a time,

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without delaying non-target species. An additional pilot study will be conducted in 2014 that will evaluate the efficacy of trapping spring Chinook using separation-by-code technology.

The trap is operated by use of a pneumatic gate that directs individual target fish to a collection area and a trapping vessel. The trap design mimics a basket; it is lowered into the fish ladder and can remove one fish at a time. To identify targeted broodstock for collection, the fish ladder directly in front of the counting room will be outfitted with a PIT tag detection array. This will provide a total of three PIT tag detection arrays located downstream of the trap in the fish ladder (baffle four, baffle six, and the entrance into the counting room/trap location). The separation-by-code software will rely on a pre-loaded library of PIT tag codes, that when detected by one of the three PIT tag arrays, will send a visual and auditory signal to the trap operator indicating a target fish has been detected. As an identified target fish moves through the baffles of the ladder and subsequent PIT tag arrays (a total distance of roughly 125 feet), three sequential notifications will occur indicating the fish is approaching the trap chamber. Once the last notification occurs, the operator in the counting room will be able to visually observe the target fish, manually open the trap door, and trap the fish. The operator located above the trap will raise the trap and confirm the targeted fish was trapped by use of a hand held PIT tag detector loaded with the same library of PIT tag codes. Fish collected would be transported to Eastbank Hatchery, immediately adjacent to the Rocky Reach Project. Natural-origin smolts previously PIT-tagged at the Chewuch smolt trap will be targeted for trapping.

Prior to using the Rocky Reach Trap for routine broodstock collection, Chelan PUD will complete the analysis of the 2014 separation-by-code pilot and obtain any necessary HCP Hatchery Committees approvals either separately or as part of the annual broodstock collection protocol development. Specifically, Chelan PUD will examine the amount of handling time, potential handling effects of trap operation, and proposed improvements intended to increase trapping effectiveness.

Winthrop NFH

In 2013, Chelan PUD obtained hatchery origin broodstock from the USFWS Winthrop NFH outfall. In years when low natural-origin returns are expected that would preclude meeting the full conservation program, the Winthrop NFH outfall may be used to collect hatchery-origin adults, as approved by the HCP Hatchery Committees.

Tributary Spawning Grounds

Interim or stopgap measures to collect locally adapted natural-origin broodstock through angling, tangle netting or other method in select tributaries such as the Chewuch River may be implemented, if approved by the HCP Hatchery Committees to increase the likelihood of meeting Chelan's production obligations. Known or suspected spring Chinook spawning locations will be targeted for tangle netting and/or angling. Snorkeling in several pools will be conducted prior to deploying any nets for spring Chinook capture and active spawners will be avoided. Because there is considerable concern over the potential risk via harassment, removal, or displacement of

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Commented [A42]: WDFW has considerable concerns about the long term viability of using the RR trap as a broodstocking location. Based upon a single years data, there is not sufficient evidence that Methow/Chewuch origin fish can be collected without collateral interactions with non-target populations. While adipose clipped fish can be identified and selectively removed (albeit less than 50% of the time due to visibility and proximity to other fish issues), it has not addressed the efficacy in being able to target the appropriate fish to meet Chelan's production obligation.

My suggestion is that in order for the RR trap to truly be viable, testing of sort by code technology is a must. This is the only way to know for certain that this facility can meet the needs of the program – even if it is only 38 fish.

CCPUD: proposal updated

Deleted: Prior to using the Rocky Reach Trap for broodstock collection, Chelan PUD will complete the analysis of the 2013 pilot and obtain any necessary HCP Hatchery Committees approvals. Specifically, Chelan PUD will examine the amount of handling time, potential handling effects of trap operation, and proposed improvements intended to increase trapping effectiveness. ¶
¶
To identify broodstock for collection, the trap would be outfitted with additional PIT detection equipment that allows sort by code of adults PIT-tagged as naturally emigrating smolts, or other non-visual actuation, if supported by the HCP Hatchery Committees.¶
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spawning or near spawning condition adults, use of this methodology will only be considered on an annual basis and requires a parallel path to develop a long term viable broodstocking methodology.

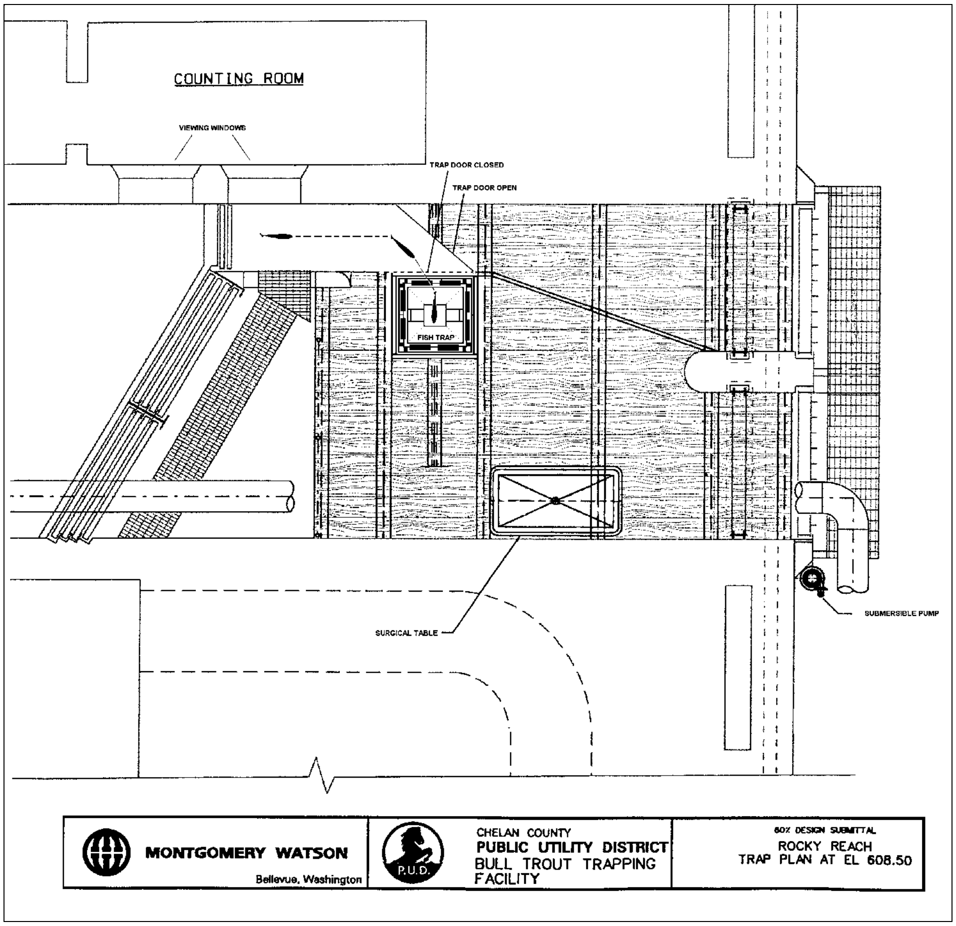

Figure 5-1. Rocky Reach trapping facility.

5.2) Fish transportation equipment (description of pen, tank truck, or container used).

Fish transportation equipment used will ensure safe, water to water transfer of ESA listed fish. Equipment will be mechanically reliable and will allow for ease of disinfection to occur. Dissolved oxygen levels and temperature will be monitored within the tanks and at trapping and receiving locations. Salt will be used as a stress reduction measure when hauling adults.

5.3) Broodstock holding and spawning facilities.

Broodstock holding may occur at Eastbank Hatchery, Wells or Winthrop facilities, all of which have been used historically and safely for listed spring Chinook. These facilities include the following features:

- They allow for safe containment of adults including appropriate temperature regimes
- They provide measures to try to calm adults (e.g. spray system)
- They provide adequate flow of water under normal operating conditions
- They are alarmed for low flow
- They allow separate holding vessels between stocks.

Spawning facilities are integrated into the broodstock holding facilities. The spawning facilities allow for broodstock to be sorted for “ripeness” and then spawned. The spawning area can be cleaned easily.

5.4) Incubation facilities.

Incubation and early rearing is expected to occur primarily at Eastbank Hatchery. Winthrop NFH was used for early incubation for brood year 2013; the use of Winthrop NFH in future years would be contingent upon approvals from the HCP Hatchery Committees.

The incubation facilities:

- Provide adequate flow of pathogen free water under normal operating conditions
- Allow for manipulation of water temperatures
- Are alarmed for low flow
- Provide for individual female segregation throughout viral sampling

5.4.1) Locations

Eastbank Hatchery

The Eastbank Aquifer, a high quality groundwater source with connectivity to the Columbia River, supplies water to the hatchery. Both the Eastbank Hatchery Complex and the Regional Water System, which provides municipal water to the customers of Chelan PUD, the City of Wenatchee, and the East Wenatchee Water District, use the Eastbank Aquifer. The Eastbank Hatchery water right permit provides for 55 cfs of instantaneous water supply. On an annual basis, temperatures range from approximately 45.5°F to 59.0°F. Spring Chinook are held for broodstock, incubated, and early-reared on this water. Water can be chilled during incubation to meet specific growth targets.

At Eastbank, eggs would be incubated in MariSource vertical incubators. The incubators are configured with eight tray units called "half-stacks." Each tray consists of a "water tray" which conducts the water flow through egg trays that are inserted in the water trays. The egg trays have a mesh lid on them. The water flows into the back of the water tray, flows forward through the eggs or fry, flows back down the sides, then exits to the back of the next tray below. Each tray is supplied with 2 gallons per minute (gpm) of chilled water and 1 gpm of well water. The chilled water is 38°F and is mixed with well water to meet an incubation temperature of 42°F to 45°F (adjusted based on developmental needs and desired emergence timing). At spawning, the eggs from a single female are added to a single tray. The capacity of a single tray is about 6,500 eggs.

At Eastbank Hatchery, water withdrawal for hatchery use is regulated by the Washington State Department of Ecology under Chapter 90.03 of the RCW (water code). None of the hatchery facilities employed to carry out the proposed artificial propagation programs de-water river reaches used by listed fish for migration, spawning, or rearing. All hatcheries owned and/ or operated by WDFW discharge water in compliance with NPDES General Permit No. WAG 13, valid through August 1, 2015. This permit is administered in Washington by the Washington State Department of Ecology under agreement with the United States Environmental Protection Agency.

Winthrop NFH

All spring Chinook salmon eggs are incubated on 100 percent groundwater. This water source is free of silt, does not create fungus problems, and provides temperatures in the 39°F (chilled) to 52°F (unchilled) range during incubation. Dissolved oxygen is relatively constant at 9 parts per million (ppm) on the inflow and not less than 8 ppm at the outflow. It is not necessary to use formalin during incubation since *Saprolegnia sp.* fungus has not been a problem. Heath trays are loaded at one female per tray through the entire incubation cycle (3000 to 6000 eggs per tray). Flows through the incubation stacks are 1 to 2 gpm to the eyed stage and 3 to 5 gpm from the eyed to button-up fry stage (see Winthrop NFH HGMP).

5.4.2) BKD Management:

Chelan PUD proposes to implement a BKD management approach that relies on HSRG recommendations as well as historic program data (from 1996 to 2008) consistent with agreements in the HCP-HC (2007). At present, many of the decisions in the program will depend on a lethal, enzyme-linked immunosorbent assay (ELISA) to determine the probability of broodstock transmitting BKD vertically to their progeny. In the future, non-lethal screening techniques may offer new opportunities to manage for BKD. Until that time, however, the incidence of BKD in the Methow Spring Chinook Program will be minimized using three management practices: prevention, treatment and replacement.

Prevention

Disinfection and antibiotics: Female (hatchery- and natural-origin) spring Chinook broodstock will be injected before spawning with an appropriate antibiotic (e.g., azithromycin at 40 milligrams per kilogram [mg/kg] fish) and the resulting eggs will be surface disinfected with iodophor consistent with methods in The Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State.

Screening: Female broodstock will be assayed (ELISA) to determine titer level (e.g., OD).

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Culling titer progeny of OD ≥ 0.12: Hatchery-origin eggs/progeny with ELISA titers of OD 0.12 or greater will be culled from the program.

Rearing titer progeny of OD ≥ 0.12 ≤ OD 0.19: Wild-origin eggs/progeny with ELISA titers between OD 0.12 and 0.19 will be raised at a lower density of 0.06.

Culling titer progeny of OD > 0.19: All hatchery- and natural-origin eggs/progeny with ELISA titers of OD greater than 0.19 should be culled from the program.

Screening (future): The HCP Hatchery Committees will evaluate emerging technology to provide non-lethal BKD screening (e.g., near infrared spectroscopy and genetic tests) as these tools become commercially available.

Treatment

Antibiotics: At the first signs of infection with BKD, juvenile spring Chinook will be treated with orally administered antibiotics at a type, dosage, and duration as determined by fish health personnel. The treatments may be repeated if there is evidence that the BKD agent has persisted in the hatchlings and fish health determines additional treatment is warranted. For adults, antibiotics are administered to minimize vertical transmission from parent to progeny no less than two weeks prior to spawning and then every four week thereafter during spawning.

Commented [A43]: Suggest separating this into two pieces – adults and juveniles. For adults antibiotics are administered to minimize vertical transmission from parent to progeny no less than two weeks prior to spawning and then every 4weeks (please verify this with Bob R.) thereafter through spawning.

CCPUD: change made

Rearing Density: Chelan PUD will provide adequate facilities to rear up to 20 percent of the conservation program at a lower density (0.06 density index). The low density rearing environment would be designated for wild origin fish with titers of 0.12 ≤ OD ≤ 0.19[1]. When less than 5 percent of the program production is in the 0.12 ≤ OD ≤ 0.19 titer range, the HCP Hatchery Committee may elect not to rear these fish to program size and instead utilize the available hatchery space for other purposes.

Replacement

Broodstock Collection: Up to 20 percent extra hatchery-origin spring Chinook females may be collected to meet any production shortfalls related to culling hatchery fish with titers of OD greater than 0.12 and wild fish with titers of OD greater than 0.19. This number of extra hatchery origin fish is also expected to assist with any efforts to reduce pHOS.

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5.5) Rearing facilities.

Fish would be transported from Eastbank Hatchery to the Carlton Acclimation Facility (or other locations within the Methow Basin as determined by the HCP Hatchery Committees) in October to allow overwinter rearing to occur in the Methow Basin.

[1] These values may change depending on lab technologies and methodologies employed.

5.5.1) Program Targets

- Target size at transfer to overwinter rearing site: approximately 26 to 30 fish per pound.
- Target transfer date to overwinter rearing site: October to November depending on annual temperature variation and observed temperature differentials between transfer and receiving facilities and pathogen load of receiving water.

5.5.2) Location

Chelan PUD's Carlton facility site is located approximately 2.5 miles south of Twisp, Washington, off the east side of the Twisp-Carlton Road (Methow River; river mile 35 [river kilometer 56]). In 2012, Chelan PUD leased to Grant PUD the portion of unused property directly adjacent to an existing single 84,000 cubic foot pond for the purpose of constructing an overwinter acclimation facility at the Carlton site. Construction of Grant PUD's overwinter acclimation is expected to be completed in 2014. The facility will be comprised of 8, 30-foot diameter circular fiberglass tanks with single pass flow-through.

Currently, surface water supply to the facility is from the Methow River through a screened surface water pumped intake located on the right bank of the Methow River. This system is expected to supply 14.9 cfs to the facility between October and May. The existing screen system consists of a pair of 30-inch diameter tee screens with a high pressure air backwash cleaning system. The screens have a total screened area of 163 square feet, which would allow a maximum intake flow rate of 32.6 cfs at the typical screen approach velocity of 0.4 feet/second.

At Carlton, water withdrawal for hatchery use is regulated by the Washington State Department of Ecology under Chapter 90.03 of the RCW (water code). None of the hatchery facilities employed to carry out the proposed artificial propagation programs de-water river reaches used by listed fish for migration, spawning, or rearing. All hatcheries owned and/ or operated by WDFW discharge water in compliance with NPDES General Permit No. WAG 13, valid through August 1, 2015. This permit is administered in Washington by the Washington State Department of Ecology under agreement with the United States Environmental Protection Agency.

To minimize the likelihood for the take of listed natural fish, Chelan PUD will ensure that water intakes into artificial propagation facilities are properly screened in compliance with 1995 NMFS screening criteria and as per the 1996 addendum to those criteria (NMFS 1996). Water intake screen structures will be inspected and monitored at hatchery facilities to determine if listed salmon and steelhead are being drawn into the facility.

5.6) Acclimation/release facilities.

5.6.1) Program Targets

- Target transfer date to acclimation site: February-March, as determined by WDFW and YN hatchery operators, depending on annual temperature differences between Carlton Acclimation Facility and the final release facility

- Target release size: 15 to 18 fish per pound
- Target release dates: April through May
- Release method: volitional

5.6.2) Locations

Final acclimation of Chelan PUD's spring Chinook program may occur within the Yakama Nation Expanded Acclimation sites or other sites approved by the HCP Hatchery Committees. Any one or a combination of (depending on size of the facility), the acclimation facilities described below may be used as a final acclimation site. To encourage hatchery origin spawners to migrate further upstream, YN proposes to acclimate (spring only) 15,000 Chinook pre-smolts at YN's Goat Wall acclimation site and 46,000 at Mid-Valley Pond. The sum of 61,000 would represent Chelan PUD's spring Chinook obligation in the Methow River starting in 2015.

Goat Wall (Yakama Nation): The Goat Wall acclimation site is a disconnected side channel system on the upper Methow River, located near of the mouth of the Lost River (Methow River; river mile 70 [river kilometer 112]). There is a pond at the downstream end of a disconnected side channel. The pond is fed by both surface water and groundwater. Surface water is provided by a diversion on the adjacent Gate Creek, and groundwater is supplied by Cold Creek (a groundwater seep). The estimated capacity is 34,000 spring Chinook.

Mid-Valley (Yakama Nation): A series of large springs originate in the Methow valley floor; ponds have previously been constructed in the past to impound the spring water for irrigation purposes. Habitat restoration efforts are currently underway to provide fish passage into and past the ponds. The pond proposed for acclimation is the most downstream in the springs complex. The site is located on the Methow River (river mile 54, [river kilometer 87]) and is downstream of the section of the Methow River that annually dewaters. The pond measures approximately 450 feet x 70 feet. A temporary seine system would allow passage by other fish species in the spring system. The adjacent upstream property is WDFW's Big Valley Unit of the Methow Wildlife Area and is managed for riparian habitat protection and wildlife conservation. The site has capacity for up to 122,650 spring Chinook.

Chewuch Acclimation Pond (Yakama Nation and Douglas County PUD): The Chewuch Acclimation Pond is owned by Douglas County PUD and has been operated by the WDFW since 1994 to acclimate spring Chinook (under existing permit 1196). The existing facility is comprised of a Hypalon-lined pond with 24,000 cubic feet of volume (150 feet long by 40 feet wide and 4 feet deep) and receives 2,700 gallons per minute of surface water flow from the Chewuch River.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.

Commented [A44]: I believe there have also been operational issues related to environmental conditions that have led to significant impacts to fish in the Chewuch acclimation pond. I suggest talking with Guy up at Winthrop or Douglas to get more details and include that information here.

It may also to note that because Carlton Pond has never been used to over-winter Chinook (let alone spring Chinook) there is some uncertainty as to what operation al issues may arise in the further that could lead to significant fish mortality.

CCPUD: section modified.

In January 2007, nearly 8 percent of the juveniles from the 2006 brood hatchery by wild (HxW) steelhead component died of asphyxiation at Eastbank Hatchery because of a rare and severe wind storm that knocked out power to the facility (including pumps) for several hours.

In May 1997, 100 percent of the coho reared in the Chewuch acclimation pond died when the intake screens were plugged by detritus. The incident occurred prior to installation of the auto dialer alarm system.

5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

For broodstock collection activities:

- All species will be held for a minimal duration in the traps and holding areas (less than 24 hours).
- Traps and holding areas will be locked or secured against tampering or vandalism.
- All natural-origin spring Chinook in excess of broodstock goals will be released upstream immediately without harm.
- All non-target taxa of concern (NTTOC) will be released upstream immediately without harm.
- Spring Chinook will be transferred using water-to-water techniques.
- Broodstock collection protocols will be developed in coordination with the HCP Hatchery Committees annually.

Broodstock collection specific to the Rocky Reach Trap:

- Utilization of a separation-by-code system to target trapping efforts;
- To improve efficacy of the trap, installation of underwater lighting and an underwater camera that can capture the view of the trap entrance will occur to enable better viewing of the fish as they move into the trap; installation of an electrical control pendant for the technician located above the trapping area to allow additional control of the trap door; and modification of the control pendants for opening and closing the door which will allow pushing the button once to open and close the trap door versus holding the button to open and close the trap door.

Broodstock collection specific to tangle netting and/or hook and line:

- Primary wild spring Chinook spawning areas will be identified using historical NOR spawning data. Only those areas (pools) of the river immediately above and below the spawning areas will be targeted for netting rather than a randomized approach.
- Personnel that have experience capturing Chinook salmon using tangle nets will conduct the tangle netting.

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- Targeted pools will be snorkeled to determine what, if any level of bull trout presence exists; if bull trout are not observed or if they are located in an area that can be avoided by the netting while targeting Chinook then the crews will proceed.
- If a bull trout is incidentally caught in the net, it will be immediately removed and released, preferably in an area that it isn't likely to be re-encountered.
- If more bull trout are encountered than is reasonable and prudent, all netting activities will cease.
- Fish transportation equipment will ensure safe transportation of collected broodstock including equipment that is mechanically reliable and that can be disinfected, equipment to monitor dissolved oxygen levels, and salt will be available and used as a stress reduction measure if needed.

For adult holding and rearing activities:
Operational failures due to power/water loss, flooding, freezing, vandalism, predation, and disease may result in catastrophic losses to holding and rearing adults and juveniles. Flow reductions, flooding, and poor fish culture practices may all cause hatchery facility failure or the catastrophic loss of ESA-listed fish under propagation. To protect endangered spring Chinook, all efforts will be made to ensure that the survival of adult spring Chinook held for broodstock collection at the hatchery facility is maximized. Rapid response in the event of power or water loss or freezing is provided by a combination of staffing, automatic alarm paging systems, and redundant power supplies to the facilities. In addition, Chelan PUD has developed an emergency/incident response protocol in the event that activities occur that could result in take. This protocol defines the notification pathway that should occur and ensures that, 24 hours per day, 7 days per week, Chelan PUD hatchery facilities are monitored and supported to minimize take.

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SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Responsibilities: Chelan PUD is responsible for providing the funding for the activities described in this section. WDFW is currently under contract to conduct the activities described in this section. Consistent with these responsibilities, Chelan PUD and WDFW will be co-permit holders for the activities described in this section with WDFW designated as an agent under a current contract between Chelan PUD and WDFW and until this contract expires and is not renewed or renegotiated.

6.1) Source.

The broodstock selected represents natural populations native or adapted to the watersheds in which hatchery fish will be released. Broodstock will be of wild x wild (WxW) parentage or hatchery x wild (HxW) parentage. Hatchery x hatchery (HxH) crosses may be used only in years of very low abundance to meet the production obligation. Wild-origin broodstock collection will not exceed 33 percent of the wild run. Hatchery-origin broodstock will be used to augment wild-origin broodstock to the extent necessary to meet the program production target in the event wild-origin broodstock are not available. The pNOB will be maximized to the extent possible to meet a PNI goal of greater than 0.67 annually.

6.2) Supporting information.

6.2.1 History.

Natural-origin spring Chinook broodstock collections began in 1996 as shown in Table 6-1. Native (natural) Methow spring Chinook were ESA-listed in 1999.

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Table 6-1. Collection sites and history for Methow River Basin spring Chinook broodstock.

Broodstock Source	Origin	Year(s) Used	
		Begin	End
UCR spring Chinook composite (collected at Wells Dam) (protocol varies annually as to H:W proportion taken)	Natural/Hatchery	1996	Ongoing
Methow River spring Chinook composite (Methow, Twisp, and Chewuch hatchery stocks collected at Winthrop NFH Hatchery outfall	Hatchery	1998	Ongoing

6.2.2) Annual size.

Under the current program, up to 38 fish will be collected for broodstock. Historic broodstock collection is summarized in Table 6-2. The sex ratio of broodstock is expected to be close to 1:1.

Table 6-2. Numbers of wild and hatchery spring Chinook collected for Methow Basin program broodstock, numbers that died before spawning, and numbers of spring Chinook spawned, 1994 to 2008. Unknown origin fish (i.e., undetermined by scale analysis; no elastomer, CWT, or fin clips; and no external evidence of hatchery residence) were considered naturally produced (in part from Snow et al. 2008).

Brood year	Wild spring Chinook					Hatchery spring Chinook					Total number spawned
	Number collected[1]	Pre-spawn loss	Mortality[2]	Number spawned	Number Not Used	Number collected [1]	Pre-spawn loss	Mortality[2]	Number spawned	Number Not Used	
1994	16	0	0	16	0	2	0	0	2	0	18
1995	0	0	0	0	0	11	0	0	11	0	11
1996	117	0	0	117	0	95	4	0	86	5	203
1997	12	0	0	12	0	272	0	0	270	2	282
1998	94	0	0	94	0	88	2	0	79	7	173
1999	49	0	0	49	0	141	14	0	115	12	164
2000	6	0	0	6	0	339	23	0	306	10	312
2001	52	2	0	49	1	357	10	0	228	119	277
2002	0	0	0	0	0	438	21	0	367	50	367
2003	42	1	0	41	0	218	9	0	166	43	207
2004	50	5	0	45	0	304	4	0	299	1	344
2005	9	0	0	9	0	281	2	0	265	14	274
2006	9	1	0	8	0	342	13	0	320	9	328
2007	23	0	0	23	0	204	2	0	169	33	192
2008	56	2	0	52	2	327	4	0	308	15	360
Avg.	36	1	0	35	0.2	228	7	0	199	21	234

Notes:
1 – The sum of broodstock collected at all sites.
2 – Mortality includes fish that died of natural causes typically near the end of spawning and were not needed for the program or were immature fish killed at spawning.

6.2.3) Past and proposed level of natural fish in broodstock.

Based on CWT and scale analysis on brood years 1994 through 2005, 15.9 percent of the 1,581 spring Chinook trapped for the Methow basin program were natural-origin and 84.1 percent were hatchery-origin (Snow et al. 2008). Annual broodstock contribution from natural-origin fish ranged from 0 to 58 percent during this period. See Section 1.8.2 for proposed broodstock composition. See Table 6-2 for the historical natural and hatchery composition of past overall combined broodstock collections. For the proposed program, the proportion of natural-origin fish will be maximized in an effort to attain 100 percent natural origin broodstock. This requires that the collection of NORs for broodstock does not exceed 33 percent of the NORs to the Methow Basin.

6.2.4) Genetic or ecological differences.

Small et al. (2007) provided a recent review of the genetic characteristics of Methow River basin spring Chinook. Fish samples from 1992 through 2006 were obtained from the Winthrop NFH and both natural and hatchery-origin fish from the Methow, Twisp, and Chewuch rivers. Twisp hatchery and natural-origin collections formed a discrete group distinct from a Methow-Chewuch-Winthrop NFH group. Methow River fish were very similar to the Winthrop NFH collections and differentiated from Chewuch River fish collected in 1992 to 1993. The Methow and Chewuch Rivers fish became more similar after developing the broodstock that combines the Methow and Chewuch River fish. Assignment tests indicated that if natural-origin fish were collected at Wells Dam for broodstock and assigned with a moderate probability threshold (10 times more likely to have come from one collection as from another), there is low risk of incorrectly identifying a Methow-Chewuch fish as a Twisp fish, and even lower risk of incorrectly identifying a Twisp fish as a Methow-Chewuch fish.

In addition to genetic similarity, the broodstocks chosen display morphological and life history traits similar to the natural populations.

The annual adult broodstock collection protocol is keyed on target numbers at various collection sites, currently operated by WDFW, that provide broodstock for Mid-Columbia PUD mitigation program facilities. This adult broodstock collection protocol is an interim and dynamic hatchery broodstock collection plan, which may be altered following HCP Hatchery Committee discussions. As such, there may be significant in-season changes in broodstock numbers, locations, or collection times, brought about through continuing co-manager consultation and in-season monitoring of the anadromous fish runs to the Columbia River above Priest Rapids Dam.

6.2.5) Reasons for choosing.

The goal of the program is to rebuild and recover listed UCR spring Chinook in the Methow River basin. Multiple sub-basins have contributed to the UCR spring Chinook genetic makeup. The sources for collection provide broodstock from distinguishable stocks for rebuilding and recovery of the listed UCR spring Chinook in the Methow.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

The broodstock protocols were designed to mitigate for potential genetic effects from hatchery domestication and to avoid introgression with fish from other spawning aggregates.

SECTION 7. BROODSTOCK COLLECTION AND ADULT MANAGEMENT

Responsibilities: Chelan PUD is responsible for providing the funding for the activities described in this section. WDFW is currently contracted to conduct the activities described in this section. Consistent with these responsibilities, Chelan PUD and WDFW will be co-permit holders for the activities described in this section with WDFW designated as an agent under a current contract between Chelan PUD and WDFW and until this contract expires and is not renewed or renegotiated.

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

Only adults will be collected for broodstock.

7.2) Broodstock and adult management collection activities.

7.2.1) Broodstocking activities

WDFW, in coordination with the HCP Hatchery Committee, will annually develop site-based broodstock-collection protocols for NMFS approval. These objectives and protocols may be adjusted in-season to meet changes in the abundance, composition, and location of adult returns, and to minimize impacts on non-target fish. The protocol described below will be used to facilitate the collection of hatchery spring Chinook broodstock throughout the run while achieving the target extraction rate and ensuring full broodstock collection.

Based on forecasted run size, the HCP Hatchery Committees will identify target PNI levels and associated pHOS, pNOB values (also see Section 1.9 of this document), and overall broodstock targets for all of the Methow programs. Based on the target PNI levels and broodstock numbers, WDFW will develop weekly broodstock-collection goals. WDFW and the HCP Hatchery Committee will use in-season data (e.g., dam counts, PIT-tag detections) to verify pre-season estimates of run size and composition to ensure that the selected PNI, pHOS, and broodstock goals are appropriate, and will modify those goals in-season as necessary. Weekly collection goals will target the collection of broodstock distributed throughout the run.

Broodstock will be of WxW or HxW parentage. HxH crosses may be used only in years of very low abundance. Wild-origin broodstock collection will not exceed 33 percent of the wild run. Hatchery-origin broodstock will be used to augment wild-origin broodstock to the extent necessary to meet the program production target. The pNOB will be maximized to the extent possible to meet a PNI goal of greater than 0.67 annually. Adults will be trapped at existing Rocky Reach and Wells traps, as described below.

As described in Section 5.1, broodstock may be collected at any of the following locations in a given year: Wells Dam, Rocky Reach Dam Trap, Winthrop National Fish Hatchery (in the event sufficient NORs are not available for the program, HORs from the conservation programs could be used for broodstock if collected at WNFH), or on tributary spawning grounds as approved by the HCP-HC.

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7.2.1 Adult management activities

Broodstock collection: Excess hatchery origin adults from the Methow conservation program may be used as broodstock for the Winthrop NFH spring Chinook program and the CJH spring Chinook program when managing for pHOS. The number of broodstock available for other facilities will decrease commensurately with increasing escapement of hatchery returns to the natural spawning grounds in order to meet spawning escapement goals.

PIT tag and external marks: Chelan will CWT 100 percent of the released smolts. Additionally, up to 25 percent of released smolts from Chelan PUD's program will be PIT tagged to ensure that up to 25 percent of returning adults can be readily identified and potentially removed using non-lethal sorting techniques at any traps located throughout the basin. Chelan PUD will also fund external marking required for conservation and harvest management as agreements allow. Chelan PUD will fund marking as necessary to support the adaptive management and ESA compliance of the program. The JFP will determine the appropriate mark, marking levels and obtain approval from other managers as needed.

Rocky Reach Trap: Based on previous efforts with bull trout and steelhead, the Rocky Reach Trap can effectively remove externally marked fish, one fish at a time, without delaying unmarked fish of those species or causing take of non-target fish. Based on the average distribution of the most recent 10 years of data (DART: http://www.cbr.washington.edu/dart/), the first 5 percent of the spring Chinook run passes Rocky Reach by April 18, and the 95 percent passage date is June 17. Therefore, 90 percent of the run passes during an approximately 60-day period. Under an extremely conservative trapping scenario (40 days of operation and no more than four fish removed per day), up to 160 excess hatchery-origin spring Chinook could be removed annually at Rocky Reach Trap. With the installation of separation-by-code technology, it is expected that additional fish, not externally marked, could also be removed, if desired by managers.

Wells Trap: Hatchery origin returns may be managed at the ladder traps at Wells Dam in years when pHOS requires adjustment and minimum spawning escapement goals have been achieved (Douglas PUD 2010).

Full-time Employee funding to WDFW: In order to ensure that WDFW has the capacity to manage excess hatchery origin spring Chinook from Chelan's program, Chelan PUD will provide funding to WDFW sufficient to support up to a full-time equivalent staff person.

Fishery: Implementation of fisheries may contribute to reducing the number of hatchery-origin adults; however, under present marking strategies in for spring Chinook in the Methow Basin, a fishery would be directed at Winthrop NFH returning adults and not necessarily at fish originating from this program. Therefore, a fishery may help overall adult management in the basin, but may

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not have a substantial effect on adult management of Chelan PUD's spring Chinook production in the Methow River unless alternative marking strategies were employed.

7.3) Identity.

All smolts will be given an external mark or otherwise tagged as agreed to by the HCP Hatchery Committees. Marking and tagging strategies will be sufficient to allow differential harvest between conservation and safety net production components and to allow efficient broodstock collection and removal of HORs.

Chelan will PIT tag up to 25 percent of released smolts from Chelan PUD's program to ensure that up to 25 percent of returning adults can be readily identified and potentially removed using non-lethal sorting techniques at any traps located throughout the basin. Chelan PUD will also fund marking required for conservation and harvest management. Chelan PUD will fund marking as necessary to support the adaptive management and ESA compliance of the program. JFP will determine annual marking levels and coordinate or obtain approval from other managers as needed.

Through a combination of marking, infrastructure, and FTE funding, Chelan PUD will ensure that WDFW has the tools necessary to successfully remove at least 165 hatchery-origin fish annually (i.e., 100 percent of the expected average number of fish produced by Chelan PUD's program), if necessary. These removals may include Chelan PUD origin fish or other hatchery production groups originating from the Methow Basin depending on prioritization by managers. The funding by Chelan PUD will ensure that WDFW has capacity to remove fish at any facility (not restricted to Chelan PUD owned facilities). WDFW will remove excess hatchery origin fish, as authorized under applicable laws and regulatory frameworks. Attainment of annual pHOS goals will be monitored by the M&E program (Hillman 2013).

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):

- Approximate number of adults collected: not to exceed 38 NORs or up to 45 HORs. The program is focused on using NORs in the brood to maximize pNOB. However, 20 percent more HORs[1] may be collected to make up for production shortfalls resulting from BKD management. The number of brood required to produce 60,516 smolts (i.e., 38) is derived from Douglas PUD (2010) where 142 broodstock were required to produce 225,000 smolts. Chelan PUD's proposed program is 26.9 percent of Douglas PUD's program (i.e., 60,516/225,000), and 26.9 percent of 142 is 38. These values are based on a current, mean age-4 fecundity of 3,714, an egg-to-smolt survival of 90 percent and pre-spawn survival of 95 percent (Douglas PUD 2010).
- Sex Ratio 1:1

[1] These values may change depending on lab technologies and methodologies employed.

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7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

Table 7-1, below, provides information for broodstock collection for recent years.

Table 7-1. Natural and hatchery-origin broodstock collected at Methow River basin traps, brood years 1992 to 2008.

	Chewuch River		Methow River		Twisp River	
Brood Year	Naturals	Hatchery	Naturals	Hatchery	Naturals	Hatchery
1992	25	5	0	0	20	0
1993	91	9	26	55	30	1
1994	11	1	0	1	5	0
1995	0	0	0	11	0	0
1996	21	45	74	25	22	25
1997	1	66	11	191	0	15
1998	0	0	93	77	1	11
1999	0	0	33	117	16	24
2000	0	0	0	276	6	63
2001	18	73	0	250	34	34
2002	0	126	0	297	0	15
2003	2	60	0	126	40	32
2004	1	134	0	145	49	25
2005	2	134	0	130	7	17
2006	1	125	8	189	0	28
2007	0	0	19	168	4	36
2008	0	0	44	296	12	31

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.

Excess hatchery origin adults from the Methow program may be used as broodstock for the Winthrop NFH spring Chinook program, the CJH spring Chinook program when managing for pHOS, and or the Douglas and Grant County PUD hatchery programs. The number of broodstock available for other facilities will decrease commensurate with increasing escapement of hatchery returns to the natural spawning grounds in order to meet spawning escapement goals.

Additional hatchery fish removed as part of adult management may be used for ceremonial/subsistence use by the Tribes, food banks, distribution to minor spawning areas, nutrient enhancement projects or other acceptable use as determined by the Joint Fisheries Parties.

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7.6) Fish transportation and holding methods.

Fish will be removed from traps daily or more often as needed to minimize capture and handling effects on listed fish and placed in truck-mounted transport tanks using fish socks or other water-to-water handling methods. The tanks will be supplied with river water from the trapping site, and fish will be transported to adult broodstock ponds at the appropriate facility.

7.7) Describe fish health maintenance and sanitation procedures applied.

Fish health maintenance, management, and sanitation procedures/criteria for all life stages will be consistent with the IHOT, Pacific Northwest Fish Health Protection Committee (PNFHPC), Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State dated July 2006, and WDFW's Fish Health Manual dated November 1996.

7.8) Disposition of carcasses.

IHOT, PNFHPC, state, or tribal guidelines are followed for broodstock fish health inspection, transfer of eggs or adults, and broodstock holding and disposal of carcasses. Carcasses of ESA-listed fish spawned in captivity may be outplanted in the Methow River watershed for nutrient enrichment if disease protocols as determined by the JFP fish health specialists are met, donated for educational purposes, incinerated, buried on-station after completion of spawning, or disposed of at waste disposal facilities.

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7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

Specifically, the following measures will be employed to minimize the likelihood of adverse effects to listed natural fish (NMFS 2003):

- ESA-listed fish must be handled with extreme care and kept in water to the maximum extent possible during sampling and processing procedures. Adequate circulation and replenishment of water in holding units is required. When using methods that capture a mix of species, ESA-listed fish must be processed first. The transfer of ESA-listed fish must be conducted using equipment that holds water during transfer.
- Visual observation protocols must be used instead of intrusive sampling methods whenever possible. This is especially appropriate when merely ascertaining the presence of anadromous fish.
- In trapping operations directed at the collection of broodstock, measures that minimize the risk of harm to listed salmon and steelhead shall be applied. These measures include, but are not limited to, limitations on the duration (hourly, daily, or weekly) of trapping in mainstem river areas to minimize capture and handling effects on listed fish; limits on trap holding duration of listed fish prior to release; application of procedures to allow safe holding, careful handling, and release of listed fish; and allowance for free passage of migrating listed fish through trapping sites in mainstem and tributary river locations when those sites are not being actively operated.

- ESA-listed juvenile fish will not be handled if the water temperature exceeds 21°C at the capture site. Under these conditions, ESA-listed fish will only be identified and counted.
- If water temperature at adult trapping sites exceeds 21°C, the trap operation shall cease pending further consultation with NMFS to determine if continued trap operation poses substantial risk to ESA-listed species.
- Target species that require handling other than visual observation will be anesthetized.
- Annual broodstock collection and spawning protocols shall be developed for the UCR ESA-listed Methow spring Chinook artificial propagation programs. Protocols will be coordinated with the JFP and HCP Hatchery Committees and must be submitted to NMFS Salmon Recovery Division by April 15 of the collection year.
- Monitor the incidence of, and minimize capture, holding, and handling effects on, listed salmon and steelhead encountered during trapping. Incidentally captured listed UCR spring Chinook salmon adults that are not intended for use as broodstock in concurrently operated and previously authorized listed stock recovery programs shall be carefully handled and immediately released upstream.
- Ensure that the hands of fish handlers are free of sunscreen, lotion, or insect repellent.
- Non-target species will be bypassed, minimally handled, or will be fully recovered (if anesthetized) and immediately released upstream of the trapping site.

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SECTION 8. MATING

Responsibilities: Chelan PUD is responsible for providing the funding for the activities described in this section. WDFW is currently contracted to conduct the activities described in Section 8. Consistent with these responsibilities, Chelan PUD and WDFW will be co-permit holders for the activities described in this section with WDFW designated as an agent under a current contract between Chelan PUD and WDFW until this contract expires and is not renewed or renegotiated.

8.1) Selection method.

In situ stock separation of ESA-listed spring Chinook, Carson origin, and out-of-basin stray fish is accomplished through scale sample, genetic analysis, and CWT analysis; only natural-origin and appropriate hatchery origin adults will be spawned. Though not preferred, some HxH crosses may be necessary for the Methow/Chewuch component in some years with very low escapement.

8.2) Males.

Spawning ratio protocols reflect the need to maintain genetic diversity of the Chinook populations. A 1:1 spawning ratio or a factorial mating strategy may be utilized. Wild males may be utilized twice as a primary spawner if required to maximize WxW crosses. Males will not be selected by size and smaller males will be represented in the mating protocol proportional to their presence in the broodstock collected at random from the trapping sites.

8.3) Fertilization.

Prior to fertilization, ovarian fluid from all females will be sampled for regulated and reportable viral pathogens. Kidney and spleen samples from all males and female spawners will be examined for regulated viral pathogens and other pathogens as necessary. As changes in techniques and technology occur, this methodology may be updated if approved by the HCP Hatchery Committees.

Spawning ratio protocols reflect the need to maintain genetic diversity of the Methow spring Chinook populations. A factorial mating strategy to increase (maximize) effective population size will be implemented when possible. In some cases, not enough females, males, or fish of the necessary stock/origin will be available on an individual spawn day, and a standard one-male-to-one-female strategy will be employed. Annual spawning protocols will detail the specifics of the spawning ratios.

After fertilization, eggs will be water hardened in iodophor in pathogen-free well water, according to standard fish health protocols. Individual egg lots will be incubated in isolation until pathogen testing has confirmed them free of pathogens. Any egg lots with regulated viral pathogens will be destroyed in accordance with fish health protocols.

8.4) Cryopreserved gametes.

None.

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8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

- A 1:1 equivalent mating ratio will be employed.
- Inclusion of natural origin jack Chinook in the run-at-large broodstock collections helps to alleviate occasional low adult male occurrence. The hatchery broodstock will remain genetically similar to, and representative of, the upriver spring Chinook populations. However, when appropriate to do so, hatchery origin age-3 males will be excluded from the broodstock to minimize the risk associated with producing progeny from younger age at maturity fish.
- Fish health procedures used for disease prevention will include biological sampling of spawners. Generally, kidney/spleen samples will be collected from all female spawners to test for the presence of viral pathogens. The ELISA will be conducted on kidney samples from all females. This assay detects the antigen for *Renibacterium salmoninarium*, the causative agent of BKD.
- Factorial mating to increase effective population size.
- Maximize pNOB to decrease the potential effects of domestication selection.

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SECTION 9. INCUBATION AND REARING -

Responsibilities: Chelan PUD is responsible for providing the funding for the activities described in Section 9. WDFW is currently contracted to conduct the activities described in Section 9. Consistent with these responsibilities, Chelan PUD and WDFW will be co-permit holders for the activities described in this section with WDFW designated as an agent under a current contract between Chelan PUD and WDFW until this contract expires and is not renewed or renegotiated.

9.1) Incubation:

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

Egg-take goals will vary annually dependent upon the necessary level of over-collection for BKD management. Currently, the over-collection rate is determined annually based on the average of high-titer (ELISA OD ≥ 0.12) females from the previous five brood years; for 2009, the over-collection rate was 12 percent for hatchery origin fish.

Table 9-1. Hatchery life stage survival rate standards and level achieved (%) by stock and brood year for Met-Comp spring Chinook, brood years 1999 to 2008. Standards are in parentheses.

Brood Year	Unfertilized egg to eyed (92.0)	Eyed egg to ponding (98.0)	30 d after ponding (97.0)	100 d after ponding (93.0)	Ponding to release (90.0)	Transport to release (95.0)	Unfertilized egg to release (81.0)
1999	95.4	100.0	99.5	99.5	99.2	---	94.6
2000	96.5	100.0	99.6	99.4	99.0	99.9	92.7
2001	93.2	100.0	99.3	99.1	97.0	99.8	90.8
2002	96.0	100.0	98.6	98.6	96.5	98.5	92.7
2003	90.0	100.0	98.8	98.3	93.0	99.8	77.9
2004	94.8	96.2	99.2	99.2	96.6	99.8	84.6
2005	96.9	96.9	99.6	99.5	90.4	99.6	87.7
2006	93.9	95.0	89.4	89.4	76.5	96.2	68.2
2007	92.9	94.8	99.6	99.3	95.7	99.1	84.2

9.1.2) Cause for, and disposition of surplus egg takes.

To meet production goals and counter the effect of culling related to BKD management, WDFW may collect up to 20 percent extra hatchery-origin spring Chinook females (replacing hatchery fish with titers of OD greater than 0.12 and wild fish with titers of OD greater than0.19). In general, permit conditions specify a maximum number of broodstock that can be collected as determined by expected pre-spawning survival of broodstock, fecundity, and survival-to-release of progeny. To facilitate achievement of the production target of 60,516 smolts while anticipating the need to cull progeny of high-ELISA (BKD) females, current annual protocols for broodstock collection include collection of up to 12 percent additional broodstock above that necessary for the production target.

Given the deliberate over-collection for BKD management, culling of hatchery-origin eggs may occur as required to manage BKD and/or maintain production at no more than 60,516 yearling smolts. Under any circumstances, culling will be selective for hatchery-origin egg lots with the highest ELISA OD values. Culling of eggs from natural-origin females will not occur unless their ELISA levels are determined by WDFW Fish Health to be a substantial risk to the program.

9.1.3) Loading densities applied during incubation.

IHOT species-specific incubation recommendations will be followed for water quality, flows, temperature, substrate, and incubator capacities. Fertilized eggs from each female will be incubated in individual iso-buckets to the eyed-egg stage to segregate for ELISA values and then transferred to Heath stack incubators, with the progeny of one female per Heath tray (approximately 4,000 eggs per tray). Incubation conditions will be based on loading densities recommended by Piper et al. (1982).

9.1.4) Incubation conditions.

Eggs may be incubated full-term (green egg to emergence) at either Eastbank Hatchery or Winthrop. At Eastbank Hatchery, eggs will be incubated in MariSource vertical incubators. The incubators are configured with eight-tray units called "half-stacks." Each tray consists of a "water tray," which conducts the water flow through egg trays that are inserted in the water trays. The egg trays have a mesh lid on them. The water flows into the back of the water tray; then flows forward through the eggs or fry; then flows back down the sides; then exits to the back of the next tray below. Each tray is supplied with 2 gpm of chilled water and 1 gpm of well water. The chilled water is 3ºC and is mixed with well water to meet an incubation temperature of 5 to 7º C (adjusted based on developmental needs and desired emergence timing). At spawning, the eggs from a single female will be added to a single tray. The capacity of a single tray is about 6,500 eggs.

9.1.5) Ponding.

Unfed spring Chinook fry are transferred from Heath trays for ponding at swim-up. Ponding generally occurs after the accumulation of 1,650 to 1,750 temperature units. Unfed fry are transferred to rearing ponds from early May through early June.

9.1.6) Fish health maintenance and monitoring.

Eggs will be examined daily by hatchery personnel. Prophylactic treatment of eggs for the control of fungus is prescribed by fish-health specialists, and may include treatment with formalin or other accepted fungicides. Non-viable eggs and sac-fry will be removed by bulb-syringe. Adherence to WDFW, PNFHPC, and IHOT (1995) fish disease-control policies reduces the incidence of diseases in fish produced and released from hatcheries. All lots will be monitored for BKD; no eggs will be retained from hatchery-origin females with ELISA OD values 0.12 or greater. Culling of eggs from natural-origin females will not occur unless their ELISA levels are determined by WDFW Fish Health to be a substantial risk to the program (generally >0.19). Juveniles from natural-origin females with

ELISA levels of 0.12 or greater will be differentially tagged for evaluation purposes. If the program is under the target 60,516 goal, some low-ELISA fish may be reared at lower densities.

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

All eggs brought to the facility will be surface-disinfected with iodophor (as per disease policy). Eggs will be incubated in pathogen free, silt-free well water to ensure maximum egg survival and minimize potential loss from disease. All equipment (nets tank and rain gear) will be disinfected with iodophor between different fish/egg lots. Different fish/egg lots will be physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water. Tank trucks will be disinfected between the hauling of different fish lots. Foot baths containing iodophor will be strategically located on the hatchery grounds (i.e., entrance to "clean" or isolated areas of the incubation room) to prevent spread of pathogens. Formalin drips will be applied to prevent fungal spread from dead eggs. Flow, dissolved oxygen, and temperature units will be monitored per IHOT or program guidelines.

In order to minimize the likelihood for adverse genetic and ecological effects as a result of fish mortality, redundant power supplies will be provided to the hatcheries for supplying power to the pumps as well as an alarm to alert hatchery personnel of electrical failure or water flow/elevation changes.

See Section 5.4.2 regarding measures to be applied regarding BKD.

9.2) Rearing:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available.

See Table 9-1 in Section 9.1.1.

9.2.2) Density and loading criteria (goals and actual levels).

Table 9-2, below, represents current density and loading criteria. The HCP Hatchery Committee may adjust criteria as deemed necessary.

Table 9-2. Density and fish loading criteria for spring Chinook

Rearing Criteria	Spring Chinook	
Rearing Criteria	ELISA ≤0.119[1]	ELISA ≥0.12
Density index (lbs/cf-in)	0.12	0.06
Flow index (lbs/gpm-in)	0.75	0.60
Acclimation Criteria	Spring Chinook	
Density index (lbs/cf-in)	0.10	0.06
Flow index (lbs/gpm-in)	1.00	0.60

Note:
1 – The 0.119 threshold was developed jointly by the USFWS and WDFW. Natural origin fish with an ELISA >0.19 will be culled.

9.2.3) Fish rearing conditions

Temperature, dissolved oxygen, and pond turnover rate will be monitored. IHOT standards for water quality, alarm systems, predator control measures (netting) to provide the necessary security for the cultured stock, loading, and density will be followed. Settleable solids, unused feed, and feces will be removed regularly to ensure proper cleanliness of rearing containers. All ponds will be vacuumed weekly for the yearlings. Ponds will be pressure washed between broods. Temperature and dissolved oxygen will be monitored and recorded daily during fish rearing.

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

These data have not been collected monthly at the Methow Hatchery, where this program was historically implemented.

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.

These data have not been collected monthly at the Methow Hatchery, where this program was historically implemented.

9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Table 9-3. Food type information.

Rearing Period	Food Type	Application Schedule (#feedings/day)	Feeding Rate Range (%B.W./day)	Lbs. Fed Per gpm of Inflow	Food Conversion During Period
December-January	BioDiet Starter	3-4	1.0-3.0	0.025	0.8
February-March	BioDiet Starter	2-3	1.0-2.0	0.02	1.0
April-May	BioVita	2	1.0-2.0	0.02	1.0
June-September	BioVita	1-2	1.0-1.5	0.02	1.0
October-April	BioVita	1	1.0	0.02	1.0

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.

Standard fish-health monitoring will be conducted by a fish-health specialist at frequencies appropriate to the life stage and susceptibility to disease. Significant fish mortality attributable to unknown causes will be sampled appropriately for study (i.e., viral assay, bacterial culture, and histopathology). Fish health maintenance strategies are described in IHOT (1995). Incidence of viral pathogens in spring Chinook broodstock will be determined by sampling fish at spawning in accordance with the Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State. Populations of particular concern may be sampled at the 100 percent level and may require segregation of eggs/progeny in early incubation or rearing.

Typical disease treatments include:

- Formalin – prophylactic fungal treatment and post-handling
- Aquamycin – fed for BKD treatment and prophylaxis
- Erythromycin – fed and injected to manage BKD
- Azithromycin – fed and injected to manage BKD
- Chloramine T – bath to treat external bacteria

Fish will be monitored daily by staff during rearing for signs of disease, through observations of feeding behavior and monitoring of daily mortality trends. A fish health specialist will monitor fish health often as determined necessary. More frequent care will be provided as needed if disease is noted. Hatchery specialists under the direction of the fish health specialist will provide treatment for disease. Sanitation will consist of raceway cleaning as necessary by brushing, and disinfecting equipment. Fish-health examinations will be performed on all spring Chinook production lots throughout the rearing period and pre-release.

All equipment (nets, tanks, and boots) will be disinfected with iodophor between different fish/egg lots. Tank trucks will be disinfected between the hauling of adult and juvenile fish. Foot baths containing disinfectant will be strategically located on the hatchery grounds to prevent spread of pathogens.

The general policy is to bury dead juvenile fish and eggs to minimize the risk of disease transmission to natural fish. Adult spring Chinook carcasses will be buried or disposed of in an approved landfill if individuals have been treated with antibiotics and died within the withdrawal period. All adults injected with maturation accelerating hormones (such as sGnRHa implants) will be disposed of in an approved landfill, consistent with Investigational New Animal Drug requirements.

9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.

Degree of smoltification will be monitored through monthly collection of data indicating average condition factor (Kfl) of the populations. Gill ATPase levels have been monitored in the past to attempt to indicate degree of smoltification. However, this index has not been found to be a useful tool for determining when to begin releases, due to the delay in obtaining results from sampling and the finding that ATPase levels do not actually increase until the smolts are actively migrating in the Columbia River (Petersen et al. 1999). In general, hatchery staff observe fish behavior and appearance to make fine scale, best professional opinion adjustments to release timing/truck planting within the release window. Behavioral smoltification cues include increased activity and swimming adjacent to the edges of rearing vessels. Appearance cues include loss of parr marks, silvery appearance, caudal fin banding, and scale loss.

9.2.9) Indicate the use of "natural" rearing methods as applied in the program.

Currently, natural rearing methods are approached through the transfer of most Chinook smolts to acclimation ponds at release locations. The acclimation ponds provide lower density rearing vessels for the fish on their natal water prior to release. Additionally, in the case of the Yakama Nation acclimation locations, most of these locations support the concept of rearing smolts in natural ponds. This concept has been tested over the last decade as part of the Yakama Nation's coho restoration project in the Wenatchee and Methow Rivers. The coho restoration project has demonstrated both high survival rates (juveniles and adults) as well as adult returns with SARs comparable or higher than established supplementation program in the Upper Columbia (YN 2010)

9.2.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during propagation

- Marked fish from outside of the Mid-Columbia region will be excluded from the Methow broodstock. Progeny from adults captured at Wells Dam that are from the Entiat or Wenatchee basins will be returned to their tributary of origin, if this action is consistent with fish health protocols. This will require reading of CWTs during spawning.
- Adults may be PIT tagged (or individually marked by some means) to identify them by time of arrival. If too many adults are collected because the actual run size differs substantially from the prediction, adults may be selected for return to the river for natural spawning or, alternatively, removed for control of pHOS. This will be performed in a manner that allows an adequate representation of the gene pool and is consistent with ongoing disease prophylaxis treatments. Origins of late arriving adults (i.e., spring Chinook versus summer Chinook) will be based on timing and morphological and phenotypic differences.
- In-situ stock separation of Methow/Chewuch composite from other or stray fish via genetic analysis, scale analysis, PIT-tag identification, and/or reading of CWTs during spawning operations will continue.

SECTION 10. RELEASE

Responsibilities: Chelan PUD is responsible for providing the funding for the activities described in Section 10. WDFW is currently contracted to conduct the activities described in Section 10. Consistent with these responsibilities, Chelan PUD and WDFW will be co-permit holders for the activities described in this section with WDFW designated as an agent under a current contract between Chelan PUD and WDFW and until this contract expires and is not renewed or renegotiated.

10.1) Proposed fish release levels.

Table 10-1. Approximate size and number targets for production of spring Chinook smolts from Chelan PUD's Methow River spring Chinook Hatchery Program. Targets are subject to change at the discretion of the HCP Hatchery Committees.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs	None	NA	NA	NA
Unfed Fry	None	NA	NA	NA
Fry	None	NA	NA	NA
Fingerling	None	NA	NA	NA
Yearling	60,516 (+/-10%)	15 – 18	April – May	Methow River

10.2) Specific location(s) of proposed release(s).

Table 10-2. Release Locations for Chelan PUD's Methow River Spring Chinook Hatchery Program

Release Location	Waterbody	Release Point (RM)
Carlton Acclimation Pond	Methow River	37.5
Goat Wall Acclimation Sites	Methow River	68.0
Mid Valley Pond	Methow River	54.4
Chewuch River Pond	Chewuch River	8.0
Other locations approved by the HCP Hatchery Committee	Methow River Basin	To be determined

All sites are in the (Upper) Columbia River watershed in WRIA 48. Future acclimation facilities/sites within the Methow Basin may be developed by others and may receive releases of spring Chinook from Chelan PUD's Chinook program at the discretion of the HCP Hatchery Committees.

10.3) Actual numbers and sizes of fish released by age class through the program.

Table 10-3. Methow River yearling spring Chinook smolt releases, 1994 to 2005.

Release Year	Methow River No.	Date (MM/DD)	Avg Size (fpp)
1994	-	-	-
1995	210,849	4/15	15.9
1996	4,477	4/22	14.5
1997	28,878	4/15	14.1
1998	202,947	4/15	18.1
1999	332,484	4/15	18.3
2000	218,499	4/17	16
2001	180,775	4/17	11.0
2002	66,454	4/16	16.9
2003	130,787	4/21	16.0
2004	181,235	4/2-14	15.8
2005	48,831	4/18	16.0

Note:
Data source: Snow et al. (2008), and WDFW unpublished data.

10.4) Actual dates of release and description of release protocols.

See Section 10.3 (Table 10-3) for recent release dates. Historically, releases from the acclimation ponds at the beginning of the release period in April are volitional for approximately 20 days with the remaining fish forced out by mid-May.

10.5) Fish transportation procedures, if applicable.

Pre-smolts will be transported from the hatchery to the acclimation sites by tanker truck. Current fish-transport procedures include crowding and loading into distribution trucks via a fish pump. Distribution trucks are reliable and safe, and water is tempered as appropriate. Fish are tempered to within 3°C of the receiving water prior to release into the ponds. Loading densities are from 0.3 to 0.5 pounds of fish per gallon of water. Fish are volitionally released directly from the ponds to the river and do not require additional transportation.

10.6) Acclimation procedures

Transfer date to acclimation sites would range from February to March depending on annual temperature variation and the necessity to temper fish to within 3°C of receiving water. Pre-smolts will be transferred from the Carlton Pond to the acclimation ponds where fish are acclimated for approximately 30 days. Fish will be provided a volitional release and are expected to migrate quickly from the acclimation facilities.

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

All juveniles will be 100 percent CWT marked. All smolts will be marked to distinguish specific program and hatchery crosses and to facilitate removal of hatchery-origin fish in selective fisheries. Additionally 25 percent of the hatchery releases would be PIT-tagged so they can be easily detected and removed at sorting/collection facilities prior to spawning.

10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

Broodstock and egg collections are designed to minimize the potential for egg surpluses. Egg surpluses, if any, will be culled (see Section 9.1.2). Thus, surplus smolts are not expected. If smolt surpluses do exists, transfer to other programs, provided they meet fish health and population acceptance criteria may occur or smolts may be out-planted to a recipient lake (without connectivity to the Columbia River system) for a resident program if supported by the JFP.

Deleted: co-managers

10.9) Fish health certification procedures applied pre-release.

Fish health and disease conditions are continuously monitored in compliance with the requirements of the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (Co-managers 1998), requirements of the Section 10 ESA permit issued, and guidelines of IHOT (1995). Spring Chinook will be monitored daily by staff during rearing for signs of disease through observations of feeding behavior and monitoring of daily mortality trends. A fish health specialist will monitor fish health as least monthly; these inspections must adhere to the disease prevention and control guidelines established by the PNFHPC. More frequent care will be provided as needed if disease is noted. Prior to release, the population health and condition will be established by the Area Fish Health Specialist. This is commonly done 1 to 3 weeks before release, and up to 6 weeks before release on systems with pathogen-free water and little or no history of disease.

10.10) Emergency release procedures in response to flooding or water system failure.

Emergency releases shall be allowed in the event of flooding, water loss to raceways, or vandalism that necessitates early release of ESA-listed spring Chinook to prevent catastrophic mortality. Any emergency releases made by the hatchery operators will be reported immediately to the NMFS Salmon Recovery Division in Portland, Oregon.

10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

The risk of ecological hazards to listed species resulting from liberations of hatchery-origin spring Chinook will be minimized through the following measures:

- Hatchery spring Chinook will be reared to sufficient size such that smoltification occurs within nearly the entire population, reducing residence time in the streams after release and promoting rapid seaward migration which can reduce precocious maturation.
- Spring Chinook smolt releases will be timed to improve survival at mainstem dams and to reduce the duration of interactions with wild fish and non-target taxa.
- Acclimation in natal stream water will contribute to smoltification, reducing the residence time in the rivers and mainstem corridors.
- Hatchery spring Chinook smolts will be released when environmental conditions exist that promote rapid emigration.
- Total number of smolts released with expected adult contribution to natural spawning will be managed with consideration of HCP obligations as well as tributary carrying capacity.
- All artificially propagated UCR spring juveniles shall be externally or internally marked prior to release according to the coordinated marking scheme under development by the HCP Hatchery Committees.

Variance from this smolts-only release requirement shall only be allowed in the event of an emergency, such as flooding, water loss to raceways, or vandalism that necessitates early release of ESA-listed spring Chinook to prevent catastrophic mortality. Any emergency spring Chinook releases made by the action agencies will be reported immediately to the NMFS Salmon Recovery Division in Portland, Oregon.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

Monitoring and evaluation plays an important role in helping measure program results and determining future directions (adaptive management). The HCP Hatchery Committee has developed a rigorous monitoring plan and program for the Methow River Spring Chinook Program (Hillman et al. 2013). Currently, the M&E program monitors survival and growth within the hatchery and the effects of hatchery fish on population productivity, genetic diversity, run and spawn timing, spawning distribution, and age and size at maturity. This information is collected directly from or derived from spawning ground surveys, broodstock sampling, stock composition sampling (stock assessment), hatchery juvenile sampling, smolt trapping, precocity sampling, PIT tagging, CWT tagging, genetic sampling, disease sampling, and snorkeling. Importantly, the monitoring and evaluation program is consistent with the draft monitoring and evaluation plan prepared by NMFS for the *Upper Columbia Spring Chinook and Steelhead Recovery Plan* (see Appendix P to the Recovery Plan) and the Ad Hoc Supplementation Monitoring and Evaluation Workgroup recommendations (Galbreath et al. 2008).

11.1.1) Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.

The existing M&E program document (Hillman et al. 2013) describes the data collection effort in detail (see Section 11.1).

11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

Chelan PUD will continue to fund hatchery M&E according to its obligations in the Rock Island and Rocky Reach HCPs. In 2013, Chelan PUD's M&E obligations were updated by the Hatchery Committee (Hillman et al. 2013). It is expected that Chelan, Douglas, and Grant PUDs will proportionally co-fund the M&E activities for spring Chinook in the Methow Basin.

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

The current HCP approved M&E Plan describes this section fully (Hillman et al. 2013).

SECTION 12. RESEARCH

Currently, no research program is conducted in direct association with the hatchery program described in this HGMP. Chelan PUD will be responsive to research needs identified and approved by the Rocky Reach and Rock Island HCP Hatchery Committees.

12.1) Objective or purpose.

N/A

12.2) Cooperating and funding agencies.

N/A

12.3) Principle investigator or project supervisor and staff.

N/A

12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

N/A

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.

N/A

12.6) Dates or time period in which research activity occurs.

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.

N/A

12.8) Expected type and effects of take and potential for injury or mortality.

N/A

12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table" (Table 1).

N/A

12.10) Alternative methods to achieve project objectives.

N/A

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

N/A

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

N/A

SECTION 13. ATTACHMENTS AND CITATIONS

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the information provided is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by_____________________________ Date:_____________

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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	March 21, 2014
From:	Mike Schiewe, Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the February 19, 2014 HCP Hatchery Committees Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees' meeting was held at Douglas PUD headquarters in East Wenatchee, Washington, on Wednesday, February 19, 2014, from 9:30 am to 12:00 pm. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- Mike Tonseth will revise the Extension Request for the Wenatchee Relative Reproductive Success Study (RSS), as discussed, and will provided the final request to Kristi Geris for distribution to the Hatchery Committees no later than February 28, 2014 (Item I).
- Mike Tonseth will develop a draft protocol for measuring fecundity at size, and provide the draft protocol to Kristi Geris for distribution to the Hatchery Committees no later than February 28, 2014 (Item I).
- Alene Underwood will review the status of pending recirculation pilot studies at Eastbank Fish Hatchery and Chiwawa Fish Hatchery, and will report back to the Hatchery Committees by the April 16, 2014 meeting (Item I).
- Chelan PUD will provide the revised draft Chelan PUD Methow Spring Chinook Hatchery and Genetic Management Plan (HGMP) in redline strikeout (RLSO) to Kristi Geris for distribution to the Hatchery Committee by February 20, 2014; Hatchery Committees members will document their approval or request for additional changes to the draft HGMP via email to Chelan PUD no later than Friday, February 28, 2014 (Item II-B).
- Chelan PUD will provide an electronic copy of the Rocky Reach Trap Proposal to Kristi Geris for distribution to the Hatchery Committees (Item II-C).
- Chelan PUD will consider modifying the visual and auditory passive integrated

transponder (PIT)-tag detection signals leading up to the Rocky Reach Trap to differentiate between detection locations (Item II-C).
- Chelan PUD will provide video from the Rocky Reach Trap 2013 Pilot Study to Kristi Geris to post on the HCP Hatchery Committees Extranet Site (Item II-C).
- Chelan PUD will revise Table 1 of the draft Rocky Reach Trap Proposal, including: 1) correcting for age at return; and 2) verifying Chewuch numbers (Item II-C).
- Chelan PUD will develop a flow diagram describing the sequence of options for collecting Methow spring Chinook broodstock to meet Chelan PUD's 2014 production obligation (Item II-C).
- Greg Mackey will provide the draft Non-Target Taxa of Concern (NTTOC) Report for a 60-day review to Kristi Geris for distribution to the Hatchery Committee prior to the meeting on March 19, 2014 (Item III-C).
- The Yakama Nation (YN), Douglas PUD, and Chelan PUD will develop a list of questions for Karl Halupka (U.S. Fish and Wildlife Service [USFWS]) regarding how incidental take is assigned for discussion at the National Marine Fisheries Service (NMFS)/USFWS Biological Opinion Coordination Meeting on March 10, 2014 (Item V-A).

DECISION SUMMARY

- The Hatchery Committees representatives present approved the Chelan PUD 2014 Sockeye Monitoring and Evaluation (M&E) Implementation Plan, as revised (Item II-A).
- The Hatchery Committees representatives present approved the Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan (Item II-D).

AGREEMENTS

- The Hatchery Committees representatives present agreed to consider approval of the Chelan PUD Methow Spring Chinook HGMP by email no later than February 28, 2014 (Item II-B).

REVIEW ITEMS

- Kristi Geris sent an email to the Hatchery Committees on January 20, 2014, notifying them that the draft Wells Hatchery Modernization 30% Design Drawings and draft Wells Hatchery Preliminary Design Report are available for download from the HCP Hatchery Committees Extranet Site. These documents are available for a 60-day review period, with comments due to Greg Mackey no later than Friday, March 21, 2014 (Item I).
- Kristi Geris sent an email to the Hatchery Committees on February 21, 2014, notifying them that the revised draft Chelan PUD Methow Spring Chinook HGMP is available for review with an email vote due to Chelan PUD no later than Friday, February 28, 2014 (Item II-B).
- Kristi Geris sent an email to the Hatchery Committees on February 21, 2014, notifying them that the draft Rocky Reach Trap/Methow Spring Chinook Broodstock Collection Proposal is available for review with comments due to Chelan PUD no later than Friday, March 7, 2014 (Item II-C).

FINALIZED DOCUMENTS

- The Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan that was approved by the Hatchery Committees on February 19, 2014, was approved by the HCP Coordinating Committees on February 25, 2014, and was finalized and distributed to the Hatchery Committees by Kristi Geris on February 26, 2014.

I. Welcome, Agenda Review, Meeting Minutes, and Action Items

Mike Schiewe welcomed the Hatchery Committees and asked for any additions or other changes to the agenda. The following revisions were requested:

- Alene Underwood added a decision on the Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan.
- Greg Mackey added a NTTOC Update.
- Bill Gale added a discussion on incidental take.

The Hatchery Committees reviewed the revised draft January 15, 2014 meeting minutes. Kristi Geris said that a second revised version was distributed to the Hatchery Committees on

February 18, 2014, which included additional edits tracked in RLSO. She said that one comment is remaining to be discussed regarding the discussion on Chelan PUD's Sockeye M&E Implementation Plan. Keely Murdoch clarified that her comments were regarding juvenile freshwater productivity estimates, and not spawner estimates. Reference to spawner estimates was omitted, as requested. Murdoch also reviewed her edits to the YN's coho trapping discussion, and Lynn Hatcher said that Craig Busack noted a couple of discrepancies between his records and what was reported in the meeting minutes with regards to currently permitted trapping dates and the requested modified trapping hours. Murdoch said that she will contact Busack to confirm these details. Greg Mackey also noted edits he made to the coho trapping discussion regarding incidental take and how it is applied. Bill Gale said that he recently spoke with Karl Halupka (USFWS) about this topic, and that he will provide a brief summary of their discussions later in the agenda.

The Hatchery Committees members present approved the draft January 15, 2014 meeting minutes, as revised. Geris will finalize the meeting minutes and distribute them to the Committees.

Action items from the last Hatchery Committees meeting on January 15, 2014, and follow-up discussions were as follows: *(Note: italicized item numbers below correspond to agenda items from the January 15, 2014 meeting.)*

- *Bill Gale will discuss with RD Nelle an appropriate venue for a presentation on lamprey distribution in the Wenatchee River, and discuss the outcome with Mike Schiewe (Item II-A).*
  Gale said that he spoke with Nelle and Steve Lewis, and they agreed to introduce this discussion at the Rocky Reach Fish Forum.
- *Hatchery Committees representatives will discuss with their respective agency's Coordinating Committees representative their recommendations regarding Hatchery Committees access to all HCP-related documents on the HCP Extranet site, including Coordinating, Hatchery, and Tributary Committees' documents; Mike Schiewe will raise the issue during the HCP Coordinating Committees meeting on January 28, 2014 (Item II-B).*
  Schiewe said that the HCP Coordinating Committees had a thorough discussion regarding access to the HCP Extranet Sites. They agreed to develop two libraries: 1)

Draft Documents; and 2) Final Documents. HCP Committee Representatives and Alternates will have access to their respective Committee Draft Library, and also access to all HCP Committees Final Libraries. The HCP Coordinating Committees also decided that, with regard to HCP email distribution lists, any additions other than HCP Committee Representatives and Alternates will need to be brought forward by a HCP Coordinating Committees Representative and vetted by the HCP Coordinating Committees. Greg Mackey said that Douglas PUD would like Jayson Wahls and Charlie Snow to be included on the Hatchery Committees distribution list. Schiewe said that, per the recently agreed upon process, Tom Kahler will need to bring that request to the HCP Coordinating Committees for approval.

- *Mike Schiewe will obtain feedback from the HCP Coordinating Committees regarding their views on providing access rights to the HCP Extranet site to participants in the Hatchery Evaluation Technical Team (HETT; Item II-B).*
  Schiewe said that, as previously explained, a HCP Coordinating Committees Representative will need to request HCP Coordinating Committees' approval to add participants in the HETT to the HCP distribution list. Bill Gale said that USFWS would want Matt Cooper to be included on the Hatchery Committees distribution list. Schiewe said that Gale could either relay information to Cooper as needed, or Jim Craig will need to bring that request to the HCP Coordinating Committees for approval.
- *Tom Kahler will ensure that selected pre-HCP documents are available on the HCP Extranet site; actions needed to fulfill this action item will be determined following discussions in the HCP Coordinating Committees regarding Committee access rights to HCP documents on the site (Item II-B).*
  Kristi Geris said that Kahler is in the process of uploading selected documents to the Extranet Site.
- *Greg Mackey will provide the Wells Hatchery Modernization 30% design drawings for review to Kristi Geris for distribution to the Hatchery Committees (Item II-D).*
  Geris sent an email to the Hatchery Committees on January 20, 2014, notifying them that the draft Wells Hatchery Modernization 30% Design Drawings and draft Wells Hatchery Preliminary Design Report are available for download from the HCP Hatchery Committees Extranet Site. Geris also notified the Hatchery Committees on

February 20, 2014, that these documents are available for a 60-day review period, with comments due to Mackey no later than Friday, March 21, 2014.

- *The Hatchery Committees' meeting on February 19, 2014, will be held at Douglas PUD, with the Wells Hatchery Modernization Workshop to follow in the afternoon (Item II-D).*
  Noted.
- *Mike Tonseth will revise the Extension Request for the Wenatchee RRS Study, as discussed, and will provided the final request to Kristi Geris for distribution to the Hatchery Committees (Item III-A).*
  Tonseth will provide the final request to Geris for distribution to the Hatchery Committees no later than February 28, 2014.
- *Mike Tonseth will develop a draft protocol for measuring fecundity at size, and will provide the draft protocol to Kristi Geris for distribution to the Hatchery Committees to be discussed at the Hatchery Committees meeting on February 19, 2014 (Item III-B).*
  Tonseth will provide the draft protocol to Geris for distribution to the Hatchery Committees no later than February 28, 2014.
- *Chelan PUD will coordinate with the Washington Department of Fish and Wildlife (WDFW) and the YN to further discuss and revise the draft Sockeye Addendum to the final Chelan PUD 2014 Hatchery M&E Implementation Plan (Item IV-A).*
  The revised draft Chelan PUD 2014 Sockeye M&E Implementation Plan was distributed to the Hatchery Committees by Kristi Geris on February 5, 2014.
- *Chelan PUD will provide a formal Rocky Reach Trap Pilot Study Proposal for consideration at the Hatchery Committees' meeting by February 19, 2014 (Item IV-B).*
  This topic will be discussed today.
- *Bill Gale will provide Chelan PUD with the U.S. Fish and Wildlife Service's (USFWS') comments on the Chelan PUD Spring Chinook Hatchery and Genetic Management Plan (HGMP) no later than close of business on Friday, January 17, 2014 (Item IV-C).*
  Gale provided comments.
- *Kristi Geris distributed a meeting invite on January 16, 2014, for a WebEx conference call on February 6, 2014, from 9:00 am to 11:00 am, to discuss final comments on Chelan PUD's Spring Chinook HGMP (Item IV-C).*

Noted.

- *Hatchery Committees representatives will submit edits and comments on the draft Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan to Chelan PUD no later than Friday, January 31, 2014 (Item IV-D).*
  This topic will be discussed today.
- *Alene Underwood will review the status of pending recirculation pilot studies at Eastbank Fish Hatchery and Chiwawa Fish Facility, and will report back to the Hatchery Committees at the February 19, 2014 meeting (Item IV-D).*
  Underwood will report back to the Hatchery Committees by the April 16, 2014 meeting.
- *Hatchery Committees representatives will discuss with their respective agencies' Coordinating Committees representatives their recommendations regarding the YN's proposed coho trapping under the YN HGMP and future Biological Opinion (BiOp) (Item VI-A).*
  Mike Schiewe said that the HCP Coordinating Committees thoroughly vetted the YN's proposed coho trapping during their meeting on January 28, 2014. He said that Cory Kamphaus (YN) and Tom Scribner also attended the meeting by phone. The HCP Coordinating Committees approved the proposed trapping, contingent upon: 1) ongoing monitoring of detection times of steelhead and fall Chinook at Rocky Reach Dam and Wells Dam; 2) an annual re-evaluation by the HCP Coordinating Committees of the modified trapping operations during the initial years of implementation; and 3) the YN providing a report to the HCP Coordinating Committees summarizing trapping efforts with the modified operations.

II. Chelan PUD

A. DECISION: Chelan PUD 2014 Sockeye M&E Implementation Plan (Alene Underwood)

Alene Underwood said that Chelan PUD met with Andrew Murdoch and Keely Murdoch to review comments on the draft plan that were discussed at the Hatchery Committees meeting on January 15, 2014. She said that the plan was updated per their discussions, and the revised Chelan PUD 2014 Sockeye M&E Implementation Plan was distributed to the Hatchery Committees by Kristi Geris on February 5, 2014. Underwood said that Andrew Murdoch also reviewed and approved the changes made to the revised plan, and the

Hatchery Committees representatives present approved the Chelan PUD 2014 Sockeye M&E Implementation Plan, as revised.

B. Chelan PUD Methow Spring Chinook HGMP (Alene Underwood)

Alene Underwood said that during the conference call on February 6, 2014, held to discuss comments on the Chelan PUD Methow Spring Chinook HGMP, Chelan PUD agreed to distribute a RLSO version and a clean version of the revised HGMP for final review. She said that, as recommended, detailed information on the Rocky Reach Trap Pilot Study was moved from the body of the plan to Appendix E. She said that Chelan PUD needs to address a few additional comments on Appendix E, and then plans to provide the revised draft Chelan PUD Methow Spring Chinook HGMP in RLSO to Kristi Geris for distribution to the Hatchery Committee by February 20, 2014. *(Note: Underwood provided the draft HGMP to Geris on February 20, 2014, which Geris distributed to the Hatchery Committees on February 21, 2014.)* The Hatchery Committees representatives present agreed to consider approval of the Chelan PUD Methow Spring Chinook HGMP by email. Hatchery Committees members will document their approval or request for additional changes to the draft HGMP via email to Chelan PUD no later than Friday, February 28, 2014.

C. Rocky Reach Trap/Methow Spring Chinook Broodstock Collection Proposal (Alene Underwood)

Alene Underwood handed out a draft Rocky Reach Trap/Methow Spring Chinook Broodstock Collection Proposal (Attachment B), and noted that she would provide an electronic copy of the draft proposal to Kristi Geris for distribution to the Hatchery Committees. *(Note: Underwood provided an electronic copy of the draft proposal to Geris, which she distributed to the Hatchery Committees on February 21, 2014.)* Underwood explained that the proposed Chelan PUD Methow spring Chinook broodstock collection effort is a two-tiered approach: 1) trapping at the Rocky Reach Trap; and 2) tributary-based broodstock collection.

<u>Rocky Reach Trap</u>

Underwood recalled that, as discussed at the Hatchery Committees meeting on January 15, 2014, Chelan PUD plans to install a separation-by-code adult salmon collection system at Rocky Reach. She described where the new PIT-tag array will be installed following baffle

#4 and baffle #6, as depicted in Figure 1 of Attachment B. She said that a predetermined library of PIT-tag codes will be uploaded into the separation-by-code monitoring system, and the system will be connected to the PIT-tag arrays. She explained that as fish ascend the ladder, there will be an auditory and visual signal (light and beep) at baffle #4, another at baffle #6, and another at the newly installed PIT-tag array. Once the last signal occurs, the operator in the counting room will be able to visually observe the target fish and can manually operate the trap. She noted that if there is any confusion or doubt about whether the fish is a target fish, the operator will let the fish pass. Once a fish is trapped, it will be confirmed with a hand-held PIT-tag detector loaded with the same library of PIT-tag codes. Once confirmed, the target fish will be transferred to a holding tank located directly adjacent to the trap chamber, and Eastbank Hatchery Staff will be notified to transport the fish to Eastbank Hatchery for holding.

Keely Murdoch asked if the signals are unique so that the operator knows which detection point the fish is passing. Underwood agreed that this would be a good feature, and said that Chelan PUD will consider modifying the visual and auditory detection signals leading up to the Rocky Reach Trap to differentiate between detection locations.

Underwood said that a benefit of the proposed trap operations is that ladder passage at the dam will remain open because only certain fish will be targeted for trapping. Lynn Hatcher said that Bryan Nordlund also noted this benefit of the Rocky Reach Trap proposal.

Kirk Truscott asked if the new PIT-tag array will be far enough away from the trap to effectively trap fish. Underwood said that the operators from last year indicated that there will be ample time after fish pass the new PIT-tag array to open the trap gate. She added that the solid trap door was also replaced with a perforated trap door to avoid water displacement. She said that video was taken of trapping events during the Rocky Reach Trap 2013 Pilot Study, which shows the trap in operation. She said that Chelan PUD will provide this video to Geris to post on the HCP Hatchery Committees Extranet Site.

Catherine Willard reviewed Table 1 of Attachment B. She said that collection efforts will be targeting juveniles that are PIT-tagged in the Methow Basin; specifically, PIT-tagged natural-origin recruit (NOR) juveniles from the Chewuch River smolt trap and mark/recapture evaluations, and from the mark/recapture evaluations above the confluence of the Methow River and Twisp River. She said that Methow River smolt trap spring Chinook NORs will also be targeted, and if captured, genetic analyses will be used to differentiate Twisp River and non-Twisp River spring Chinook NORs. Adults that are determined to be of Twisp origin will be offered to Douglas PUD for their Twisp spring Chinook conservation program, hopefully in exchange for a MetComp NOR trapped at Wells Dam. Underwood said that the idea behind this provision is to avoid returning fish to the river; and added that if Chelan PUD cannot use the fish, perhaps someone else can. Willard said that up to 45 hatchery-origin recruit (HOR) adults from the Methow Hatchery MetComp smolt releases will also be targeted as contingency broodstock in the event that the total number of NORs needed for Chelan PUD's Methow Basin Conservation Program is not available. She said that as part of stray management, Chiwawa Hatchery spring Chinook will also be targeted, and if captured, they will be taken to Eastbank Hatchery and their disposition determined by the Joint Fisheries Parties (JFP).

Bill Gale noted that Winthrop National Fish Hatchery (NFH) is evaluating adult management by monitoring how many Winthrop-origin fish return to Winthrop NFH based on PIT-tag detections, and he questioned if removing fish at the Rocky Reach Trap may impact this evaluation. He said that this same evaluation could be conducted using coded-wire-tags (CWT); however, it would take several more years than it does using PIT-tags. He noted that Matt Cooper is conducting this study. Underwood said that Chelan PUD will contact Cooper to discuss this, and Gale said that, ultimately, discussions may also need to go through Douglas PUD. Mike Tonseth noted that this proposal is for 2014 only. He said that if Chelan PUD is able to meet their needs for the Conservation Program, and Grant PUD, Douglas PUD, and USFWS do not need the fish for their respective programs, those fish will be returned to the river. He said that it would be incorrect to assume that those fish will not be available. Greg Mackey said that when Douglas PUD PIT-tagged their hatchery fish, they did not have a clear adult management hypothesis defined. The tagging was focused on juvenile migration. He suggested identifying what PIT-tags are intended to do and who is contributing, and then developing a management policy for broodstock collection in regard to PIT-tagged fish. Hatcher said that this does not seem to be a significant issue for just one year. He added, however, that if the proposed trapping operations carry on into future years, then it may be necessary to revisit this discussion. Mackey said that Charlie Snow has been

PIT-tagging fish in-stream to obtain life stage survival data, but it is still unknown how many of those fish will return as adults. Snow agreed with Mackey and added that only in the last couple of years have a large number of PIT-tags been deployed; so it will be another year before adult return data are available. Snow also cautioned that if Chelan PUD is relying heavily on PIT-tags from the U.S. Geological Survey (USGS) efforts in the Chewuch, those efforts may be winding down. He said that USGS will no longer run the trap, nor will they continue PIT-tagging. Gale asked if the U.S. Bureau of Reclamation discontinued funding completely, and Snow said that he is unsure. He said that funding seems to be transitioning from habitat monitoring in the Chewuch and mainstem Methow to focusing more on the Twisp River. Willard said that she spoke to Patrick Connolly at USGS and he indicated that he was hopeful that USGS would receive additional funding to continue efforts in the Chewuch. She added that Connolly will submit a proposal to Chelan PUD to continue running the trap.

Truscott said that the numbers in Table 1 of Attachment B seem optimistic, noting that the numbers do not account for age at return. Snow also noted that the Chewuch numbers seemed incorrect. Willard stated that the Chewuch numbers definitely included fish PIT-tagged at the Chewuch smolt trap, but it may not have included WDFW's mark/recapture PIT-tagging efforts. Underwood said that Chelan PUD will review and revise Table 1 of the draft Rocky Reach Trap Proposal if necessary, including: 1) correcting for age at return; and 2) verifying Chewuch numbers.

Gale asked how many spring Chinook need to be tagged to collect all broodstock at the Rocky Reach Trap. Willard said that would depend on the smolt-to-adult return ratios, but it could range anywhere from about 3,500 to a much higher number.

Tributary-based Broodstock Collection

Underwood said that the fallback option for 2014 broodstock collection is tributary-based collection using tangle netting, if it was determined that enough NORs were available for the program. She said that most of the tangle netting methodology language in the draft proposal was borrowed from Grant PUD's tangle netting efforts in Nason Creek. Gale asked when Chelan PUD plans to review this option with Karl Halupka (USFWS), and Underwood said that she planned to first discuss this within the Hatchery Committees, and then take the proposal to Halupka at the NMFS/USFWS Biological Opinion Coordination Meeting on March 10, 2014.

Tonseth cautioned that, in the tributaries, conservation fish are not adipose fin (ad)-clipped; therefore, HOR fish may be inadvertently obtained as well. He added that no more than one-third of the run can be retained, which is why the proposal indicates that fish will be returned that are not needed. He also added that permits are not in place to conduct adult management. Hatcher asked what backup options are in place in case there are issues with obtaining the necessary permitting. Underwood said that because this is a conservation program, fish from Winthrop NFH would not be ideal; however, Gale indicated that Winthrop HOR fish could potentially be used as a last resort option. Truscott suggested that Chelan PUD develop a flow diagram describing the sequence of options for collecting Methow spring Chinook broodstock to meet their 2014 production obligation, and Underwood said that she would do so. She added that she reviewed Chelan PUD's permit language, which is essentially the same language that USFWS and NMFS approved for tangle netting in Nason Creek, so she does not anticipate issues with permitting. She also asked Hatcher about take coverage as it relates to this proposal. Hatcher said that Craig Busack indicated that Chelan PUD is covered under Permit 1392. Underwood said that she believes that is Chelan PUD's Rocky Reach Dam Incidental Take Permit, which only provides up to 2% incidental take coverage, which is not a lot of fish. She said that anything that puts Chelan PUD in jeopardy of exceeding the permitted take for the entire Project will be a deal-breaker.

Underwood acknowledged that the proposal is not an ideal situation, but noted that Chelan PUD is committed to obtaining these fish. She also noted that Chelan PUD is exploring several options for the future, including options for working with Douglas PUD at Methow Hatchery.

Tonseth noted the proposed 5 days per week, 6 hours per day trapping schedule, and suggested looking at historical PIT-tag passage data to determine catch probability for the proposed trapping period. Murdoch asked if a 6-hour window might be too short, and suggested that more brood might be obtained over a longer trapping window. She asked if 6 hours per day was a permitting constraint, and Underwood said that it was a staffing issue.

She added that if historical data indicate a longer trapping window improves trapping efficacy, adjustments to the trapping schedule can be considered. Truscott asked if the 6-hour window is the cumulative time of individual trapping events, and Underwood explained that the 6-hour window is staffing hours (i.e., a 6-hour block). Willard said that within the last 10 years, most detections occurred between 0800 and 1500 hours, and Underwood added that last year, the trapping schedule was also 6 hours per day.

Underwood said that this proposal will be presented to the HCP Coordinating Committees at their meeting on March 25, 2014.

D. DECISION: Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan (Alene Underwood)

Alene Underwood said that no comments were received on the draft plan by the January 31, 2014 deadline. The Hatchery Committees representatives present approved the Chelan PUD 2014 HCP Rocky Reach and Rock Island Action Plan.

III. Douglas PUD

A. Wells Hatchery Steelhead Broodstock Update (Greg Mackey and Jayson Wahls)

Greg Mackey said that some additional steelhead broodstock have been obtained by angling; however, angling conditions have been poor. He said that Douglas PUD also provided Craig Busack with a written explanation of the broodstock situation and requested permission to operate the ladder traps at Wells Dam earlier than permitted. He said that the request was to begin operating the traps as early as March 1, 2014, in an attempt to obtain spring-moving steelhead. He added that standard trapping protocols would still be implemented. Mike Schiewe noted that this request was also vetted in the HCP Coordinating Committees, and they endorsed the modified operations prior to Douglas PUD requesting permission from NMFS. Mackey said that Busack approved the request for the modified trapping dates. He also noted that Douglas PUD expects to obtain additional fish from the volunteer channels, and that angling efforts will also continue.

Jayson Wahls said that recently, over a 2-day period, hook-and-line angling efforts produced four females and one male. He said that fish are also beginning to appear in the volunteer channel, noting that five steelhead have been captured in the volunteer ladder. Of the five steelhead captured from the volunteer ladder, three steelhead were retained for broodstock including two males and one female (one male and one female were from Ringold Hatchery). He summarized that eight total steelhead have been obtained for broodstock in a one-month period: five by hook and line, one trapped in the volunteer channel, and two delivered from Ringold. He also noted that the Ringold Hatchery steelhead will be used for Columbia Safety-Net program.

Kirk Truscott asked if the Ringold eggs are kept separate, and Wahls replied that they are. Bill Gale asked what areas are being targeting for angling efforts, and Wahls said that efforts have been concentrated around the towns of Twisp, Carlton, and Methow. He added that the water has been frozen in the lower areas, so angling efforts have been focused more upstream. Truscott asked if steelhead have been observed in the Methow Hatchery volunteer channel, and Wahls said not yet, but that he expects to see some there this year. Truscott said that the Colville Confederated Tribes (CCT) also still plan to carry out broodstock collection efforts in the Okanogan.

B. Broodstock Protocols (Greg Mackey and Mike Tonseth)

Greg Mackey requested an update on the draft 2014 Broodstock Protocols. Mike Tonseth said the draft will be available for review prior to the Hatchery Committees meeting on March 19, 2014. He noted that the draft protocols are quite long, but that most programs have not changed from 2013. Mike Schiewe requested that Tonseth provide the draft protocols for review at least 10 days prior to the March meeting.

C. NTTOC Update (Greg Mackey)

Greg Mackey said that the draft NTTOC Report is being reviewed by HETT, with comments due to him by February 26, 2014. He added that he has already received comments from Todd Pearsons. He noted that there are several analyses and ways to evaluate these data, but the upshot is that no effects that exceeded the containment objectives were identified for programs released in the tributary basins. He said that, as requested, he included a detailed description of everything that was done, and added that he will provide the draft NTTOC Report to Kristi Geris for distribution to the Hatchery Committee for a 60-day review prior to the meeting on March 19, 2014.

D. REMINDER: Wells Hatchery Modernization Workshop (Greg Mackey)

Greg Mackey said that Ken Ferjancic, Jason Hill, and Ed Donahue from HDR Engineering, Inc. (HDR) plan to start the Wells Hatchery Modernization Workshop by about 12:30 pm, following the Hatchery Committees meeting.

IV. NMFS

A. HGMP Update (Lynn Hatcher)

Lynn Hatcher said that a NMFS/USFWS Biological Opinion Coordination Meeting is planned for March 10, 2014, from 1:00 pm to 4:30 pm.

Leavenworth Spring Chinook

Hatcher said that the Leavenworth Spring Chinook HGMP will be completed by spring 2014. He added that the BiOp is complete.

Wenatchee Steelhead

Hatcher said that the Wenatchee Steelhead HGMP will be completed by spring 2014. He said that NMFS is still waiting for a Steelhead Adult Management Plan. Mike Tonseth said that WDFW and the YN met last month, but they still need to arrange a follow-up meeting. Hatcher added that the draft Steelhead BiOp and Section 10 Permit are written, and will be shipped to Chelan PUD and others for their review when the final adult steelhead management plan is done.

Mid-Columbia Coho

Hatcher said that the draft Mid-Columbia Coho BiOp is in a near final version, and will be completed in March 2014.

Okanogan Steelhead and Methow Steelhead

Hatcher said that the Okanogan Steelhead HGMP and Methow Steelhead HGMP will be separated. He said the Okanogan Steelhead HGMP will be completed in August 2014, and added that the sufficiency letter was sent out on February 14, 2014. He said a Fishery Plan is still needed for the Methow with a completion date scheduled for Methow steelhead sometime during June to August.

Summer and Fall Chinook

Hatcher said that the summer and fall Chinook programs are still the lowest priority, but are planned to be addressed by early fall 2014. He added that summer and fall Chinook programs may actually be addressed before the Methow Steelhead HGMP, depending on how long it takes WDFW to draft a Fishery Plan for the Methow.

V. USFWS

A. Incidental Take (Bill Gale)

Bill Gale suggested raising the question of how incident take is assigned during the NMFS/USFWS Biological Opinion Coordination Meeting on March 10, 2014. He recalled that the question is whether incidental take is assigned to the owner of a facility or to the different operators at a facility. He said that he thinks that Karl Halupka (USFWS) indicated that incidental take is not assigned to the owner of a facility; however, consideration is taken of all potential incidental take at a given facility before take is issued to individual operators at that facility. Greg Mackey said that Douglas PUD is under the impression that they are responsible for any take at the Wells Project, which includes all associated facilities, and added that ultimately, clear understanding is needed one way or the other. The YN, Douglas PUD, and Chelan PUD agreed to develop a list of questions for Halupka regarding how incidental take is assigned for discussion at the NMFS/USFWS Biological Opinion Coordination Meeting on March 10, 2014.

VI. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees' meetings are on March 19, 2014 (Douglas PUD); April 16, 2013 (Chelan PUD); and May 21, 2014 (Douglas PUD).

List of Attachments

Attachment A	List of Attendees
Attachment B	Draft Rocky Reach Trap/Methow Spring Chinook Broodstock Collection Proposal

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Alene Underwood*	Chelan PUD
Catherine Willard	Chelan PUD
Greg Mackey*	Douglas PUD
Peter Graf	Grant PUD
Lynn Hatcher*	National Marine Fisheries Service
Kirk Truscott*	Colville Confederated Tribes
Keely Murdoch*	Yakama Nation
Bill Gale*	U.S. Fish and Wildlife Service
Michael Hunley	U.S. Fish and Wildlife Service
Mike Tonseth*	Washington Department of Fish and Wildlife
Jayson Wahls	Washington Department of Fish and Wildlife
Charlie Snow†	Washington Department of Fish and Wildlife

Notes:

* Denotes Hatchery Committees member or alternate

† Joined by phone

DRAFT Proposal to Trap Spring-Run Chinook Salmon at Rocky Reach Trap and Tributary Based Broodstock Collection, 2014

Purpose: To collect Methow spring-run Chinook salmon broodstock (n=38) in 2014 to meet Chelan PUD's production obligation of 60,516 smolts.

Chelan PUD is proposing a two-step approach to collect Methow spring-run Chinook salmon in 2014. The first step consists of testing newly installed sorting technology the Rocky Reach trap (RRT) to determine if appropriate broodstock could be collected to meet program needs. The second step will consist of a tributary based approach utilizing tangle nets to collect broodstock in the Chewuch River. The following is a description of the two proposed methods.

<u>Rocky Reach Trap</u>

The RRT was used historically to capture listed steelhead and bull trout (in 2002 and 2005-2007, respectively), as part of studies required for implementation of the Rocky Reach License. Based on these previous efforts with steelhead and bull trout, it was determined that select individual fish can be effectively removed at the RRT, without delaying unmarked fish or non-target species. Additionally, based on a 2013 pilot study, externally marked spring Chinook were successfully removed at the RRT, on an individual basis without delaying non-targeted spring Chinook.

In response to results and observations made from conducting the 2013 spring Chinook pilot study, several trap modifications were identified and have been made in early 2014 in an effort to improve operation of the trap and increase the success of each trapping event:

- Replace the solid trap door with a rectangular 1" diameter vertical bar screen with 1" gaps to reduce the changes in water velocity observed by a solid door, which appeared to deter fish moving into the trap;
- Install underwater lighting and an underwater camera that can capture the view of the trap entrance to enable better viewing of the fish as they move into the trap;
- Install an electrical control pendant for the technician located above the trapping area to allow additional control of the trap door;
- Paint the floor in the viewing window white to create contrast.
- Installation of separation-by-code technology.

2014 will represent a second pilot year to evaluate all of the trap modifications/improvements and to test the efficacy of using separation-by-code technology to target PIT tagged natural origin (NO) adults for broodstock (and hatchery origin [HO] adults to the extent needed, to meet the production target).

Separation-by-Code Technology

The RRT trap is operated by use of a manually operated pneumatic gate that directs individual fish to a collection area and a trapping vessel. The trap design mimics a basket; it is lowered into the fish ladder and can remove one fish at a time. To identify broodstock for collection, the fish ladder directly in front of the counting room will be outfitted with a PIT tag detection array. This will provide a total of three PIT tag detection arrays located downstream of the trap in the fish ladder (baffle four, baffle six, and the entrance into the counting room/trap location). The separation-by-code software will rely on a pre-loaded library of PIT tag codes (Table 1), that when detected by one of the three PIT tag arrays, will send a visual and auditory signal to the trap operator indicating a target fish has been detected. As an identified target fish moves through the baffles of the ladder and subsequent PIT tag arrays (a total distance of roughly 125 feet), three sequential notifications will occur indicating the fish is approaching the trap chamber (Figure 1). Once the last notification occurs, the operator in the counting room will be able to visually observe the target fish, manually open the trap door, and trap the fish. The operator located above the trap will raise the trap and confirm the intended fish was trapped by use of a hand held PIT tag detector loaded with the same library of PIT tag codes.

Upon confirmation that the trapped fish is the intended target fish, the fish will be transferred to a holding tank supplied with recirculating water, directly adjacent to the trap. Eastbank Hatchery staff will be notified that a target fish has been captured and they will transport the fish to the Eastbank hatchery, directly adjacent to Rocky Reach Dam, via truck mounted holding tank supplied with Eastbank Aquifer water and oxygen.

Trapping will occur up to five days per week (Monday through Friday), and up to six hours per day, with unrestricted passage during non-trapping periods. Unless the trap operator is attempting to actively trap a target fish, the ladder will be open to passage. Trapping will begin in late April and will continue through about the third week in June (based on the average distribution of the most recent 10 years of data [DART] the first 5 percent of the spring Chinook run passes Rocky Reach by April 18, and the 95 percent passage date is June 17; therefore, 90 percent of the run passes during an approximately 60-day period).

The following PIT-tag codes will be targeted at the RRT in 2014:

- Chewuch River smolt trap and mark/recapture evaluations (natural spring Chinook)
- Mark/recapture evaluations above the mouth of the Twisp River (natural spring Chinook)
- Methow River smolt trap (natural spring Chinook)
- Methow Hatchery MetComp smolts (brood year 2009 and 2010)

Genetic sampling/assessment will be utilized to differentiate Twisp River and non-Twisp River natural-origin spring Chinook adults that were PIT tagged as juveniles at the Methow smolt trap, once transported to Eastbank Hatchery from the RRT. Any adults that are determined to be of Twisp origin could be provided to Douglas PUD for their Twisp spring Chinook conservation program in exchange for a MetComp NOR trapped at Wells Dam (contingent upon agreement with Douglas PUD). All NORs trapped at the RRT and subsequently held at Eastbank Hatchery for genetic sampling will be retained for broodstock. Additionally, up to 45 HO adults (no age-3 returns would be retained) from the Methow Hatchery MetComp smolt releases will be trapped at the RRT and held at Eastbank Hatchery as contigency broodstock in the event the total number of NORs needed for CPUDs Methow Subbasin conservation program are not available. If it is determined that these HO adults are not needed to meet Chelan PUD's Methow spring Chinook obligation, the following options are available (the JFP will be responsible for determining the priority and ultimate disposition of these fish): 1) they will be offered to Grant and/or Douglas PUDs if a shortfall exists in their program; 2) they will be offered to the USFWS Winthrop NFH for utilization in their safety net program; and 3) they will be released above Wells Dam or in the Methow River to offset any delays caused by retaining these fish.

Chiwawa Spring Chinook Stray Management
In an effort to control potential strays from the Chiwawa spring Chinook hatchery program, PIT tag codes from hatchery releases will also be included in the separation-by-code library. If encountered in the Rocky Reach arrays, these fish will be trapped and the disposition of them determined by the JFP.

Tributary Based Broodstock Collection
If insufficient broodstock are retained from the RRT, measures to collect natural-origin broodstock utilizing tangle netting in the Chewuch will be attempted (provided authorizations and approvals are received). Known or suspected spring Chinook spawning locations will be targeted for tangle netting.

Tangle Netting Methodology
Primary wild spring Chinook spawning areas will be identified using historical NOR spawning data. Only those areas (pools) of the river immediately above and below the spawning areas will be targeted for netting versus a randomized approach. Personnel that have experience capturing salmon using tangle nets will conduct the tangle netting. Any spring Chinook captured will be assessed for CWT. Any Chinook that are captured and not retained will be released in the vicinity of where it was captured. Fish tubes filled with water will be utilized to provide transfer from the river to the holding truck. Fish transportation equipment will ensure safe transportation of collected broodstock and will include equipment that is mechanically reliable and that can be disinfected, equipment to monitor dissolved oxygen levels, and salt will be made available if it is needed as a stress reduction measure.

Based on redd survey data the majority of bull trout spawning occurs in the upper Chewuch River above River Mile (RM) 34 and in Lake Creek (RM 4 and RM 7) and limited spawning occurs in Eightmile Creek around RM 1.6. Water temperatures in the Chewuch River below RM 34 exceed the upper range of bull trout spawning temperatures; bull trout utilize the Chewuch River below RM 34 for foraging and overwintering (USFS personal communication 2014). Radio-telemetry data documented bull trout entering spawning areas in the Chewuch subwatershed in early to mid-July (USFWS 2007). This data indicates that the majority of bull trout will likely have moved through areas that will be targeted for tangle netting for Chinook salmon, and increases the likelihood of being able to avoid the capture of bull trout. To further limit capturing bull trout, targeted pools will be snorkeled to determine what, if any level of bull trout presence exists; if bull trout are not observed or if they are located in an area that can be avoided by the netting while targeting Chinook then the crews will proceed. Personnel will be employed for this activity that have experience tangle netting for salmon, while avoiding bull trout in the process. Nets will be deployed in configurations that will minimize the likelihood of capturing bull trout if bull trout are associated with aggregations of spring Chinook. Nets will be monitored continuously for bull trout. Any bull trout that is incidentally caught will be immediately removed from the net and released to the nearest upstream pool that is not targeted for netting. If more bull trout are encountered than is reasonable and prudent (or anticipated to be in excess of permit/authorization limitations), all netting activities will cease.

Table 1. Source of PIT tagged juveniles for Methow spring Chinook broodstock collection in 2014.

Source of PIT Tagged Juveniles	Year Tagged			
	2009	**2010**	**2011**	**2012**
Chewuch River smolt trap and mark/recapture evaluations (natural spring Chinook)	131	1,190	1,894	1,768
Mark/recapture evaluations above the mouth of the Twisp River (natural spring Chinook)	142	38	399	880
Methow River smolt trap (natural spring Chinook)[a]	173	249	502	657
Total	446	1,477	2,795	3,305
Range of expected tagged adults migrating past Rocky Reach based on historic SAR's of tagged wild spring Chinook returned to Wells (SAR = .0015-.0122)	1-5	2-18	4-34	5-40
Methow Hatchery MetComp smolts[b]		15,998	17,973	NA
Range of expected tagged adults migrating past Rocky Reach based on historic SAR's of tagged hatchery spring Chinook returned to Wells (SAR = .0008-.0025)		13-40	14-45	

[a]Genetic sampling/assessment will be utilized to differentiate Twisp River and non-Twisp River natural-origin spring Chinook adults trapped at the RRT which were PIT tagged as juveniles at the Methow smolt trap; any adults that are determined to be of Twisp origin could be provided to Douglas PUD for their Twisp spring Chinook conservation program in exchange for a MetComp NOR trapped at Wells Dam (contingent upon agreement with Douglas PUD). All NORs trapped at the RRT and subsequently held at Eastbank Hatchery for genetic sampling will be retained for broodstock.

[b]Up to 45 HO adults (age-3 returns would not be retained) from the Methow Hatchery MetComp smolt releases will be trapped at the RRT and held at Eastbank Hatchery as contigency broodstock in the event the total number of NORs needed for CPUDs Methow Subbasin conservation program are not available. If it is determined that these HO adults are not needed to meet Chelan PUD's Methow spring Chinook obligation, the following options (in order of priority) are available: 1) they will be offered to Grant and/or Douglas PUDs if a shortfall exists in their program; 2) they will be offered to the USFWS Winthrop NFH for utilization in their safety net program; and 3) they will be released above Wells or in the Methow River to offset any delays caused by retaining these fish.

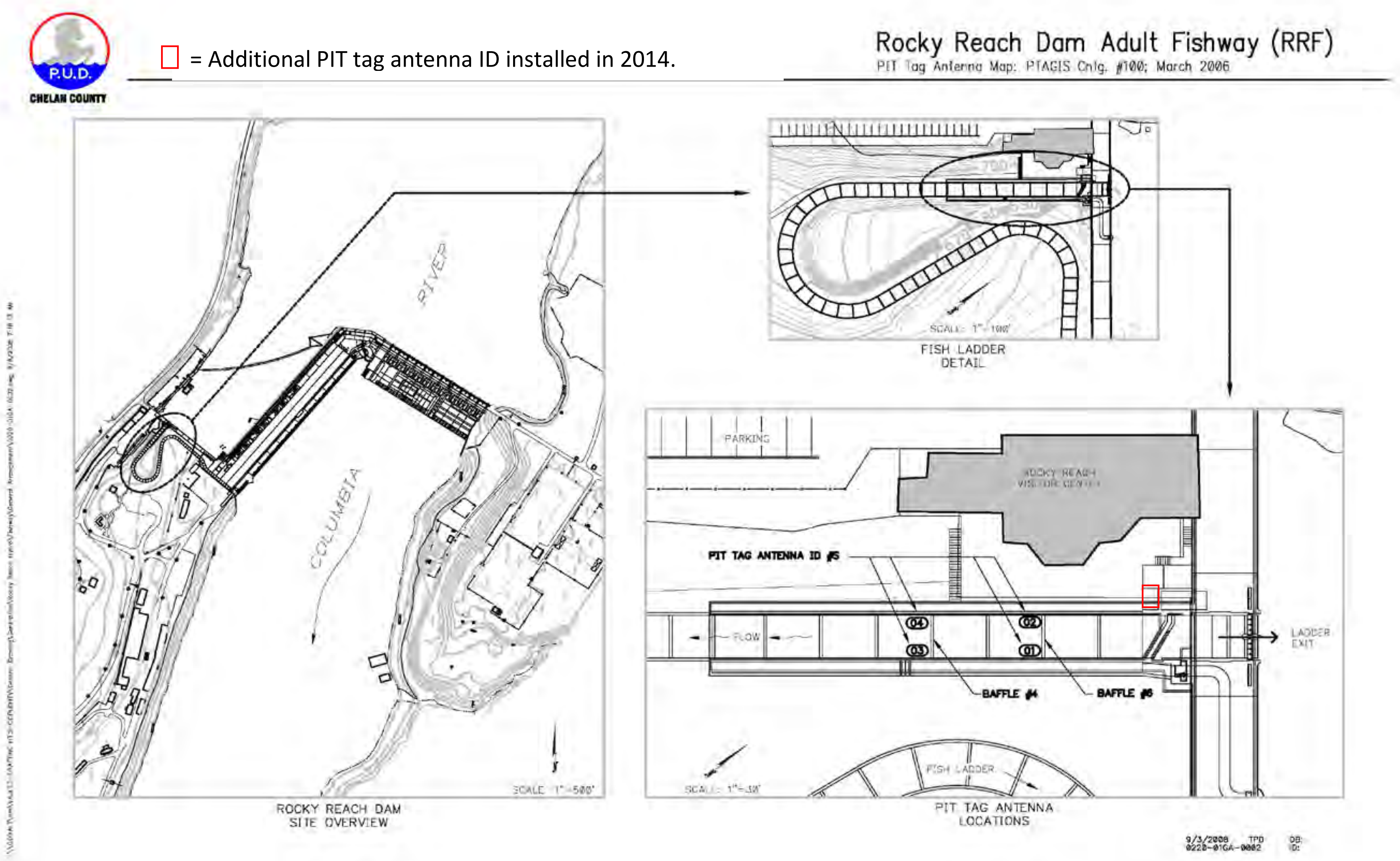

Figure 1. Rocky Reach adult fishway.

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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	April 4, 2014
From:	Kristi Geris		
Cc:	Mike Schiewe, HCP Hatchery Committees' Chair		
Re:	Final Summary of the February 19, 2014 Wells Hatchery Modernization Workshop		

This memorandum provides a summary of the Wells Hatchery Modernization Workshop that was held at Douglas PUD headquarters in East Wenatchee, Washington, on Wednesday, February 19, 2014, from 12:30 pm to 3:00 pm. Attendees are listed in Attachment A to this memorandum.

I. Wells Hatchery Modernization Workshop

A. Wells Hatchery Modernization Workshop (Greg Mackey)

Greg Mackey welcomed the attendees and introduced Ken Ferjancic, Jason Hill, and Ed Donahue from HDR Engineering, Inc. (HDR). Mackey said the purpose of this workshop is to review and receive Hatchery Committees comments and suggested changes on the Wells Hatchery Modernization 30% design drawings (Attachment B), which Kristi Geris notified the Hatchery Committees were available for download from the HCP Hatchery Committees Extranet site on January 20, 2014. Mackey said the 30% design contains a more detailed set of drawings and construction methods when compared to the Wells Hatchery Modernization Master Plan, but that the 30% design follows all of the fish rearing criteria and strategies approved by the Hatchery Committees during the review of the Master Plan on August 21, 2013.

Hill said that the Wells Hatchery Modernization 30% Submittal included: 1) the 30% design drawings; 2) a draft schedule; and 3) the Wells Hatchery Modernization Preliminary Design Report (also provided by Geris on January 20, 2014, along with the 30% design drawings). Hill explained that the Preliminary Design Report outlines the path forward and also identifies codes and initial engineering specifications moving into 60% design.

Hill reviewed the Overall Site Plan (see page 7 of Attachment B). He reviewed which existing infrastructure will remain at the site, as well as the new infrastructure that is planned for construction or refurbishment. He noted that all of the well water and surface (river) water at the site will flow into one newly designed headtank located along the west side of the site. He said the headtank has the ability to overflow, if needed, into the existing upper pool as well as into the emergency overflow area with shrubbery, as depicted on the plans. Hill also noted that the Adult Handling Facility will be relocated away from the toe of the dam to a higher location south and east of the original location as a dam safety measure. Mackey added that a 'Dam Safety Team,' including engineers with Jacobs Engineering and GeoEngineers, is also reviewing the plans from a safety and constructability perspective. Hill said that the Fish Transfer Facility was removed because it offered no advantages for fish handling, but that the plans still include the ability to allow water-to-water fish transfer from the Hatchery Building start tanks to the circular tanks or the raceways, and then from the circular tanks to dirt ponds 1 through 4. The idea is to provide water-to-water transfer for fish across all life stages. He also said that the design incorporates biosecurity features to limit exposure related to moving fish on and off station and public access. Ferjancic asked if the emergency overflow area will be wetted down frequently, and Hill replied that it should be only intermittently. Kirk Truscott asked if there were concerns with running the emergency overflow through Pond 2. Mackey responded that the design team was concerned about this initially, but the overflow feature will likely never contain flows that would enter Pond 2—it is an emergency overflow that would only be engaged if numerous other systems failed. Also, the overflow would be river water and should not pose a threat to fish health. Donahue added that there will be water control valves with built-in redundancy to control the surface water to help prevent water from moving into the emergency overflow area. Hill also noted that Pond 2 will likely be empty most of the year so there would be only a limited time when fish would be present, further reducing the risk to fish. The biological program for that pond indicated that subyearling Chinook would only be reared in Pond 2 for no more than 45 days each year. Bill Gale asked if hatchery operations will need to be moved to interim locations to accommodate the modernization. Hill replied that the modernization was designed to have the least amount of impact on current hatchery operations and the greatest amount of flexibility for construction activities and there were no plans to move the hatchery production during construction.

Truscott asked if any changes were planned for the wells themselves, and Mackey said that the entire well field had been evaluated in 2012 and 2013 and improvements were underway. He said that the water right is about 18,000 gallons per minute (gpm), with peak consumption according to the bioprogram of about 13,000 gallons per minute (gpm), which the current well field was only marginally able to produce. As a result, he said improvements have been made to several of the existing wells, including cleaning wells and installing larger pumps. He added that, to date, new pumps have been installed on Wells 10, 11, and 13, with a new pump planned for Well 12, which has increased capacity in each of those wells. He said that Wells 2 and 3 have deteriorated significantly and are not worth rehabilitating; however, a new well may be drilled adjacent to them (see page 14 of Attachment B). He said that in December 2013, an additional deeper well was drilled adjacent to existing Wells 5 and 6 (see page 15 of Attachment B). He explained that Well 6 is operable and Well 5 is an old test well and not used, and that the two wells share a water source (i.e., when water is low, the water level in Well 5 drops to increase the water level in Well 6). He said that a pump test on the newly drilled well is planned for March 2014 to determine the water production for that well in order to size the pump. He said that existing Well 7 was determined to be adequate—it had been broken but is now fixed and running smoothly. In addition, Well 8 will get a tune-up. He said that if everything goes as planned, the well field should be capable of delivering a water volume that will provide sufficient water to the hatchery while also perfecting and maintaining the existing groundwater right.

Hill reviewed Site Piping Plans 1 through 6 (see pages 16 through 21 of Attachment B), which depict the fish release lines that service the site. Mackey noted that the well water pipes that penetrate Wells Dam are old, so a new piping system is planned that will route the piping away from the dam. Hill also reviewed the Headtank Architectural Floor Plan (see page 23 of Attachment B). He explained that the headtank is divided into three sections: 1) the north end of the headtank is the surface water holding tank; 2) the south end of the headtank is the well water holding tank; and 3) the 20-foot area between the two tanks contains the fire water pump, job water pump, and motive water pumps. He briefly reviewed the Headtank Architectural Elevations (see page 24 of Attachment B); and then Mackey noted that the headtank will be enclosed to protect it from debris (see page 30 of Attachment B).

Hill reviewed the Hatchery Building Architectural Floor Plan (see page 34 of Attachment B). He noted that each of the anadromous fish programs has its own separate incubation room, and infrastructure will be installed to allow water-to-water transfer. Truscott asked if the incubation facility includes provisions for early imprinting, as discussed at the Wells Modernization Workshop on August 21, 2013. Mackey said that this is still in the plan, as discussed, and it is located within the incubation area in the room that is currently labeled "Storage" (see page 34 of Attachment B). He said that this space is reserved for that purpose; however, the infrastructure for plumbing will be installed and stubbed out, while the tank(s) and other equipment would be installed at a later date, if and when early imprinting would be used. The science behind early imprinting is still in its infancy, although the potential is very exciting. The building is meant to be able to take advantage of early imprinting when it becomes applicable to production. Hill briefly reviewed the Hatchery Building Partial Floor Plan of the Administration Area (see page 35 of Attachment B) and the Hatchery Building Below Grade Piping Plan (see page 41 of Attachment B). Ferjancic asked if the Building Information Model (BIM) was used, and Hill replied that BIM was used; however, AutoCAD Civil 3D was used for the piping. Hill added that Autodesk Navisworks was used to check for conflict (for example, to show if electrical lines might intersect).

Mike Tonseth asked if water will be treated using an ultraviolet (UV) water purification system if early imprinting is used. Mackey said the method for water treatment is an area of current research. To date, it appears that treating the water with methods such as UV affects its imprinting signal, but this is an active area of research. Tonseth also asked about the need for a Federal Energy Regulatory Commission (FERC) license amendment, recalling from the Wells Modernization Workshop on August 21, 2013, that Shane Bickford had indicated that an amendment might be needed. Mackey said that Douglas PUD sent a letter to FERC stating their plans for the modernization, and asking them if this project would require a license amendment. He said he believes the deadline for FERC to respond to Douglas PUD's letter is either approaching or has just passed. He added that, last he spoke with Bickford, FERC had not yet responded. Tonseth asked how the FERC review affects the timeline for the modernization, and Mackey replied that he believes the modernization can continue moving forward in parallel with FERC's review. Gale said that the Wells Modernization seems to be on the same level as the rebuild at Priest Rapids, and he asked if Grant PUD needed a license amendment. Tonseth noted that Grant PUD is operating under an older license, so the rules may not be consistent between the two licenses. Hill said that, generally, if FERC requires a license amendment, the process and review periods for doing so add about 3 months to the schedule. Tonseth said that the reason he asked was because, when this was last discussed, there seemed to be uncertainty regarding whether Douglas PUD would move forward as planned, or modify the plans to only include those activities that would, for certain, not invoke a license amendment. Mackey indicated that, currently, Douglas PUD plans to move forward with the entire modernization. Hill noted that part of the Dam Safety Review was currently under FERC review, and Gale asked if the Dam Safety Review is conducted by Douglas PUD staff. Mackey said that Douglas PUD works with consultants to address dam safety, but the criteria they are using are FERC-driven (i.e., based on FERC requirements).

Hill reviewed the Hatchery Building Incubation Chillers Plan (see page 42 of Attachment B). Mackey noted that two chillers are planned along with space to add a third, if needed. He said that instead of using one very large chiller, a second (and possibly a third) chiller would provide the needed chilling capacity, but also serve as back-ups for each other in the event that one chiller goes down, providing at least partial chilling. Donahue noted that the future chiller area can also serve as storage in the interim.

Hill reviewed the Circular Tank Facility Structural Plan (see page 43 of Attachment B), noting that the extra space located along the south side of the structure was initially planned for automated feeders. Whether automated feeders will be used is still being discussed, but the capacity to use automated feeders will be incorporated into the design. He added that the tanks will be installed under a covered shelter with chain-link fencing around the perimeter for predator control, while also allowing ambient air flow and light. He then reviewed the Circular Tank Facility Partial Site Piping Plan (see page 44 of Attachment B), noting the center aisle located between the two rows of tanks that is wide enough to accommodate marking trailers. He also noted the trench drain running lengthwise between the tanks that will contain drains and fish transfer piping. Mackey recalled a question discussed at the last workshop about the feasibility of removing a defective tank. He explained that the tanks can be disassembled into two parts, and added that there is adequate space to accomplish this, if needed. Truscott asked how fish transfers would be accomplished, and Jayson Wahls said with a crowder or a pump. Gale asked if fish will be passive integrated transponder (PIT)-tagged in the circulars. Mackey said that Twisp, Omak, and Okanogan steelhead will be reared to term in the circulars, and Wahls added that the goal is to keep the stocks separate and PIT-tag them back into the circulars, or move them to the ponds as appropriate for the program. He also noted that smolt size was accounted for in the bioprogramming phase of modernization planning. Truscott asked how well smolts do in a pump, and Wahls said they do fine and Wells has used a new fish pump to move steelhead smolts with no problems, and added that they are not pumped as fast. Truscott asked if the water source is dual (i.e., surface and well water), and Mackey said that it is. Ferjancic added that the tanks are relatively self-cleaning as long as a certain water velocity is maintained.

Hill reviewed the new Adult Handling Facility (see page 49 of Attachment B). He explained that fish enter the trapping area from the volunteer channel, are sent through the fish handling part of the facility, and then sent to the adult holding ponds, and noted that the larger ponds are for summer Chinook, while the smaller ponds are for steelhead and spring Chinook. Tonseth asked if the Adult Handling Facility will be one of the first pieces to be constructed, and Hill replied that it will likely be constructed later because of hatchery piping. Tonseth said that it seems like newer plumbing will be installed in the center of the adult channel, and he cautioned that in terms of adult handling, there is not a lot of down time. Truscott asked if there are designated adult ponds for certain programs, and Hill said that there are. Mackey added that those designations are described in the 30% Design Report where a monthly sequence of pond usage is presented. Hill went on to explain that Pond 6 is connected to the west ladder trap, and Wahls further explained that fish first enter Pond 6 from the west ladder trap, and then are crowded into the Spawning Building for sorting and workup. Hill explained that each pond is equipped with an automatic crowder that moves east to west. Tonseth recommended looking into the difficulties that Priest Rapids has been experiencing with their crowders. He said that the main issue is that the primary crowder does not move all the way to the end, so staff need to get into the ponds and manually crowd the fish, which results in a lot of fish handling. Hill noted this issue and Mackey also said that they were aware of these types of issues with some crowders and planned to address that in the design. Hill also briefly reviewed the new Shop (Storage) Building (see page 45 of Attachment B).

Gale asked how surplus fish will be euthanized; Tonseth pointed out that the pneumatic guns at Winthrop National Fish Hatchery (NFH) work well. *(Note: Tonseth later clarified that the pneumatic guns (or fish stunners) were tested last year at Priest Rapids Hatchery and will be used full scale beginning in 2014.)* Hill referred to the Adult Handling Facility Spawning Building Plan (see page 50 of Attachment B), and explained that fish enter from the south and then are routed through the electronarcosis (EN) unit to the ponds or the river. Gale asked if the fish can be routed directly to holding ponds without handling, and Wahls said not as currently planned. Gale asked if bull trout or white fish have been observed, and Wahls said he has not seen either to date. Gale asked how often non-target fish would be handled, and Wahls replied at least once per day. Mackey said that there was a request to have a back-up anesthetic method to the EN unit, which would involve the use of a chemical anesthetic. The EN unit will be designed to accommodate a back-up anesthetic method. Tonseth noted that if fish are chemically anesthetized with MS222, they need to be marked for non-retention so anglers would know to release them. He added, however, that if AQUI-S (clove oil) was used, the fish would only need to be held 3 days before release, and then they would be immediately acceptable for human consumption.

Truscott asked if Okanogan steelhead brood will be transferred directly to the pond from trucks, and Mackey replied that they will be—all the adult ponds will be accessible to trucks. Gale asked how fish are cycled through the system. Hill explained that once fish have been trapped and sorted, non-target fish are sent back to river and fish to be held for broodstock enter the adult holding ponds via the pipes located along the northwest corner of the building. He said that when fish in a pond need to be sampled or spawned, they are crowded to the end of the pond into a long raceway perpendicular to the holding ponds. The fish are then crowded to the building by a crowder that runs under the floor, which will be visible through the floor, and lifted into the building. The fish then go into the EN unit where they are anesthetized and can be checked for maturity and euthanized (or sent back to their pond), then they go to the bleed tables, and then they go to the carcass area. Wahls noted that the design for this room was structured after the setup at Winthrop NFH, and Hill added that everything in the carcass area is on rollers and can be easily moved. Truscott asked if fish can move through the EN unit without being anesthetized, and Mackey said that fish can be moved through the system without being anesthetized but that the plan is to anesthetize fish in order to make handling less stressful. Truscott asked if there could be issues with fish moving through the EN unit more than once. Gale replied that an EN unit is relatively benign compared to, for example, an electroanesthesia (EA) system. *(Note: Tonseth later clarified that an EN unit uses lower direct current [DC] voltage to put a fish to sleep, and recovery is almost instantaneous. To maintain EN, a fish must remain in the electrical field. EA systems use higher alternating current [AC] voltage to "stun" a fish so that it is completely immobilized both in and out of water. EA systems use a two phase approach, and the first phase is rather violent with the second phase taking them down the rest of the way. With EN, a fish is not so much aware that it is in an electrical field; however, they do react violently if they enter the electrical field facing the wrong polarity. With regard to Gale's comment, relatively speaking, fish react much less negatively to exposure via EN than they do to EA; however, both have their positives and negatives.)*

Regarding the flume system in the building, Tonseth noted that an issue with steelhead is that they will turn around and swim against the current in a flume if the flume is wide enough. Ferjancic suggested making the flume v-shaped to make it more difficult for the fish to turn around. Tonseth said that it seems a 12-inch diameter tube with access points to remove obstructions may be the best option. Lynn Hatcher asked if Bryan Nordlund (NMFS) will be reviewing these plans, and Mackey said that Douglas PUD and HDR have been keeping Nordlund updated on the design and plan to meet with him to discuss the details of the design, as well as the fact that the HCP Coordinating Committees will be reviewing all of the plans as they relate to fish passage (Nordlund is a member of the HCP Coordinating Committees). Gale asked if there will be a fish health review, and Wahls said that Bob Rogers (Washington Department of Fish and Wildlife [WDFW] fish health) was already reviewing the plans. Mackey added that Douglas PUD will be sure to continue communication with WDFW Fish Health Staff.

Hill reviewed the Adult Handling Facility Holding Ponds Structural Partial Plan (see page 52 of Attachment B). He explained that the crowders operate south to north and west to east. Tonseth asked if the fish transfer pipes are kept on a separate water source, and Hill replied that they are. Donahue also noted that Nordlund had requested that fish are not made to "plunge" into the pools, so the infrastructure was designed so that the fish slide gently into the pools. Hill noted that the crowders lift up and then move back, so fish can start filling into the pools once the crowder moves past the entry point. He said there are 5 feet of water and 5 feet of freeboard. Tonseth noted that another issue with the crowders at Priest Rapids Hatchery is that only a small amount of gravel in the ponds will cause issues with the crowder transitioning from a flat to sloped part of the pond. Hill said that that the water is controlled by stoplogs. Ferjancic asked if there will be a screen on the stoplogs, and Hill said screens are not currently planned, but they can be added. Donahue added that the stoplogs are in pairs, so that one can be cleaned while the other is still in place. Gale asked if these ponds will be used for adults only, and Hill said that is correct. Ferjancic asked if the ponds could potentially be used for juveniles for back-up or emergency use. Tonseth noted that it might not be desirable to use the same ponds for juveniles and adults because of the potential for cross-contamination. Gale asked how often the ponds will be in use, and Ferjancic said that the plan indicates the ponds will be in use every month. Hill indicated that the area will also have truck access for fish transfers both into and out of the facility.

Hill reviewed the Adult Handling Facility Fishway Structural Partial Plan (see page 54 of Attachment B). Truscott noted that the two right angles in the ladder infrastructure may impede passing fish. Donahue suggested adding fill in the corners, and Hill said the ladder itself can be modified to soften the corners. Gale asked if the entire building could be relocated further south so that the volunteer channel and the entrance to the facility are flush, making the ladder straight. Hill said the facility cannot be moved further south because of overhead utilities. He went on to explain that the ladder is not covered, but the walls include 4 feet of freeboard above the water surface, which should keep fish from jumping out. Ferjancic suggested removable grating on top of the ladder as a safety measure and to keep large debris out of the ladder. Tonseth agreed and added that grating would also provide shading.

Mackey thanked everyone for their feedback, and said that he will follow up on the comments discussed during today's workshop. Lastly, he briefly noted that the surface water intake was recently upgraded, and that a new control valve may be installed. He added that the intake is inspected by divers each year. He also added that the domestic water supply is undergoing an upgrade. He said that the new Sturgeon Facility has been running well. He also noted that the Visitors Center (overlook near the dam) will remain as it currently exists and is not affected by the hatchery modernization.

List of Attachments

Attachment A	List of Attendees
Attachment B	Wells Hatchery Modernization 30% Design Drawings

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Greg Mackey*	Douglas PUD
Kenneth Ferjancic	HDR Engineering, Inc.
Ed Donahue	HDR Engineering, Inc.
Jason Hill	HDR Engineering, Inc.
Lynn Hatcher*	National Marine Fisheries Service
Keely Murdoch*	Yakama Nation
Kirk Truscott*	Colville Confederated Tribes
Bill Gale*	U.S. Fish and Wildlife Service
Mike Tonseth*	Washington Department of Fish and Wildlife
Charlie Snow†	Washington Department of Fish and Wildlife
Jayson Wahls	Washington Department of Fish and Wildlife

Notes:

* Denotes Hatchery Committees member or alternate

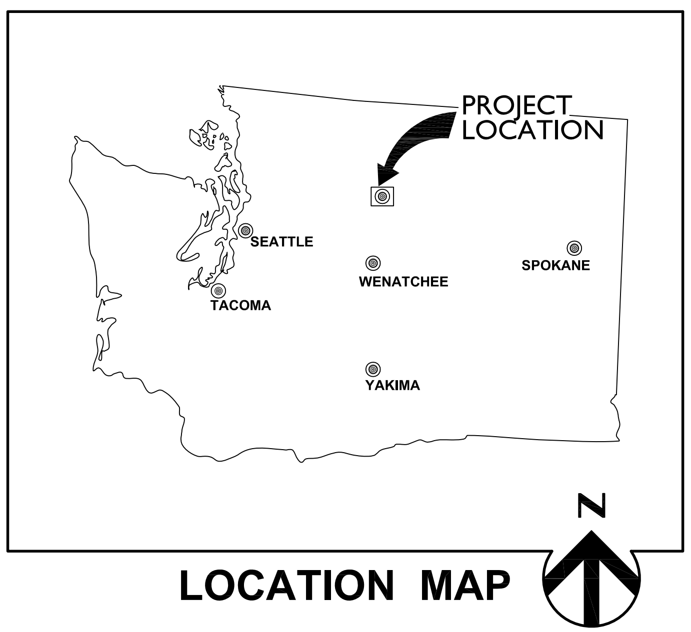
† Joined by phone

Attachment B

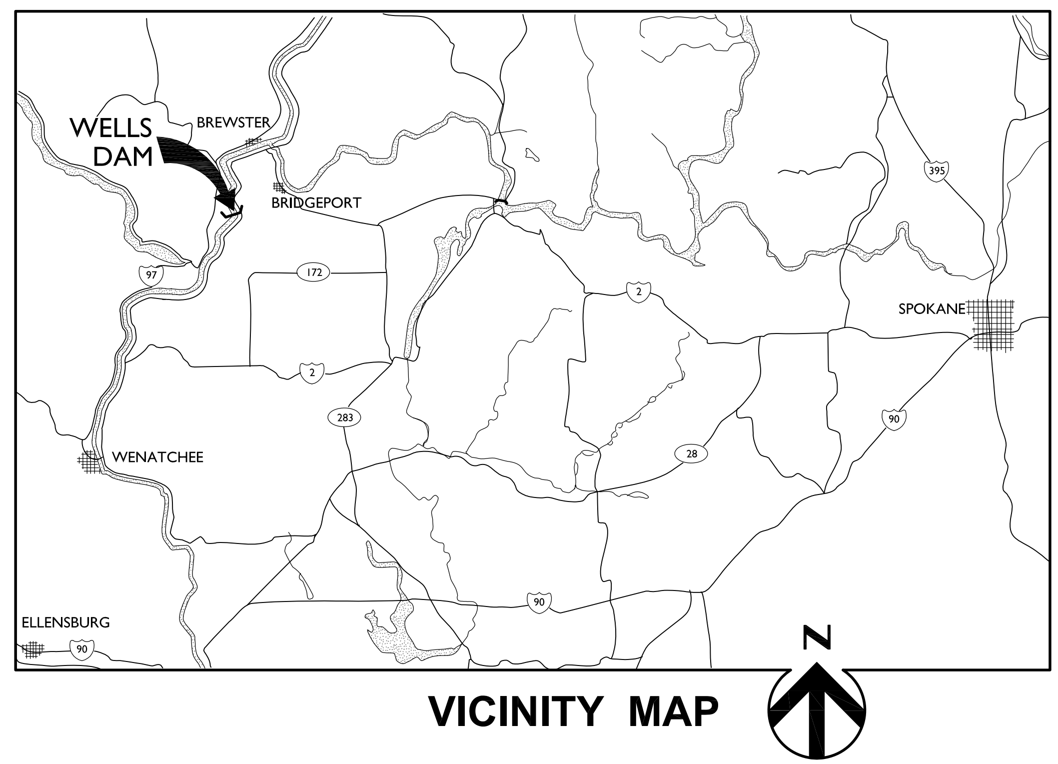
Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

30% Submittal



LOCATION MAP



VICINITY MAP

HDR Fisheries DESIGN CENTER

January 2014

SHEET 00G01

Attachment B

GENERAL – 00

00G01	COVER SHEET
00G02	DRAWING INDEX
00G03	ABBREVIATIONS
00G04	SYMBOLS 1
00G05	SYMBOLS 2

STANDARD – 01

01C01	STANDARD CIVIL DETAILS 1
01C02	STANDARD CIVIL DETAILS 2
01A01	ARCHITECTURAL DOOR SCHEDULES 1
01A02	ARCHITECTURAL DOOR SCHEDULES 2
01A03	ARCHITECTURAL FINISH SCHEDULES
01A04	ARCHITECTURAL SCHEDULES
01A05	STANDARD ARCHITECTURAL DETAILS 1
01A06	STANDARD ARCHITECTURAL DETAILS 2
01A07	STANDARD ARCHITECTURAL DETAILS 3
01S01	STANDARD STRUCTURAL DETAILS 1
01S02	STANDARD STRUCTURAL DETAILS 2
01S03	STANDARD STRUCTURAL DETAILS 3
01S04	STANDARD STRUCTURAL DETAILS 4
01S05	STANDARD STRUCTURAL DETAILS 5
01P01	PIPING SCHEDULES 1
01P02	PIPING SCHEDULES 2
01P03	PIPING SCHEDULES 3
01P04	STANDARD PIPING DETAILS 1
01P05	STANDARD PIPING DETAILS 2
01P06	STANDARD PIPING DETAILS 3
01M01	MECHANICAL SCHEDULES 1
01M02	MECHANICAL SCHEDULES 2
01M03	MECHANICAL SCHEDULES 3
01M04	STANDARD MECHANICAL DETAILS 1
01M05	STANDARD MECHANICAL DETAILS 2
01M06	STANDARD MECHANICAL DETAILS 3
01E01	ELECTRICAL SCHEDULES 1
01E02	ELECTRICAL SCHEDULES 2
01E03	ELECTRICAL SCHEDULES 3
01E04	ELECTRICAL SCHEDULES 4
01E05	STANDARD ELECTRICAL DETAILS 1
01E06	STANDARD ELECTRICAL DETAILS 2
01E07	STANDARD ELECTRICAL DETAILS 3
01E08	STANDARD ELECTRICAL DETAILS 4
01E09	STANDARD ELECTRICAL DETAILS 5

DIAGRAMS – 02

02G01	PROCESS AND INSTRUMENTATION DIAGRAM 1
02G02	PROCESS AND INSTRUMENTATION DIAGRAM 2
02G03	PROCESS AND INSTRUMENTATION DIAGRAM 3
02M01	INCUBATION CHILLER DIAGRAM

SITE – 03

03C01	SURVEY CONTROL – EXISTNG CONDITIONS
03C02	OVERALL SITE PLAN
03C03	EROSION CONTROL PLAN 1
03C04	EROSION CONTROL PLAN 2
03C05	EROSION CONTROL DETAILS 1
03C06	EROSION CONTROL DETAILS 2
03C07	GRADING, PAVING AND HORIZONTAL CONTROL PLAN 1
03C08	GRADING, PAVING AND HORIZONTAL CONTROL PLAN 2
03C09	GRADING, PAVING AND HORIZONTAL CONTROL PLAN 3
03C10	GRADING, PAVING AND HORIZONTAL CONTROL PLAN 4
03C11	GRADING, PAVING AND HORIZONTAL CONTROL PLAN 5
03C12	GRADING, PAVING AND HORIZONTAL CONTROL PLAN 6
03C13	GRADING AND PAVING DETAILS
03D05	DEMOLITION PLAN 1
03D06	DEMOLITION PLAN 2
03W01	SUPPLY PIPING PLAN 1
03W02	SUPPLY PIPING PLAN 2
03W03	SUPPLY PIPING SECTIONS AND DETAILS 1
03W04	SUPPLY PIPING SECTIONS AND DETAILS 2
03P01	SITE PIPING PLAN 1
03P02	SITE PIPING PLAN 2
03P03	SITE PIPING PLAN 3
03P04	SITE PIPING PLAN 4
03P05	SITE PIPING PLAN 5
03P06	SITE PIPING PLAN 6
03P07	PIPING DETAILS 1
03P08	PIPING DETAILS 2
03E01	ELECTRICAL SITE PLAN 1
03E02	ELECTRICAL SITE PLAN 2
03E03	ELECTRICAL SITE PLAN 3
03E04	ELECTRICAL SITE PLAN 4
03E05	ELECTRICAL SITE PLAN 5
03E06	ELECTRICAL SITE PLAN 6
03E07	ELECTRICAL SITE DETAILS 1
03E08	ELECTRICAL SITE DETAILS 2

HEADTANK – 04

04A01	ARCHITECTURAL FLOOR PLAN
04A02	ARCHITECTURAL ELEVATIONS 1
04A03	ARCHITECTURAL ELEVATIONS 2
04A04	ARCHITECTURAL SECTIONS 1
04A05	ARCHITECTURAL SECTIONS 2
04A06	ARCHITECTURAL WALL SECTIONS 1
04A07	ARCHITECTURAL WALL SECTIONS 2
04A08	ARCHITECTURAL DETAILS 1
04A09	ARCHITECTURAL DETAILS 2
04S01	STRUCTURAL FLOOR PLAN
04S02	FOUNDATION PLAN
04S03	GRATING PLAN AND DETAILS
04S04	STRUCTURAL SECTIONS 1
04S05	STRUCTURAL SECTIONS 2
04S06	STRUCTURAL SECTIONS 3
04S07	STRUCTURAL SECTIONS 4
04S08	STRUCTURAL SECTIONS 5
04M01	EQUIPMENT LAYOUT
04M02	HVAC LAYOUT
04M03	HVAC DETAILS
04P01	PARTIAL SITE PIPING PLAN
04P02	PIPING PLAN
04P03	PIPING SECTIONS 1
04P04	PIPING SECTIONS 2
04P05	PIPING DETAILS 1
04P06	PIPING DETAILS 2
04E01	POWER PLAN
04E02	LIGHTING AND RECEPTACLE PLAN
04E03	INSTRUMENTATION PLAN
04E04	ELECTRICAL DETAILS 1
04E05	ELECTRICAL DETAILS 2

HATCHERY BUILDING – 05

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05A02	PARTIAL PLAN – ADMINISTRATION AREA
05A03	PARTIAL PLAN – INCUBATION AREA
05A04	ARCHITECTURAL EXTERIOR ELEVATIONS 1
05A05	ARCHITECTURAL EXTERIOR ELEVATIONS 2
05A06	PARTIAL PLANS 1
05A07	PARTIAL PLANS 2
05A08	ARCHITECTURAL SECTIONS 1
05A09	ARCHITECTURAL SECTIONS 2
05A10	ARCHITECTURAL SECTIONS 3
05A11	ARCHITECTURAL INTERIOR ELEVATIONS 1
05A12	ARCHITECTURAL INTERIOR ELEVATIONS 2
05A13	ARCHITECTURAL WALL SECTIONS 1
05A14	ARCHITECTURAL WALL SECTIONS 2
05A15	ARCHITECTURAL DETAILS 1
05A16	ARCHITECTURAL DETAILS 2
05S01	STRUCTURAL FLOOR PLAN
05S02	FOUNDATION PLAN
05S03	STRUCTURAL SECTIONS 1
05S04	STRUCTURAL SECTIONS 2
05S05	STRUCTURAL SECTIONS 3
05S06	STRUCTURAL SECTIONS 4
05S07	STRUCTURAL SECTIONS 5
05S08	STRUCTURAL SECTIONS 6
05M01	EQUIPMENT LAYOUT 1
05M02	EQUIPMENT LAYOUT 2
05M03	EQUIPMENT LAYOUT AND DETAILS 1
05M04	EQUIPMENT LAYOUT AND DETAILS 2
05M05	HVAC LAYOUTS AND DETAILS 1
05M06	HVAC LAYOUTS AND DETAILS 2
05P01	ABOVE GRADE PIPING PLAN
05P02	BELOW GRADE PIPING PLAN
05P03	PARTIAL PLANS 1
05P04	PARTIAL PLANS 2
05P05	INCUBATION CHILLERS PLAN
05P06	PIPING SECTIONS 1
05P07	PIPING SECTIONS 2
05P08	PIPING DETAILS 1
05P09	PIPING DETAILS 2
05P10	PIPING DETAILS 3
05P11	PIPING DETAILS 4
05P12	PIPING DETAILS 5
05P13	PIPING DETAILS 6
05E01	POWER PLAN
05E02	LIGHTING AND RECEPTACLE PLAN
05E03	INSTRUMENTATION PLAN
05E04	FIRE ALARM PLAN
05E05	ELECTRICAL DETAILS 1
05E06	ELECTRICAL DETAILS 2

CIRCULAR TANK FACILITY – 06

06A01	ARCHITECTURAL PLAN
06A03	ARCHITECTURAL ELEVATIONS
06A05	ARCHITECTURAL SECTIONS
06S01	STRUCTURAL PLAN
06S02	STRUCTURAL SECTIONS
06M01	EQUIPMENT LAYOUT
06P01	PARTIAL SITE PIPING PLAN
06P02	PIPING PLAN
06P03	PIPING SECTIONS 1
06P04	PIPING SECTIONS 2
06P05	PIPING DETAILS 1
06P06	PIPING DETAILS 2
06E01	POWER PLAN
06E02	LIGHTING AND RECEPTACLE PLAN
06E03	INSTRUMENTATION PLAN
06E04	ELECTRICAL DETAILS 1
06E05	ELECTRICAL DETAILS 2

SHOP/GARAGE BUILDING – 07

07A01	ARCHITECTURAL FLOOR PLAN
07A02	ARCHITECTURAL ELEVATIONS 1
07A03	ARCHITECTURAL ELEVATIONS 2
07A04	ARCHITECTURAL SECTIONS 1
07A05	ARCHITECTURAL SECTIONS 2
07A06	ARCHITECTURAL WALL SECTIONS 1
07A07	ARCHITECTURAL WALL SECTIONS 2
07A08	ARCHITECTURAL DETAILS 1
07A09	ARCHITECTURAL DETAILS 2
07S01	STRUCTURAL PLAN
07S02	FOUNDATION PLAN
07S03	STRUCTURAL SECTIONS 1
07S04	STRUCTURAL SECTIONS 2
07M01	EQUIPMENT LAYOUT
07M02	HVAC LAYOUT
07M03	HVAC DETAILS
07P01	PIPING PLAN
07P02	PIPING SECTIONS
07P03	PIPING DETAILS
07E01	POWER PLAN
07E02	LIGHTING AND RECEPTACLE PLAN
07E03	ELECTRICAL DETAILS 1
07E04	ELECTRICAL DETAILS 2

FILTER BUILDING – 08

08A01	ARCHITECTURAL FLOOR PLAN AND ELEVATIONS
08A02	ARCHITECTURAL ELEVATIONS
08S01	STRUCTURAL PLAN AND SECTIONS
08S02	SECTIONS AND DETAILS 1
08S03	SECTIONS AND DETAILS 2
08P01	PIPING PLAN
08P02	PIPING SECTIONS 1
08P03	PIPING SECTIONS 2
08P04	PIPING DETAILS 1
08P05	PIPING DETAILS 2
08E01	POWER PLAN, LIGHTING AND RECEPTACLE PLAN
08E02	ELECTRICAL DETAILS

ADULT HANDLING FACILITY – 09

09G01	OVERALL PLAN
09A01	SPAWNING BUILDING PLAN
09A02	SPAWNING BUILDING ELEVATIONS 1
09A03	SPAWNING BUILDING ELEVATIONS 2
09S01	STRUCTURAL PARTIAL PLAN – HOLDING TANKS
09S02	STRUCTURAL PARTIAL PLAN – SPAWNING BUILDING
09S03	STRUCTURAL PARTIAL PLAN – FISHWAY
09S04	STRUCTURAL SECTIONS 1
09S05	STRUCTURAL SECTIONS 2
09S06	STRUCTURAL SECTIONS 3
09S07	STRUCTURAL SECTIONS 4
09S08	STRUCTURAL SECTIONS 5
09S09	STRUCTURAL SECTIONS 6
09S10	STRUCTURAL DETAILS 1
09S11	STRUCTURAL DETAILS 2
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09M01	EQUIPMENT LAYOUT 1
09M02	EQUIPMENT LAYOUT 2
09M03	EQUIPMENT LAYOUT 3
09M04	EQUIPMENT SECTIONS AND DETAILS 1
09M05	EQUIPMENT SECTIONS AND DETAILS 2
09M06	EQUIPMENT SECTIONS AND DETAILS 3
09M06	EQUIPMENT SECTIONS AND DETAILS 4
09M06	EQUIPMENT SECTIONS AND DETAILS 5
09M06	EQUIPMENT SECTIONS AND DETAILS 6
09P01	ABOVE GRADE PIPING PLAN
09P02	BELOW GRADE PIPING PLAN
09P03	PARTIAL PLANS 1
09P04	PARTIAL PLANS 2
09P05	PIPING SECTIONS 1
09P06	PIPING SECTIONS 2
09P07	PIPING SECTIONS 3
09P08	PIPING DETAILS 1
09P09	PIPING DETAILS 2
09P10	PIPING DETAILS 3
09P11	PIPING DETAILS 4
09P12	PIPING DETAILS 5
09P13	PIPING DETAILS 6
09E01	POWER PLAN
09E02	LIGHTING AND RECEPTACLE PLAN
09E03	INSTRUMENTATION PLAN
09E04	ELECTRICAL DETAILS 1
09E05	ELECTRICAL DETAILS 2

POLLUTION ABATEMENT POND – 10

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10S02	SECTIONS AND DETAILS 1
10S03	SECTIONS AND DETAILS 2
10P01	PIPING PLAN
10P02	PIPING SECTIONS 1
10P03	PIPING SECTIONS 2
10P04	PIPING DETAILS 1
10P05	PIPING DETAILS 2
10E01	ELECTRICAL DETAILS

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

GENERAL

DRAWING INDEX

0 1" 2"

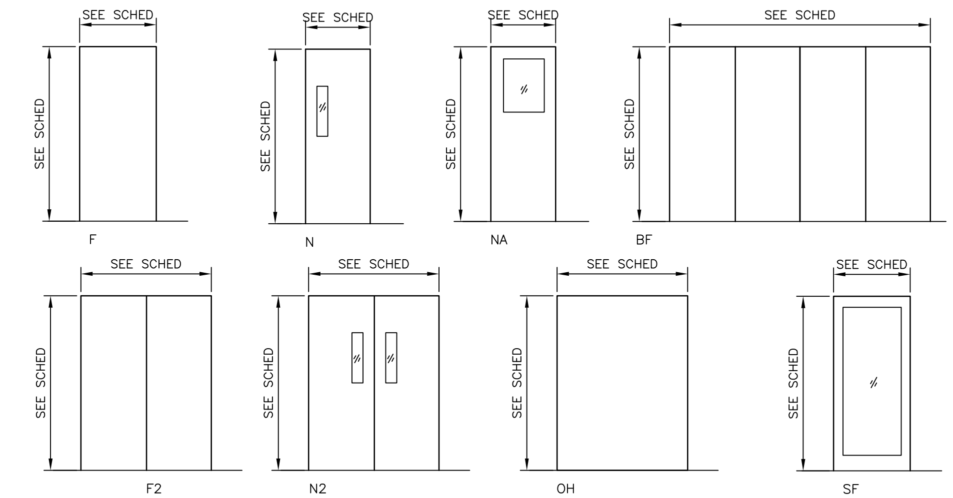
FILENAME	00G02.dwg
SCALE	SCALE AS NOTED

SHEET **00G02**

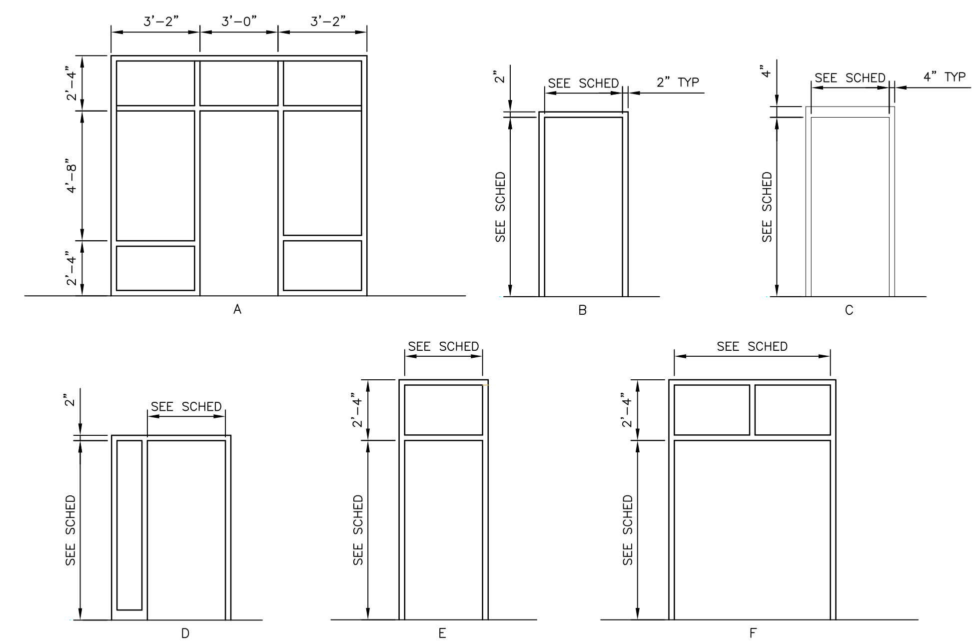
Attachment B

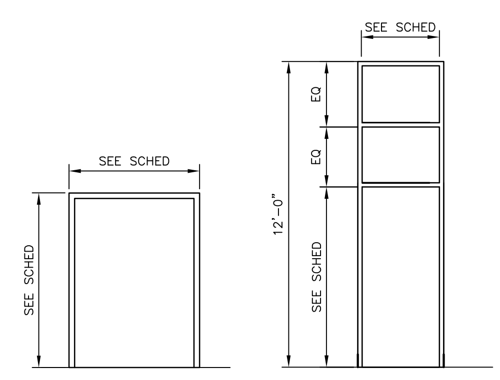
DOOR SCHEDULE – HATCHERY BUILDING (05)

NO.	SIZE	DETAIL HEAD	JAMB	THRESH	DOOR TYPE	MAT'L	FIN	GL TYPE	FRAME TYPE	MAT'L	FIN	HW GRP	RATING (MIN)	REMARKS
501A	3'-0"x7'-0"				SF	ALUM	ANOD.	TEMP.	A	ALUM	ANOD.	–	–	STOREFRONT SYSTEM
501B	3'-0"x7'-0"				SF	ALUM	ANOD.	TEMP.	A	ALUM	ANOD.	–	–	STOREFRONT SYSTEM
502A	3'-0"x7'-0"				F	WOOD	S&V		D	HM	PAINT	–	–	SAFETY GL. SIDELIGHT
502B	PR 4'-0"x7'-0"				BF	WOOD	S&V					–	–	–
503A	3'-0"x7'-0"				F	WOOD	S&V		D	HM	PAINT	–	–	SAFETY GL. SIDELIGHT
503B	PR 4'-0"x7'-0"				BF	WOOD	S&V					–	–	–
504	3'-0"x7'-0"				F	WOOD	S&V		D	HM	PAINT	–	–	SAFETY GL. SIDELIGHT
505	3'-0"x7'-0"				F	WOOD	S&V		D	HM	PAINT	–	–	SAFETY GL. SIDELIGHT
506	3'-0"x7'-0"				F	WOOD	S&V		D	HM	PAINT	–	–	SAFETY GL. SIDELIGHT
507	3'-0"x7'-0"				N	WOOD	S&V	SAFETY	B	HM	PAINT	–	–	–
508	3'-0"x7'-0"				N	WOOD	S&V	SAFETY	C	HM	PAINT	–	–	–
509	3'-0"x7'-0"				F	WOOD	S&V		B	HM	PAINT	–	–	–
510	3'-0"x7'-0"				F	WOOD	S&V		B	HM	PAINT	–	–	–
511	3'-0"x7'-0"				F	WOOD	S&V		B	HM	PAINT	–	–	–
512A	3'-0"x7'-0"				N	HM	PAINT	SAFETY	C	HM	PAINT	60	–	–
512B	12'-0"x10'-0"				OH	STEEL	PREFIN					–	–	–
512C	3'-0"x7'-0"				N	HM	PAINT	INSUL SAFETY	E	HM	PAINT	–	–	–
512D	3'-0"x7'-0"				N	HM	PAINT	INSUL SAFETY	E	HM	PAINT	–	–	–
512E	12'-0"x10'-0"				OH	STEEL	PREFIN					–	–	–
512F	12'-0"x10'-0"				OH	STEEL	PREFIN					–	–	–
512G	3'-0"x7'-0"				N	HM	PAINT	INSUL SAFETY	E	HM	PAINT	–	–	–
512H	3'-0"x7'-0"				N	HM	PAINT	INSUL SAFETY	E	HM	PAINT	–	–	–
512J	12'-0"x10'-0"				OH	STEEL	PREFIN	–				–	–	–
513A	3'-0"x7'-0"				N	HM	PAINT	SAFETY	B	HM	PAINT	–	–	–
513B	3'-0"x7'-0"				N	HM	PAINT	SAFETY	C	HM	PAINT	60	–	–
514A	3'-0"x7'-0"				N	HM	PAINT	SAFETY	B	HM	PAINT	–	–	–
514B	3'-0"x7'-0"				N	HM	PAINT	INSUL SAFETY	E	HM	PAINT	–	–	INSUL. TEMP. GL. TRANSOM
515A	3'-0"x7'-0"				F	HM	PAINT	–	B	HM	PAINT	–	–	–
516A	3'-0"x7'-0"				F	HM	PAINT	–	B	HM	PAINT	–	–	
517A	PR 3'-0"x7'-0"				N2	HM	PAINT	SAFETY	G	HM	PAINT	–	–	–
517B	PR 3'-0"x7'-0"				F2	HM	PAINT	–	F	HM	PAINT	–	–	INSUL. TEMP. GL. TRANSOM
518A	PR 3'-0"x7'-0"				F2	HM	PAINT	–	G	HM	PAINT	–	–	–
519A	PR 3'-0"x7'-0"				N2	HM	PAINT	SAFETY	G	HM	PAINT	–	–	–
519B	PR 3'-0"x7'-0"				F2	HM	PAINT		F	HM	PAINT	–	–	–
520A	PR 3'-0"x8'-0"				N2	HM	PAINT	SAFETY	G	HM	PAINT	–	–	–
520B	PR 3'-0"x7'-0"				F2	HM	PAINT		F	HM	PAINT	–	–	INSUL. TEMP. GL. TRANSOM
521A	3'-0"x7'-0"				N	HM	PAINT	SAFETY	B	HM	PAINT	–	–	–
521B	12'-0"x10'-0"				OH	STEEL	PREFIN					–	–	–
521C	3'-0"x7'-0"				F	HM	PAINT		E	HM	PAINT	–	–	INSUL. TEMP. GL. TRANSOM
522A	3'-0"x7'-0"				N	HM	PAINT	SAFETY	C	HM	PAINT	–	–	–
523A	3'-0"x7'-0"				N	HM	PAINT	SAFETY	C	HM	PAINT	–	–	–
524A	3'-0"x7'-0"				N	HM	PAINT	SAFETY	C	HM	PAINT	–	–	–
525A	PR 3'-0"x7'-0"				N2	HM	PAINT	INSUL SAFETY	F	HM	PAINT	–	–	INSUL. TEMP. GL. TRANSOM
525B	PR 3'-0"x7'-0"				N2	HM	PAINT	INSUL SAFETY	F	HM	PAINT	–	–	INSUL. TEMP. GL. TRANSOM
527A	3'-0"x7'-0"				N	HM	PAINT	SAFETY	C	HM	PAINT	–	–	–
528A	3'-0"x7'-0"				N	HM	PAINT	SAFETY	C	HM	PAINT	–	–	–
529A	3'-0"x7'-0"				N	HM	PAINT	SAFETY	C	HM	PAINT	–	–	–
530A	3'-0"x7'-0"				N	HM	PAINT	SAFETY	C	HM	PAINT	–	–	–
531A	3'-0"x7'-0"				N	HM	PAINT	SAFETY	C	HM	PAINT	–	–	–
532A	PR 3'-0"x7'-0"				F2	HM	PAINT		F	HM	PAINT	–	–	INSUL. TEMP. GL. TRANSOM

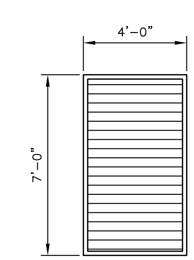


DOOR TYPES
NOT TO SCALE





FRAME TYPES
NOT TO SCALE



LOUVER

WINDOW TYPE
NOT TO SCALE

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	DH
DESIGNER 2:	
DRAWN BY:	MLDC
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

STANDARD

ARCHITECTURAL DOOR SCHEDULE 1
DOOR, WINDOW AND FRAME TYPES

0 1" 2"

FILENAME	01A01.dwg
SCALE	NOT TO SCALE

SHEET 01A01

Attachment B

DOOR SCHEDULE – HEADTANK BUILDING (04)

NO.	SIZE	DETAIL HEAD	DETAIL JAMB	DETAIL THRESH	DOOR TYPE	DOOR MAT'L	DOOR FIN	GL TYPE	FRAME TYPE	FRAME MAT'L	FRAME FIN	HW GRP	RATING (MIN)	REMARKS
401A	3'–0"x7'–0"				F	HM	PAINT	–	H	HM	PAINT	–	–	INSUL. TEMP. GL. TRANSOMS
401B	3'–0"x7'–0"				F	HM	PAINT	–	H	HM	PAINT	–	–	INSUL. TEMP. GL. TRANSOMS
401C	10'–0"x12'–0"				OH	STEEL	PREFIN					–	–	–

DOOR SCHEDULE – GARAGE/ SHOP BUILDING (07)

NO.	SIZE	DETAIL HEAD	DETAIL JAMB	DETAIL THRESH	DOOR TYPE	DOOR MAT'L	DOOR FIN	GL TYPE	FRAME TYPE	FRAME MAT'L	FRAME FIN	HW GRP	RATING (MIN)	REMARKS
701A	3'–0"x7'–0"				N	HM	PAINT	INSUL SAFETY	E	HM	PAINT	–	–	INSUL. TEMP. GL. TRANSOM
701B	12'–0"x12'–0"				OH	STEEL	PREFIN					–	–	–
701C	12'–0"x12'–0"				OH	STEEL	PREFIN					–	–	–
701D	3'–0"x7'–0"				F	HM	PAINT	–	B	HM	PAINT	–	–	–
701E	12'–0"x12'–0"				OH	STEEL	PREFIN					–	–	–
701F	12'–0"x12'–0"				OH	STEEL	PREFIN					–	–	–
701G	3'–0"x7'–0"				N	HM	PAINT	INSUL SAFETY	E	HM	PAINT	–	–	INSUL. TEMP. GL. TRANSOM

DOOR SCHEDULE – FILTER BUILDING (08)

NO.	SIZE	DETAIL HEAD	DETAIL JAMB	DETAIL THRESH	DOOR TYPE	DOOR MAT'L	DOOR FIN	GL TYPE	FRAME TYPE	FRAME MAT'L	FRAME FIN	HW GRP	RATING (MIN)	REMARKS
801A	3'–0"x7'–0"				F	HM	PAINT	–	B	HM	PAINT	–	–	
801B	8'–0"x9'–0"				OH	STEEL	PREFIN					–	–	–

DOOR SCHEDULE – SPAWNING BUILDING (09)

NO.	SIZE	DETAIL HEAD	DETAIL JAMB	DETAIL THRESH	DOOR TYPE	DOOR MAT'L	DOOR FIN	GL TYPE	FRAME TYPE	FRAME MAT'L	FRAME FIN	HW GRP	RATING (MIN)	REMARKS
901A	3'–0"x7'–0"				NA	HM	PAINT	INSUL. SAFETY	B	HM	PAINT	–	–	–
901B	3'–0"x7'–0"				NA	HM	PAINT	INSUL. SAFETY	B	HM	PAINT	–	–	–
901C	3'–0"x7'–0"				NA	HM	PAINT	INSUL. SAFETY	B	HM	PAINT	–	–	–
901D	10'–0"x12'–0"				OH	STEEL	PREFIN	–				–	–	–
901E	10'–0"x12'–0"				OH	STEEL	PREFIN	–				–	–	–
901F	10'–0"x12'–0"				OH	STEEL	PREFIN	–				–	–	–
901G	10'–0"x12'–0"				OH	STEEL	PREFIN	–				–	–	–

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	DH
DESIGNER 2:	
DRAWN BY:	MLDC
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

STANDARD

ARCHITECTURAL DOOR SCHEDULES 2

0 1" 2"

FILENAME	01A02.dwg
SCALE	NOT TO SCALE

SHEET **01A02**

Attachment B

INTERIOR FINISH SCHEDULE – HEADTANK BUILDING (04)

NO.	NAME	FLOOR MAT'L	FLOOR FIN	BASE MAT'L	NORTH WALL MAT'L	NORTH WALL FIN	EAST WALL MAT'L	EAST WALL FIN	SOUTH WALL MAT'L	SOUTH WALL FIN	WEST WALL MAT'L	WEST WALL FIN	CEILING MAT'L	CEILING FIN	CEILING HEIGHT	REMARKS
401	HEAD TANK ROOM	CONC	SEALER	RB	GWB	PAINT	GWB	PAINT	GWB	PAINT	GWB	PAINT	–	–	–	–

INTERIOR FINISH SCHEDULE – HATCHERY BUILDING (05)

NO.	NAME	FLOOR MAT'L	FLOOR FIN	BASE MAT'L	NORTH WALL MAT'L	NORTH WALL FIN	EAST WALL MAT'L	EAST WALL FIN	SOUTH WALL MAT'L	SOUTH WALL FIN	WEST WALL MAT'L	WEST WALL FIN	CEILING MAT'L	CEILING FIN	CEILING HEIGHT	REMARKS
501	VESTIBULE	CONC	SEALER	RB & GWB	CMU	–	STOREFRONT	–	GWB	PAINT	STOREFRONT	–	ACT	–	9'–4"	ENTRY FLOOR MAT
502	OFFICE	CPT TILE	–	RB	GWB	PAINT	GWB	PAINT	GWB	PAINT	GWB	PAINT	ACT	–	9'–4"	–
503	OFFICE	CPT TILE	–	RB	GWB	PAINT	GWB	PAINT	GWB	PAINT	GWB	PAINT	ACT	–	9'–4"	–
504	BREAK ROOM	CONC	SEALER	RB	GWB	PAINT	GWB	PAINT	GWB	PAINT	GWB	PAINT	ACT	–	9'–4"	–
505	OFFICE	CPT TILE	–	RB	GWB	PAINT	GWB	PAINT	GWB	PAINT	GWB	PAINT	ACT	–	9'–4"	–
506	OFFICE	CPT TILE	–	RB	GWB	PAINT	GWB	PAINT	GWB	PAINT	GWB	PAINT	ACT	–	9'–4"	–
507	MUD ROOM	CONC	SEALER	RB	GWB	PAINT	GWB	PAINT	GWB	PAINT	GWB	PAINT	ACT	–	9'–4"	–
508	JANITOR	CONC	SEALER	RB	GWB	PAINT	GWB	PAINT	GWB	PAINT	GWB	PAINT	ACT	–	9'–4"	–
509	CORRIDOR	CPT TILE	–	RB	GWB	PAINT	GWB	PAINT	GWB	PAINT	GWB	PAINT	ACT	–	9'–4"	–
510	WOMEN'S RESTROOM	CER TILE	–	CT	CT/GWB	PAINT/GWB	CT/GWB	PAINT/GWB	CT/GWB	PAINT/GWB	CT/GWB	PAINT/GWB	ACT	–	9'–4"	CT TO 40" AFF
511	MEN'S RESTROOM	CER TILE	–	CT	CT/GWB	PAINT/GWB	CT/GWB	PAINT/GWB	CT/GWB	PAINT/GWB	CT/GWB	PAINT/GWB	ACT	–	9'–4"	CT TO 40" AFF
512	PRODUCTION RM	CONC	SEALER	–	METAL PANELS	–	METAL PANELS	–	METAL PANELS	–	FRP PANELS	–	NONE	–	–	OPEN TO ROOF
513	RESEARCH	CONC	SEALER	RB	GWB	PAINT	GWB	PAINT	GWB	PAINT	GWB	PAINT	ACT	–	9'–4"	–
514	CORRIDOR	CONC	SEALER	RB	GWB	PAINT	GWB	–	–	–	–	–	–	–	–	–
515	RESTROOM	CONC	SEALER	CT	CT/GWB	PAINT/GWB	CT/GWB	PAINT/GWB	CT/GWB	PAINT/GWB	CT/GWB	PAINT/GWB	GWB	PAINT	9'–4"	–
516	RESTROOM	CONC	SEALER	CT	CT/GWB	PAINT/GWB	CT/GWB	PAINT/GWB	CT/GWB	PAINT/GWB	CT/GWB	PAINT/CMU	GWB	PAINT	9'–4"	–
517	FORMALIN STORAGE	CONC	SEALER	RB	GWB	PAINT	GWB	PAINT	GWB	PAINT	METAL PANELS	–	–	–	–	–
518	STORAGE	CONC	SEALER	RB	GWB	PAINT	GWB	PAINT	GWB	PAINT	CMU	PAINT	–	–	–	–
519	MECH/ ELEC	CONC	SEALER	RB	GWB	PAINT	GWB	PAINT	GWB	PAINT	CMU/METAL PANELS	PAINT/CMU	–	–	–	–
520	ELECTRICAL	CONC	SEALER	RB	GWB	PAINT	GWB	PAINT	GWB	PAINT	METAL PANELS	–	–	–	–	–
521	STORAGE	CONC	SEALER	RB	GWB	PAINT	GWB	PAINT	METAL PANELS	–	METAL PANELS	–	–	–	–	–
522	INCUBATION ROOM	CONC	SEALER	–	FRP PANELS	–	CMU	–	CMU	–	CMU	–	FRP	–	–	–
523	INCUBATION ROOM	CONC	SEALER	–	FRP PANELS	–	CMU	–	CMU	–	CMU	–	FRP	–	–	–
524	INCUBATION ROOM	CONC	SEALER	–	FRP PANELS	–	CMU	–	CMU	–	CMU	–	FRP	–	–	–
525	DISINFECTION/ WORKUP	CONC	SEALER	–	FRP PANELS	–	CMU	–	CMU	–	FRP PANELS	–	–	–	–	–
526	CORRIDOR	CONC	SEALER	–	CMU	–	CMU	–	CMU	–	OPEN	–	–	–	–	–
527	INCUBATION ROOM	CONC	SEALER	–	CMU	–	CMU	–	FRP PANELS	–	CMU	–	–	–	–	–
528	INCUBATION ROOM	CONC	SEALER	–	CMU	–	CMU	–	FRP PANELS	–	CMU	–	FRP	–	–	–
529	INCUBATION ROOM	CONC	SEALER	–	CMU	–	CMU	–	CMU	–	CMU	–	FRP	–	–	–
530	CORRIDOR	CONC	SEALER	–	CMU	–	CMU	–	CMU	–	CMU	–				
531	INCUBATION ROOM	CONC	SEALER	–	CMU	–	CMU	–	FRP PANELS	–	CMU	–	FRP			
532	STORAGE	CONC	SEALER	–	CMU	–	CMU	–	FRP PANELS	–	FRP PANELS	–				

INTERIOR FINISH SCHEDULE – GARAGE/SHOP BUILDING (07)

NO.	NAME	FLOOR MAT'L	FLOOR FIN	BASE MAT'L	NORTH WALL MAT'L	NORTH WALL FIN	EAST WALL MAT'L	EAST WALL FIN	SOUTH WALL MAT'L	SOUTH WALL FIN	WEST WALL MAT'L	WEST WALL FIN	CEILING MAT'L	CEILING FIN	CEILING HEIGHT	REMARKS
701	GARAGE/ SHOP	CONC	SEALER	RB	GWB	PAINT	GWB	PAINT	GWB	PAINT	GWB	PAINT	–	–	–	–

INTERIOR FINISH SCHEDULE – FILTER BUILDING (08)

NO.	NAME	FLOOR MAT'L	FLOOR FIN	BASE MAT'L	NORTH WALL MAT'L	NORTH WALL FIN	EAST WALL MAT'L	EAST WALL FIN	SOUTH WALL MAT'L	SOUTH WALL FIN	WEST WALL MAT'L	WEST WALL FIN	CEILING MAT'L	CEILING FIN	CEILING HEIGHT	REMARKS
801	FILTER ROOM	CONC	SEALER	RB	GWB	PAINT	GWB	PAINT	GWB	PAINT	GWB	PAINT	–	–	–	–

INTERIOR FINISH SCHEDULE – SPAWNING BUILDING (09)

NO.	NAME	FLOOR MAT'L	FLOOR FIN	BASE MAT'L	NORTH WALL MAT'L	NORTH WALL FIN	EAST WALL MAT'L	EAST WALL FIN	SOUTH WALL MAT'L	SOUTH WALL FIN	WEST WALL MAT'L	WEST WALL FIN	CEILING MAT'L	CEILING FIN	CEILING HEIGHT	REMARKS
901	SPAWNING AREA	CONC	SEALER	RB	GWB	PAINT	GWB	PAINT	GWB	PAINT	GWB	PAINT	–	–	–	–

INTERIOR FINISH SCHEDULE NOTES

1. TESTING AND CLASSIFICATION OF MATERAILS TO COMPLY WITH CHAPTER 8 (TABLE 803.4) OF THE INTERNATIONAL BUILDING CODE (IBC). INTERIOR FINISH MATERIALS APPLIED TO WALLS AND CEILINGS SHALL BE TESTED AS SPECIFIED IN SECTION 803 OF THE IBC.
2. ALL WORK SHALL CONFORM TO THE LATEST EDITION OF THE U.S. GYPSUM PRODUCTS AND SYSTEMS SPECIFICATION BULLETIN OR NATIONAL GYPSUM COMPANY'S LATEST SPECIFICATIONS EXCEPT AS NOTED.
3. ALL WOOD BLOCKING AND CONCEALED LUMBER SHALL BE FIRE RETARDANT TREATED.
4. SEE FLOOR PLANS FOR THE COMPLETE FINISH LOCATION CALLOUTS.

INTERIOR FINISH SCHEDULE ABBREVIATION LEGEND

ACT	ACOUSTICAL CEILING TILE
CONC	CONCRETE
CMU	CONCRETE MASONRY UNIT
CS	CONCRETE SEALER
CT	CERAMIC TILE
EXP	EXPOSED
FENCE	FENCING
FF	FACTORY FINISH
FRCB	FIBER REINFORCED CEMENT BOARD
FRP	FIBER REINFORCED PLASTIC
FSK	FIRE RESISTANT SKIM KRAFT FACE INSTALLATION
GWB	GYPSUM WALL BOARD
PT	PAINT
PLYWD	PLYWOOD
RB	RUBBER BASE
VCT	VINYL COMPOSITION TILE
CPT	CARPET TILE
LT BRM	LIGHT BROOM FINISH
H TRWL	HAND TROWEL FINISH
T&G ACX	TONGUE AND GROOVE PANEL, EXTERIOR FINISH
WRGWB	WATER RESISTANT GYPSUM WALL BOARD

REFERENCE DRAWINGS

04A01	HEADTANK FLOOR PLAN
05A01	HATCHERY BUILDING FLOOR PLAN
07A01	SHOP/GAREAGE BUILDING FLOOR PLAN
09A01	ADULT HOLDING BUILDING FLOOR PLAN

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	DH
DESIGNER 2:	
DRAWN BY:	MLDC
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

STANDARD

ARCHITECTURAL FINISH SCHEDULE

0 1" 2"

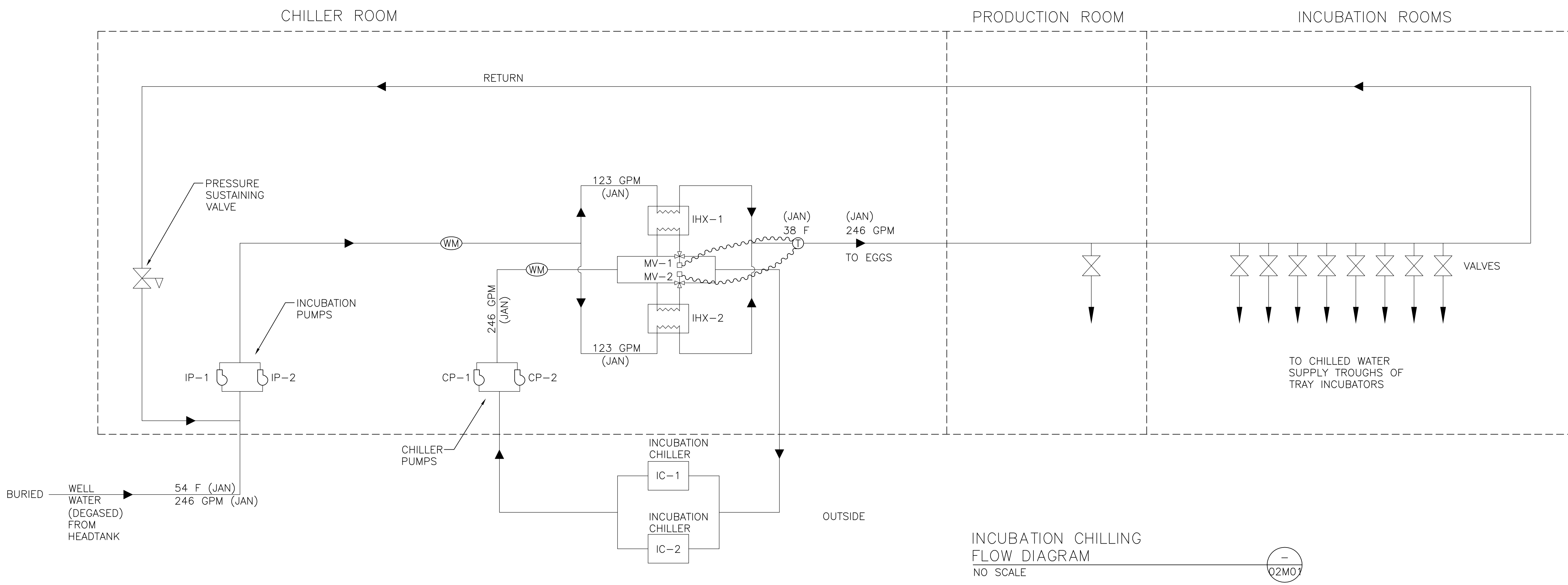
FILENAME	01A03.dwg
SCALE	NOT TO SCALE

SHEET **01A03**

Attachment B

DIAGRAM SYMBOLS & ABBREVIATIONS

JAN	JANUARY
GPM	GALLON PER MINUTE
MV	MIXING VALVE (COULD BE DIVERTER VALVE)
(WM)	WATER METER
(pump symbol)	PUMP
(T)	THERMOSTAT
~~	CONTROL WIRE
– – –	ROOM LIMITS
F	FAHRENHEIT
IHX	INCUBATION HEAT EXCHANGER (FLAT PLATE)



INCUBATION CHILLING FLOW DIAGRAM

NO SCALE

– / 02M01

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

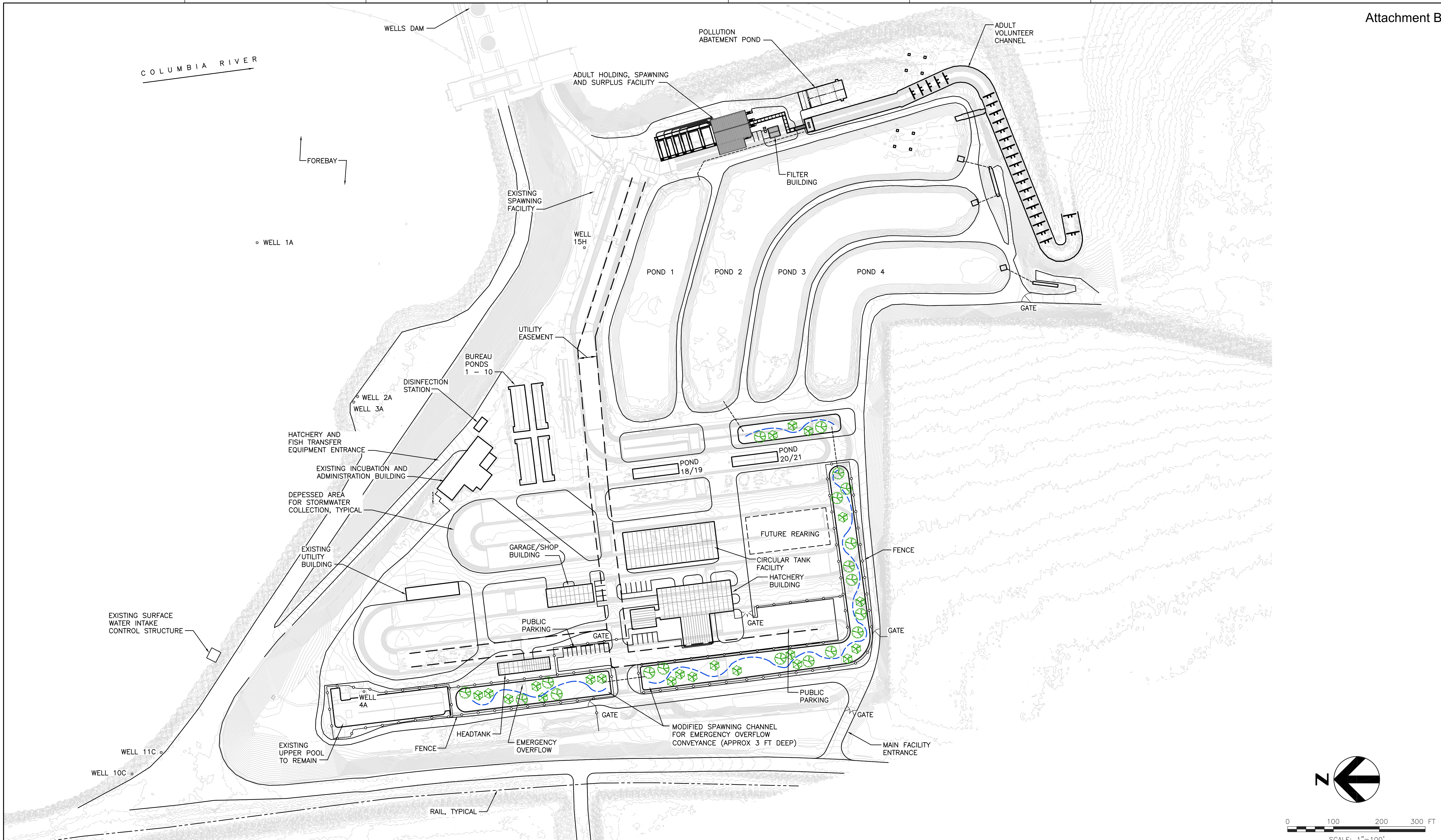
INCUBATION CHILLER DIAGRAM

0 1" 2"

FILENAME	02M01.dwg
SCALE	SCALE

SHEET 02M01

Attachment B



HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

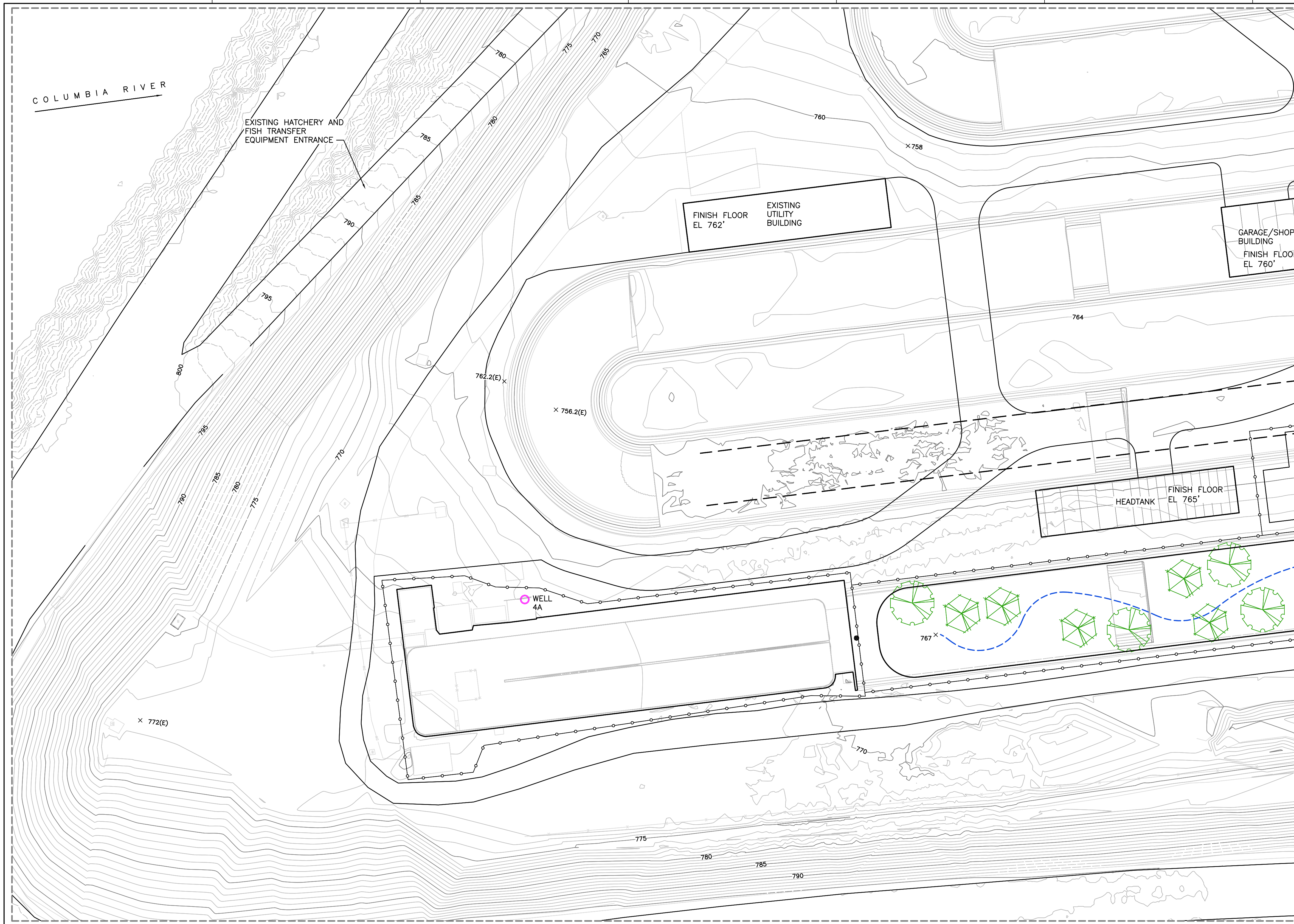
SITE OVERALL PLAN

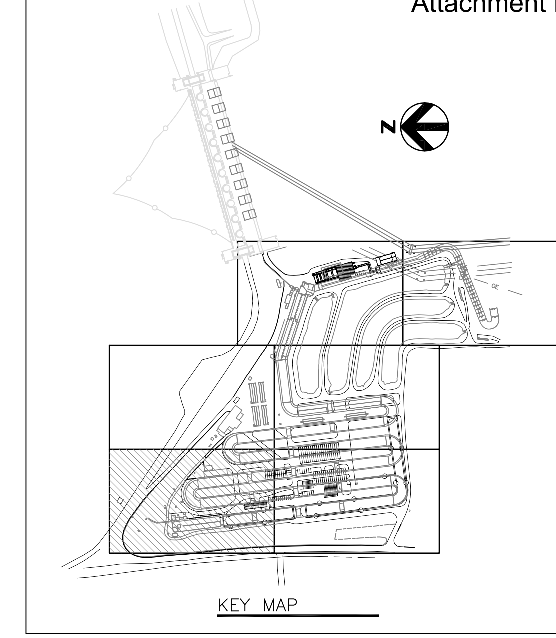
0 1" 2"

FILENAME	03C02.dwg
SCALE	SCALE AS NOTED

SHEET 03C02

Attachment B





N

0 30 60 90 FT

SCALE: 1"=30'

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

SITE

GRADING, PAVING AND HORIZONTAL CONTROL PLAN 1

0 1" 2"

FILENAME	03C07.dwg	SHEET 03C07
SCALE	SCALE AS NOTED	

Attachment B

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

SITE

GRADING, PAVING AND HORIZONTAL CONTROL PLAN 2

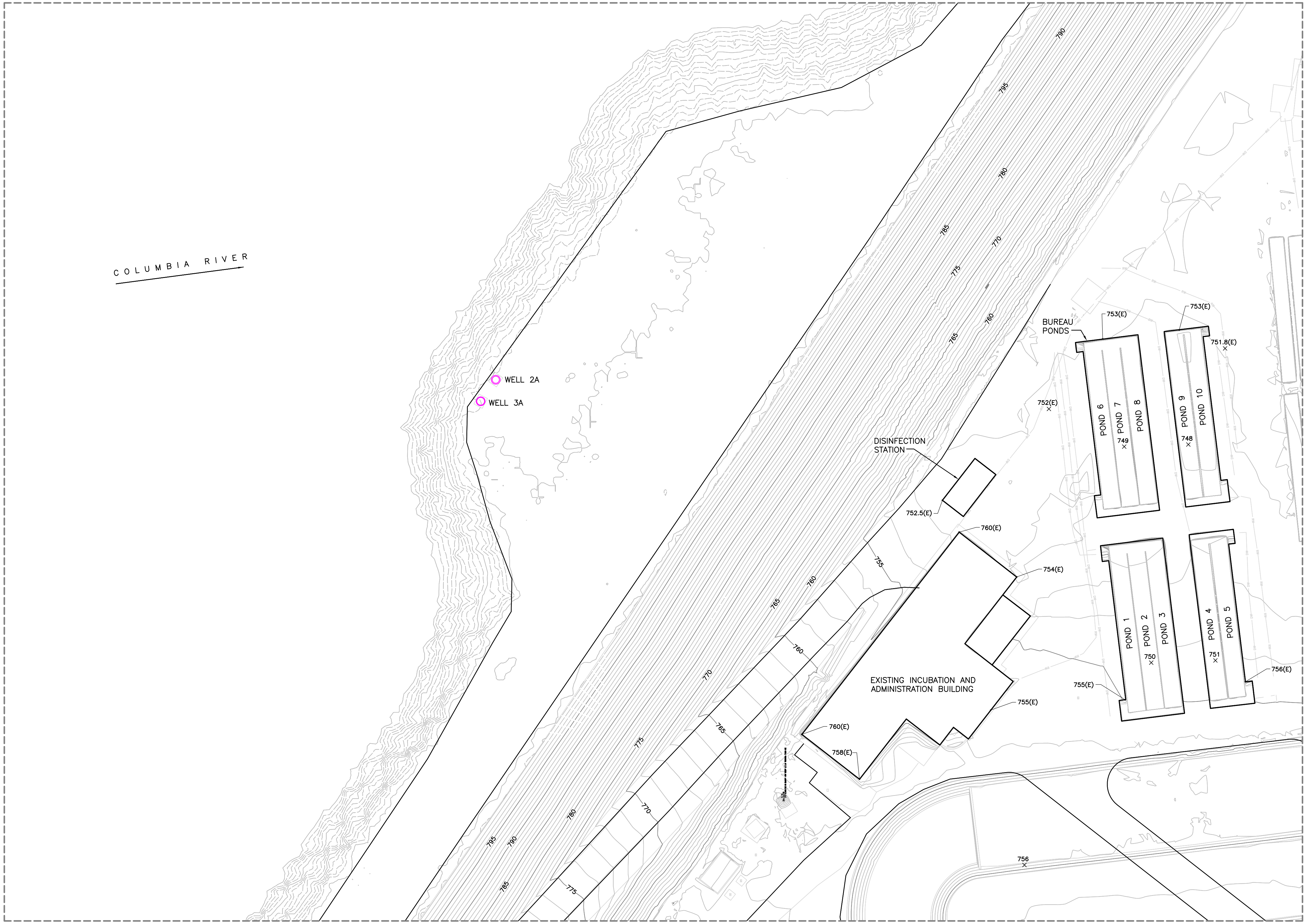
0 1" 2"

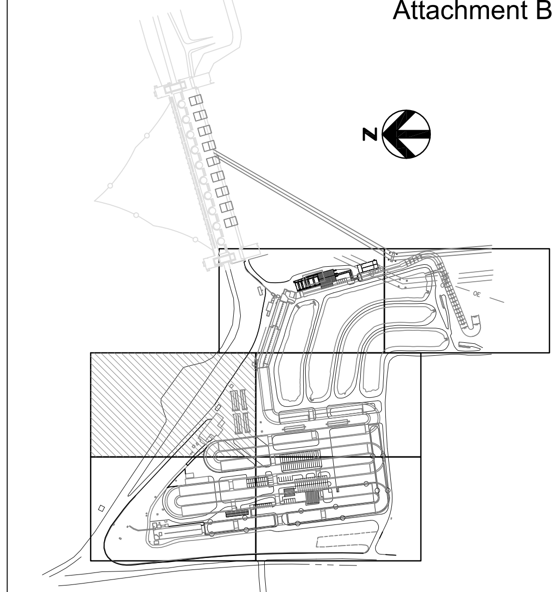
FILENAME 03C08.dwg

SCALE SCALE AS NOTED

SHEET 03C08

Attachment B





KEY MAP

N

0 30 60 90 FT

SCALE: 1"=30'

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

HDR Fisheries DESIGN CENTER

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

SITE

GRADING, PAVING AND HORIZONTAL CONTROL PLAN 3

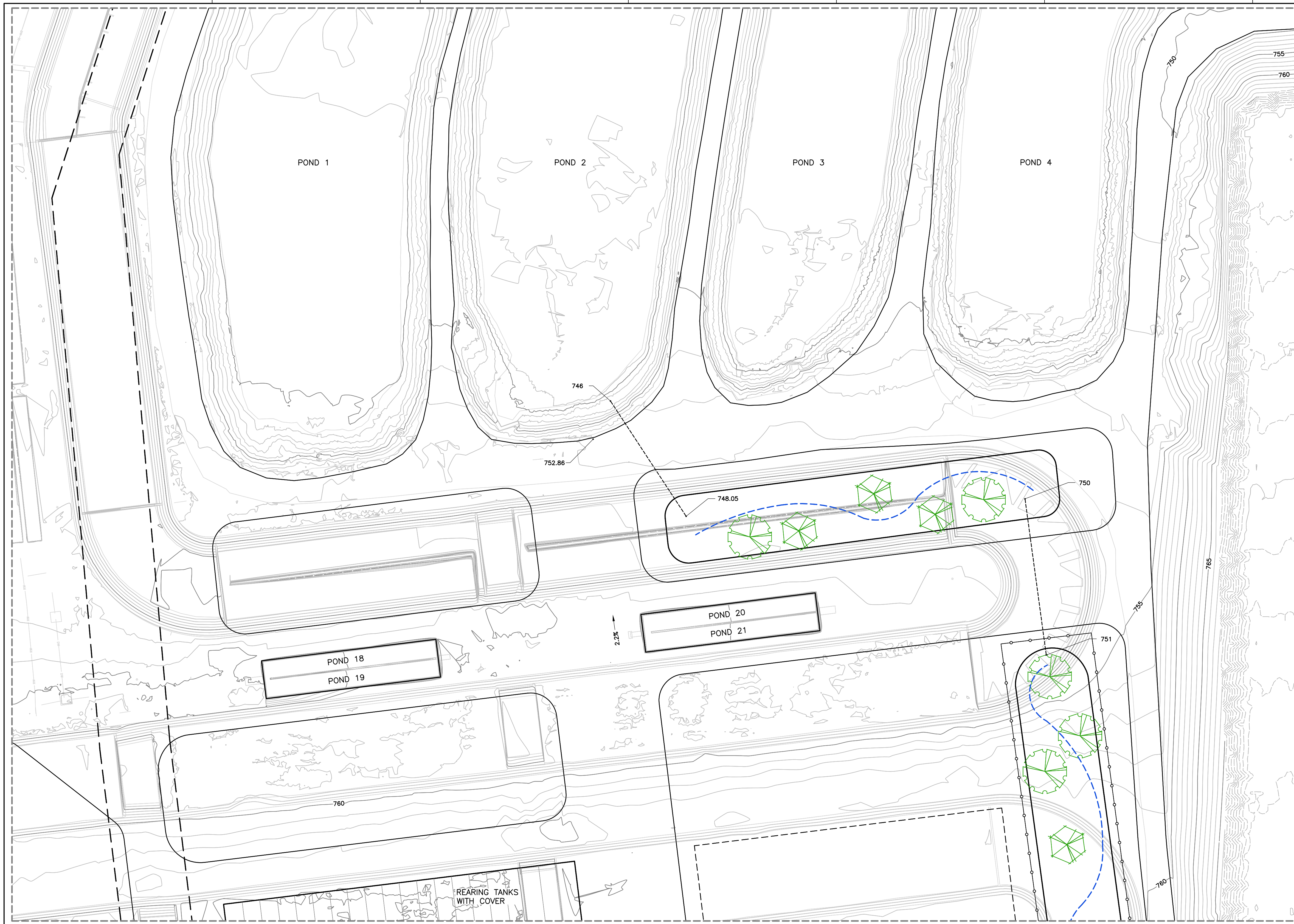
0 1" 2"

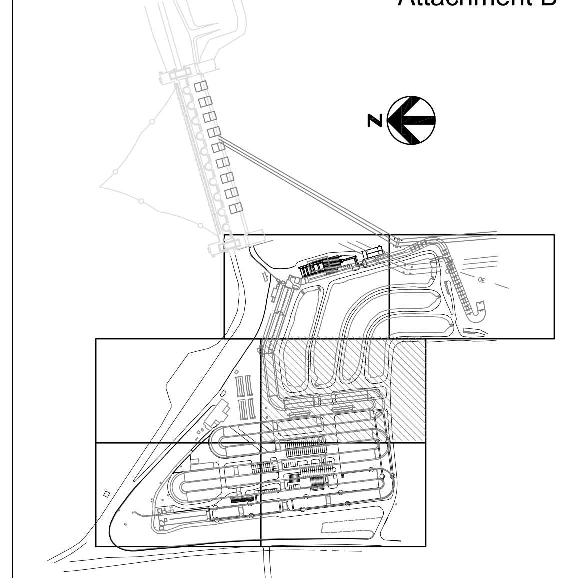
FILENAME	03C09.dwg
SCALE	SCALE AS NOTED

SHEET

03C09

Attachment B





KEY MAP

N

0 30 60 90 FT
SCALE: 1"=30'

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

SITE

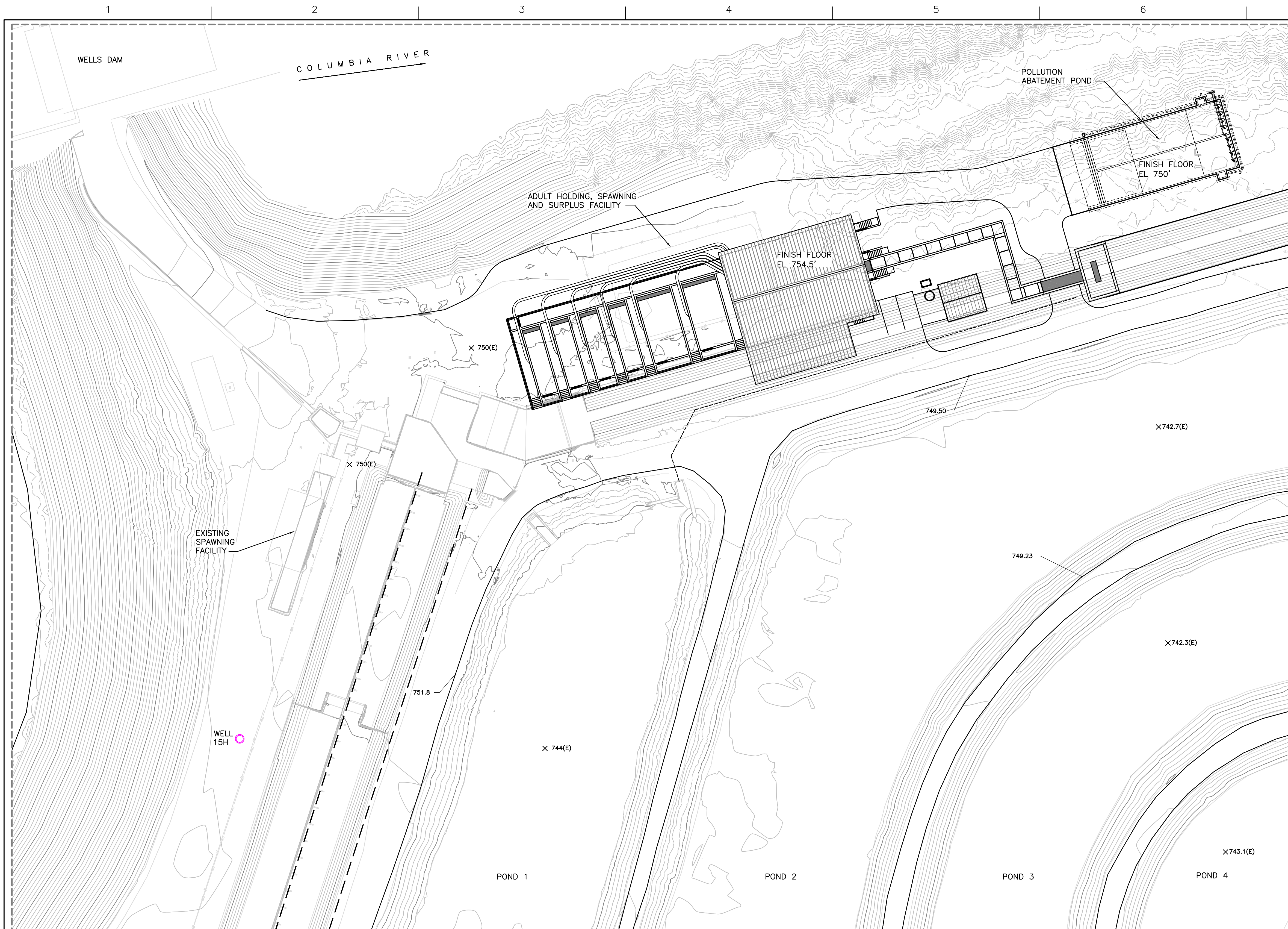
GRADING, PAVING AND HORIZONTAL CONTROL PLAN 4

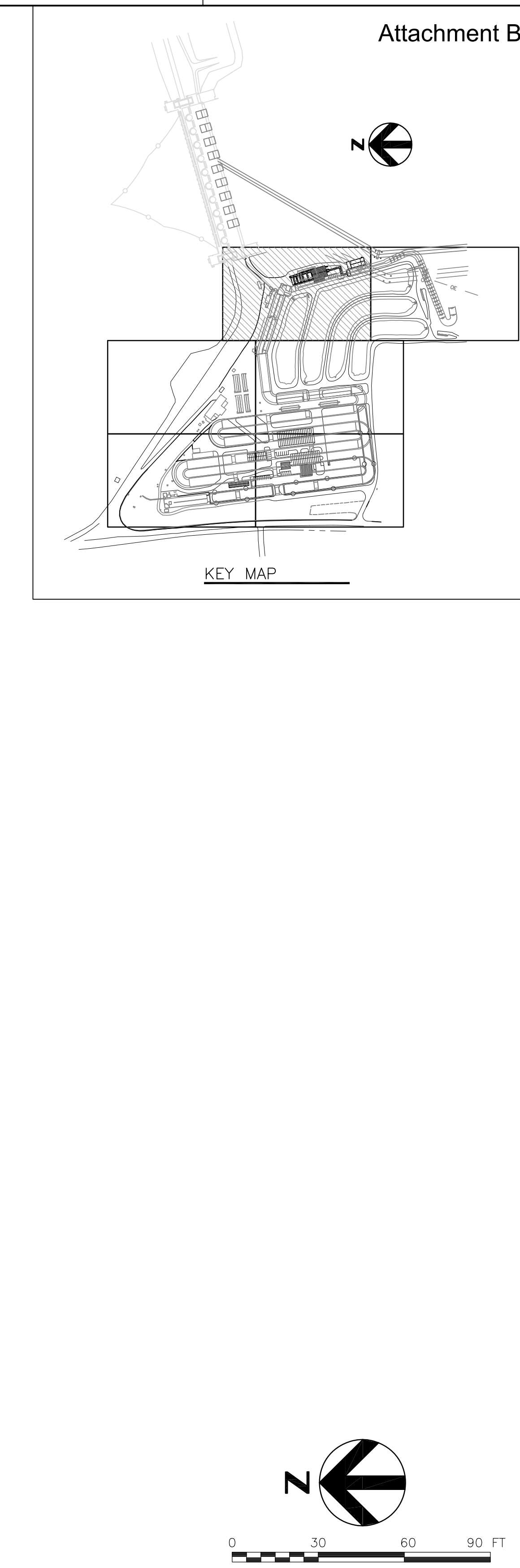
0 1" 2"

FILENAME	03C10.dwg
SCALE	SCALE AS NOTED

SHEET 03C10

Attachment B





HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

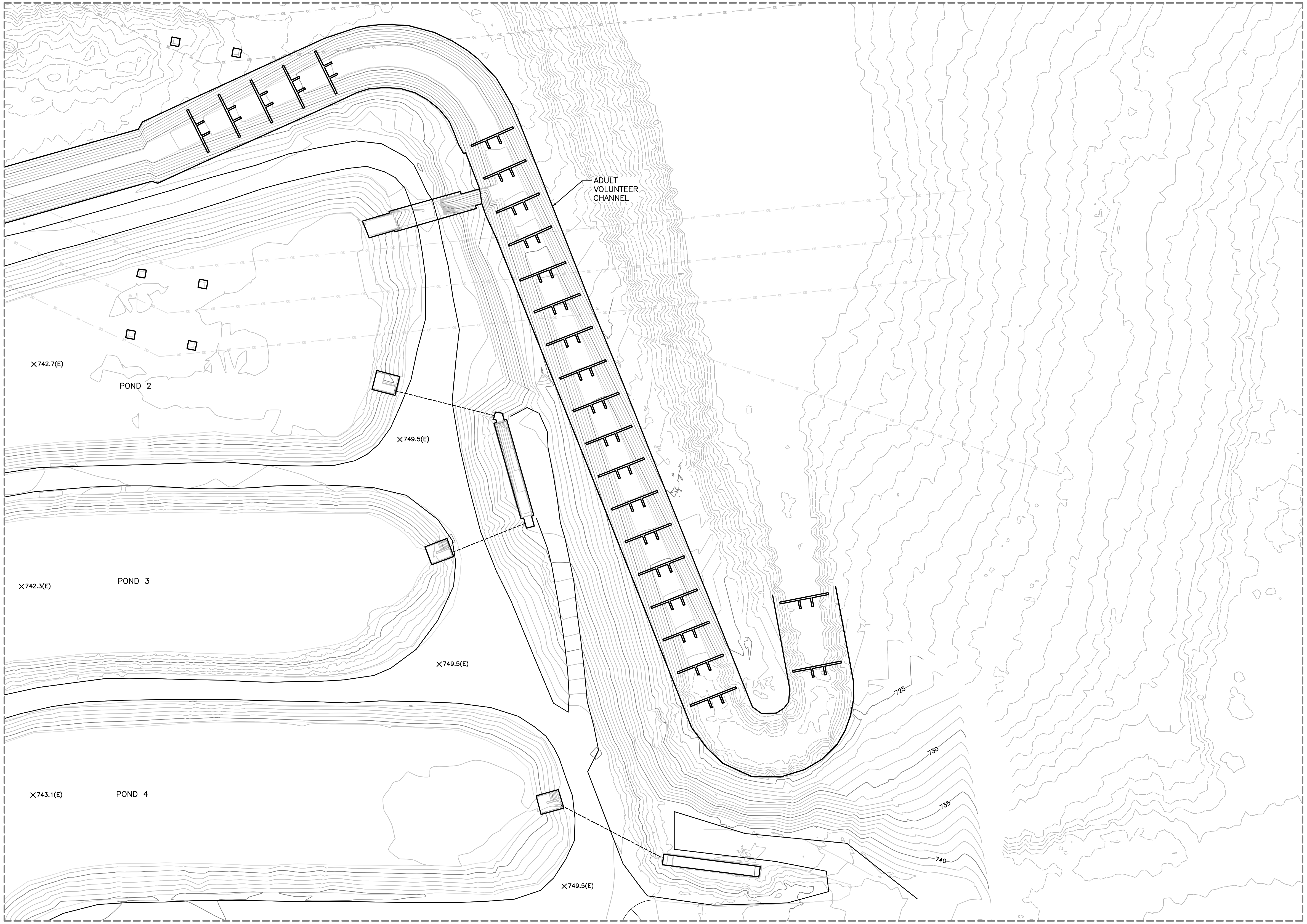
SITE

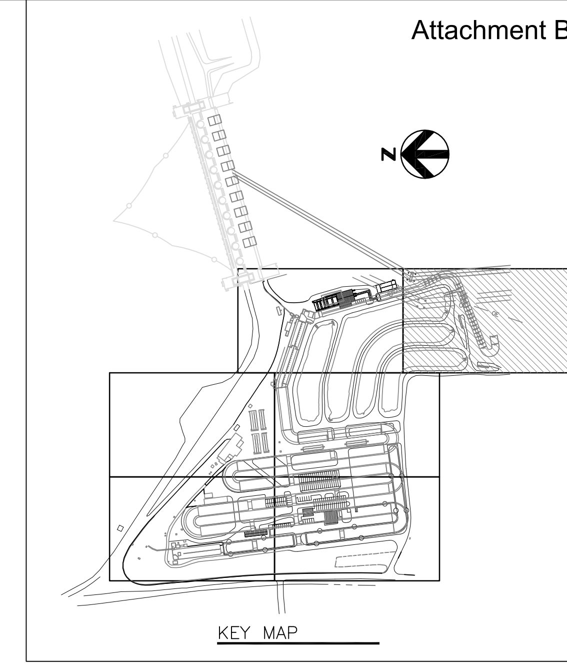
GRADING, PAVING AND HORIZONTAL CONTROL PLAN 5

0 1" 2"

FILENAME	03C11.dwg
SCALE	SCALE AS NOTED

SHEET 03C11





Attachment B

SCALE: 1"=30'

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

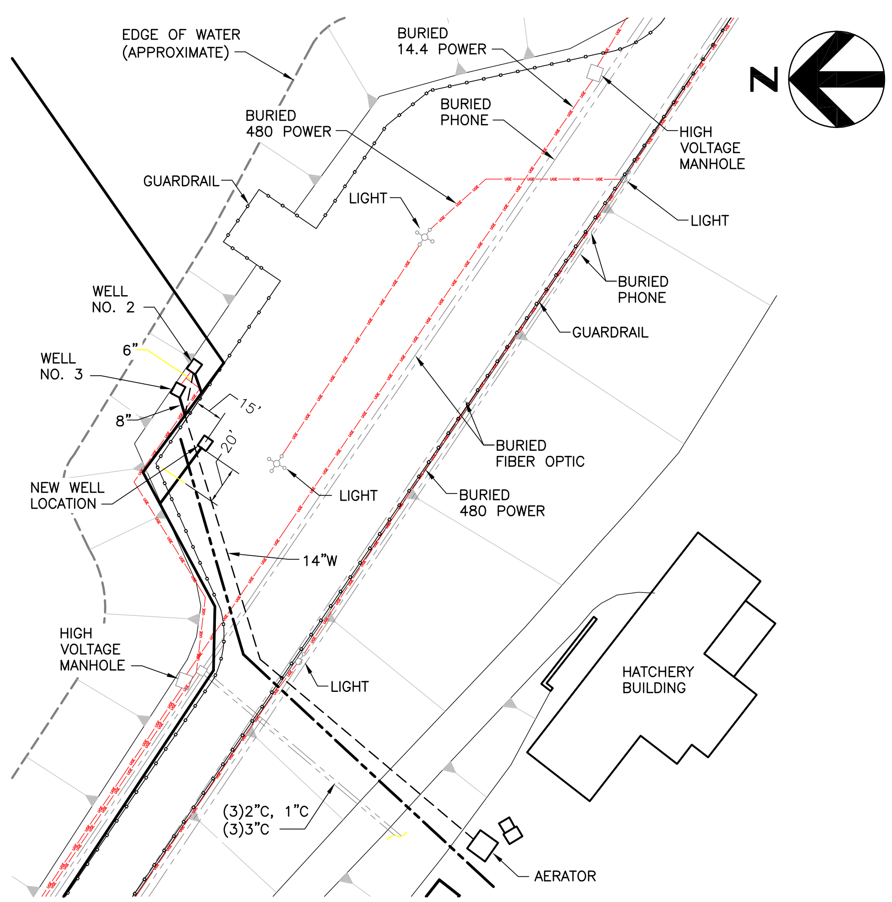
WELLS HATCHERY MODERNIZATION

SITE

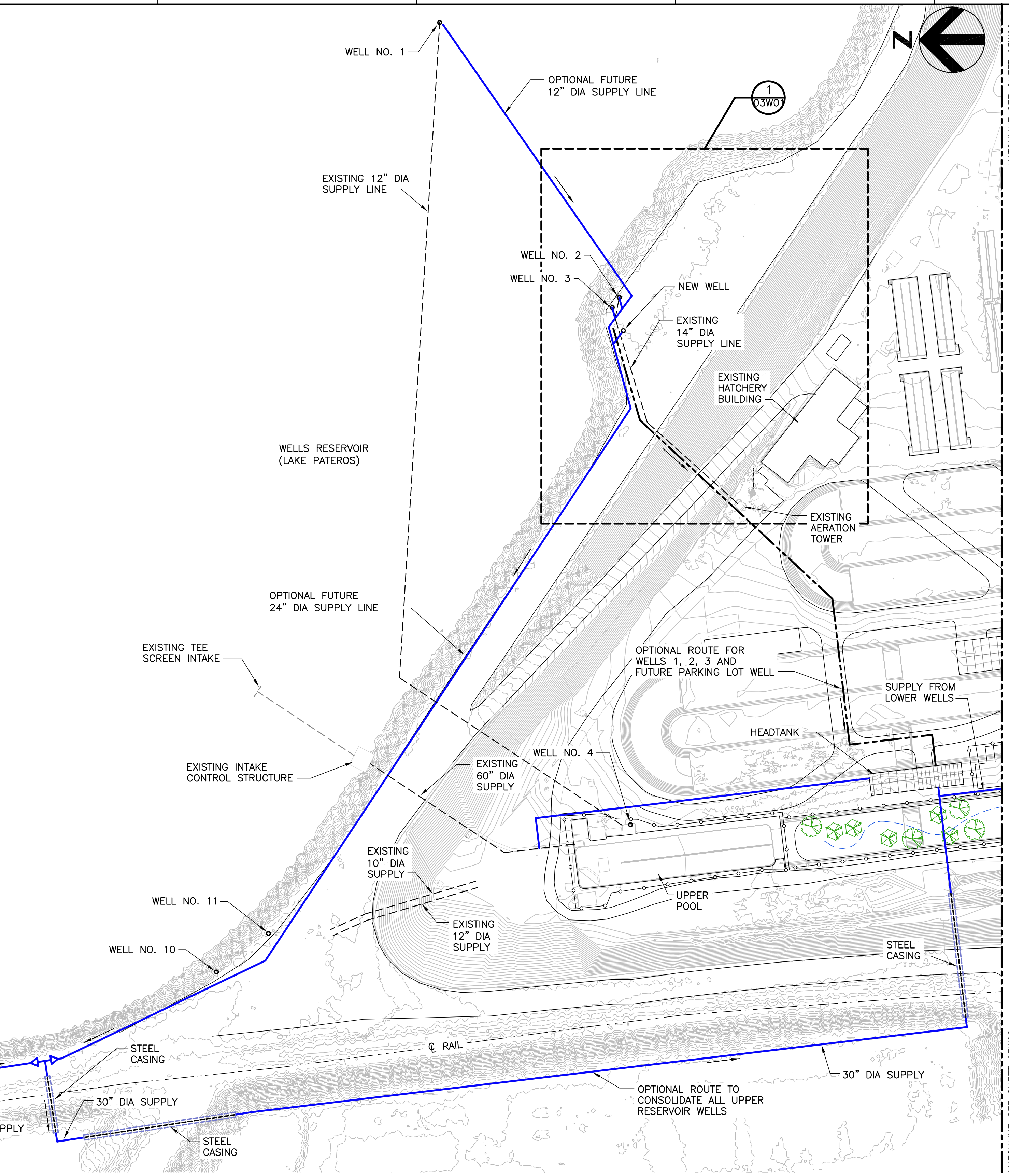
GRADING, PAVING AND HORIZONTAL CONTROL PLAN 6

FILENAME	03C12.dwg	SHEET	03C12
SCALE	SCALE AS NOTED		

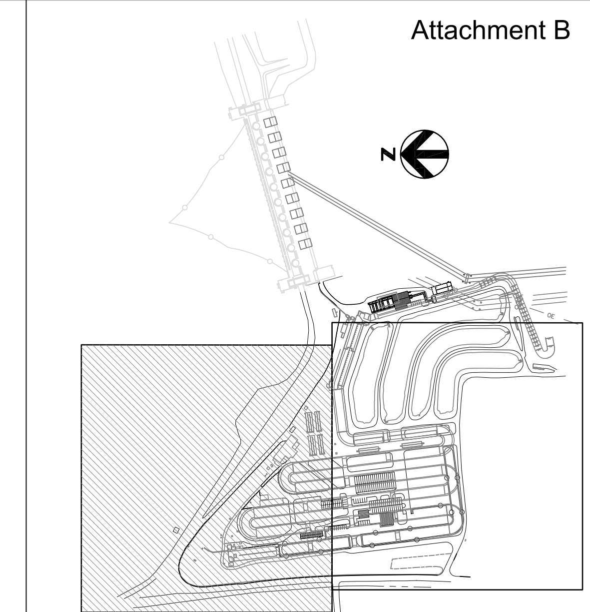
Attachment B



1 PARTIAL PLAN
Scale: 1"=50'



1 SUPPLY PIPING PLAN 1
Scale: 1"=80'



KEY MAP

REMARKS: TWO OPTIONS ARE REPRESENTED.

OPTION 1

CONSOLIDATING ALL UPPER RESERVOIR WELLS INTO ONE DELIVERY SYSTEM TO THE HEADTANK.

OPTION 2

CONSOLIDATING WELLS 1, 2, 3 AND FUTURE PARKING LOT WELLS, DELIVERY SYSTEM AND CONSOLIDATING WELLS 10, 11, 12, 13 AND A POTENTIAL FUTURE WELL DELIVERY SYSTEM.

NOTE:

1. LINE SIZING IS PRELIMINARY. LINE SIZING WILL BE ADJUSTED DEPENDING UPON FINAL WELL YIELDS.

LINE TYPES

- – – – EXISTING PIPING
- ——— OPTION 1 ROUTE
- —·—·— OPTION 2 ROUTE

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

CIVIL

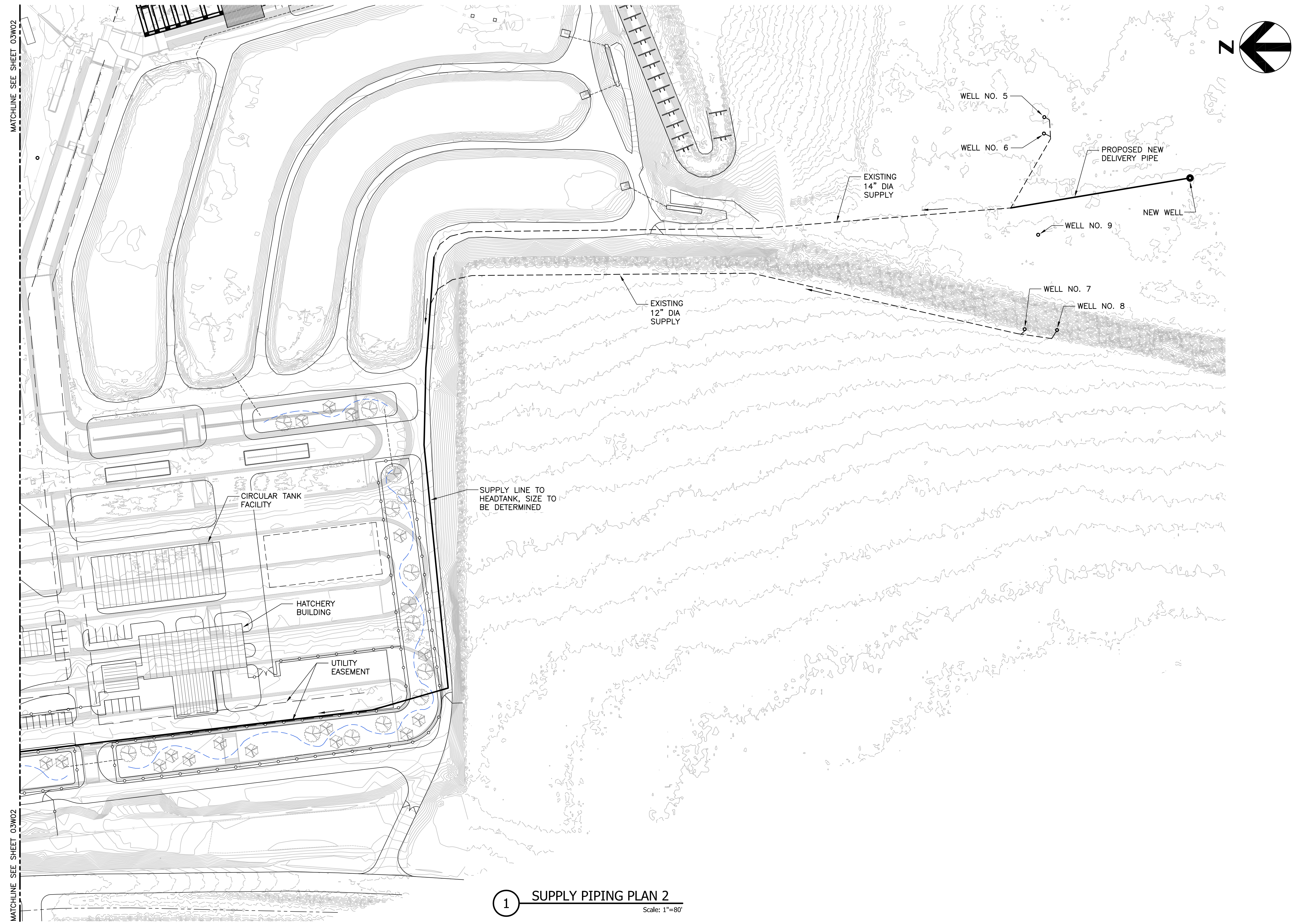
SUPPLY PIPING PLAN 1

0 1" 2"

FILENAME	03W01.dwg
SCALE	SCALE

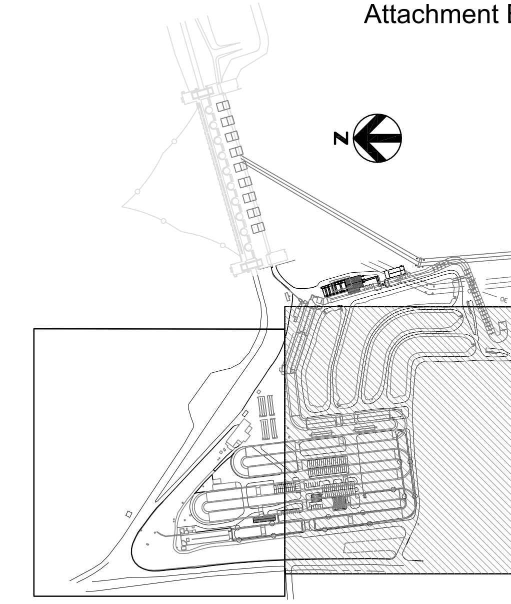
SHEET 03W01

Attachment B



1 SUPPLY PIPING PLAN 2

Scale: 1"=80'



KEY MAP

NOTE:

1. PROPOSED DELIVERY LINE SIZE WILL DEPEND UPON COMPLETION OF PUMP TESTING AT NEW WELL.

LINE TYPES

- - - - - EXISTING PIPING

——— NEW PROPOSED

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

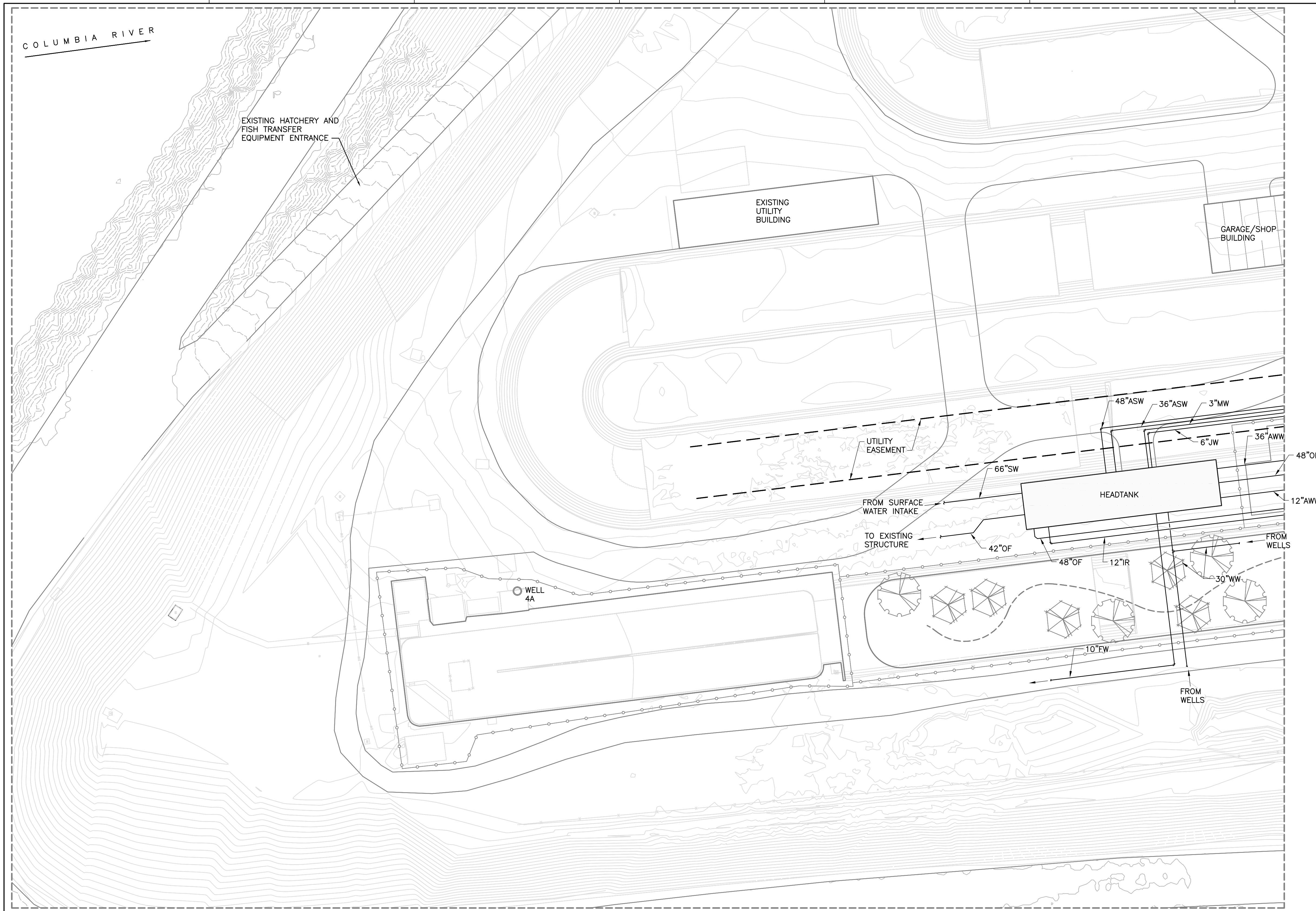
CIVIL

SUPPLY PIPING PLAN 2

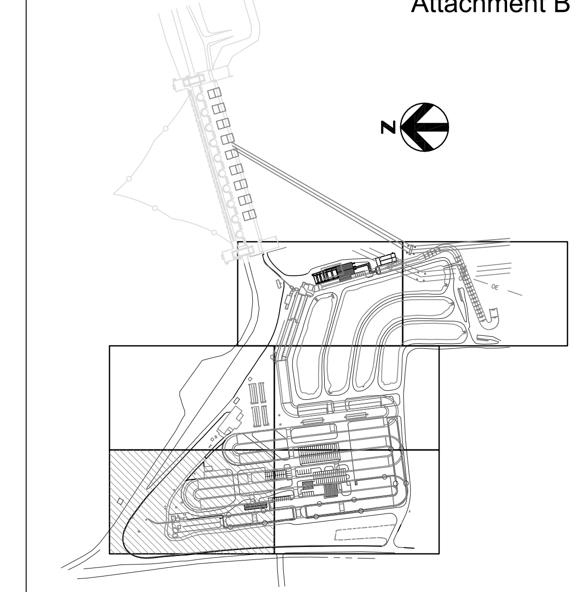
0 1" 2"

FILENAME	03W02.dwg
SCALE	SCALE

SHEET **03W02**



Attachment B



KEY MAP

N

0 30 60 90 FT

SCALE: 1"=30'

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

SITE

PIPING PLAN 1

0 1" 2"

FILENAME	03P01.dwg
SCALE	SCALE AS NOTED

SHEET 03P01

Attachment B

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

ISSUE	DATE	DESCRIPTION

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

SITE

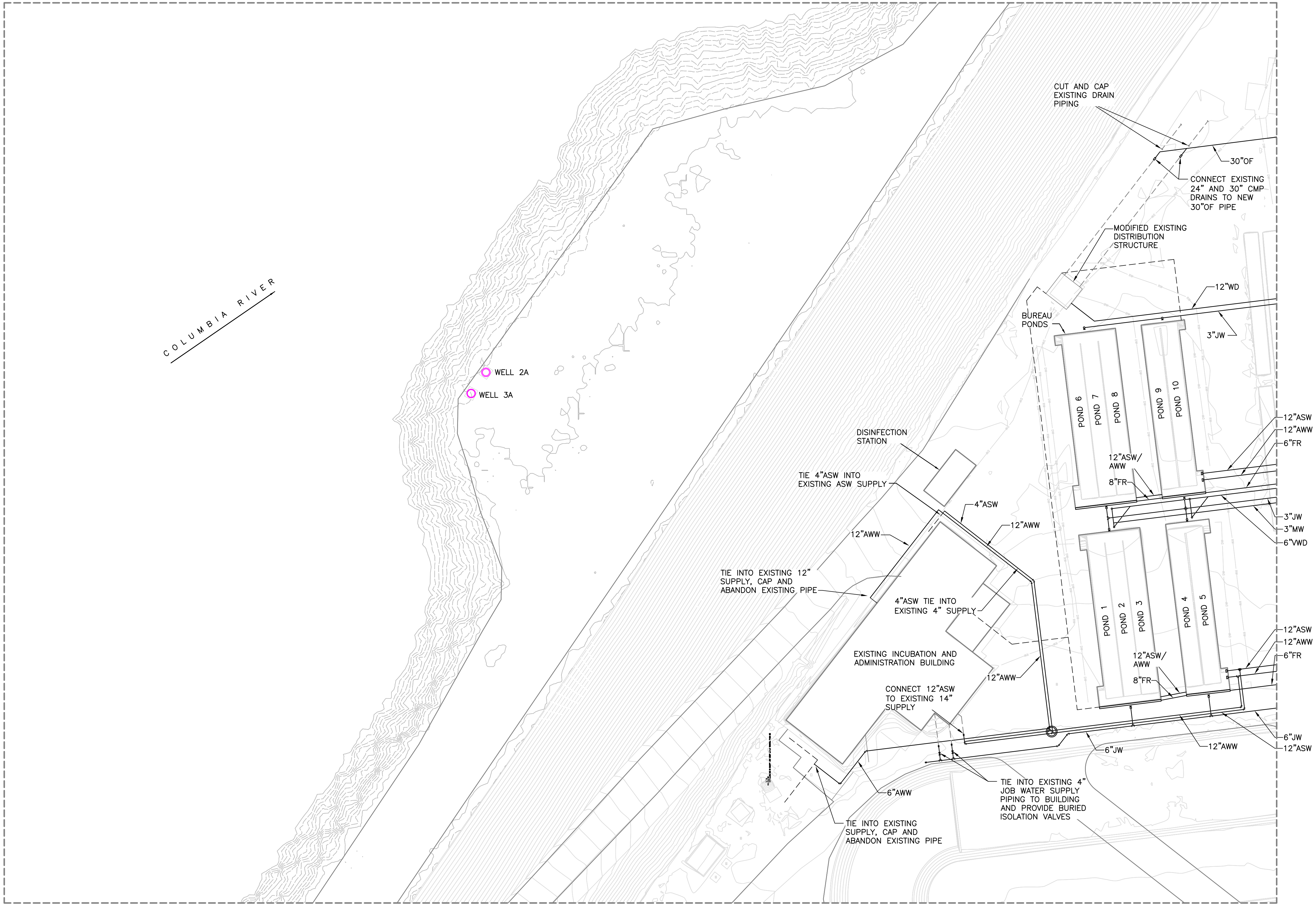
PIPING PLAN 2

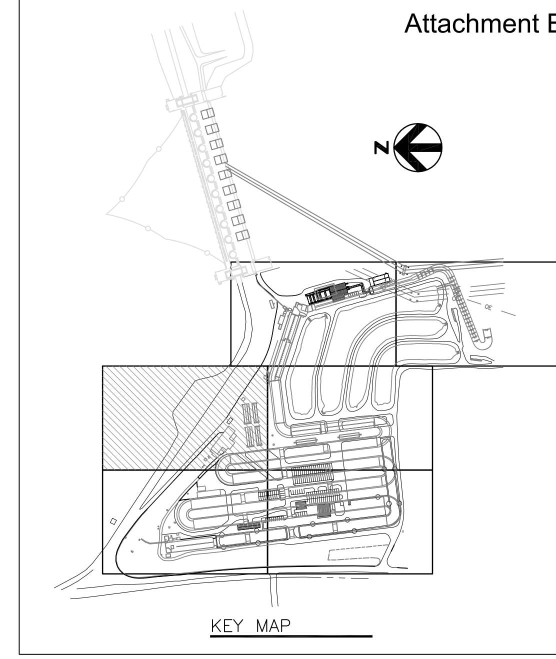
0 1" 2"

FILENAME	03P02.dwg
SCALE	SCALE AS NOTED

SHEET 03P02

Attachment B





N

0 30 60 90 FT

SCALE: 1"=30'

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

SITE

PIPING PLAN 3

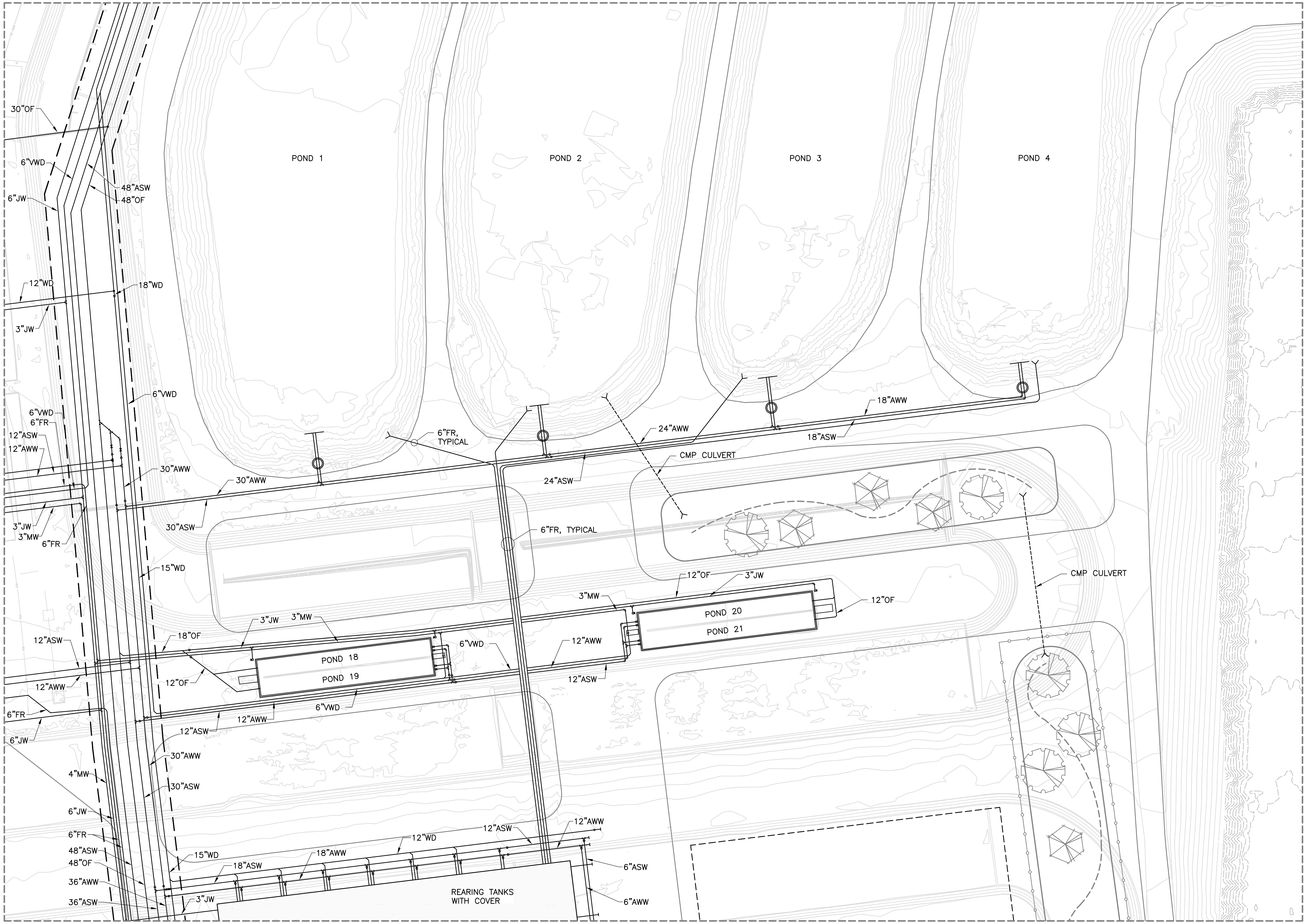
0 1" 2"

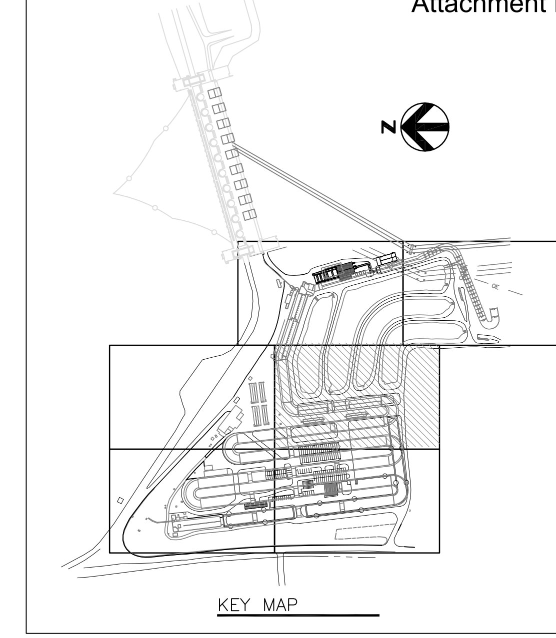
FILENAME	03P03.dwg
SCALE	SCALE AS NOTED

SHEET

03P03

Attachment B





0 30 60 90 FT

SCALE: 1"=30'

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

ISSUE	DATE	DESCRIPTION

HDR Fisheries DESIGN CENTER

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

SITE

PIPING PLAN 4

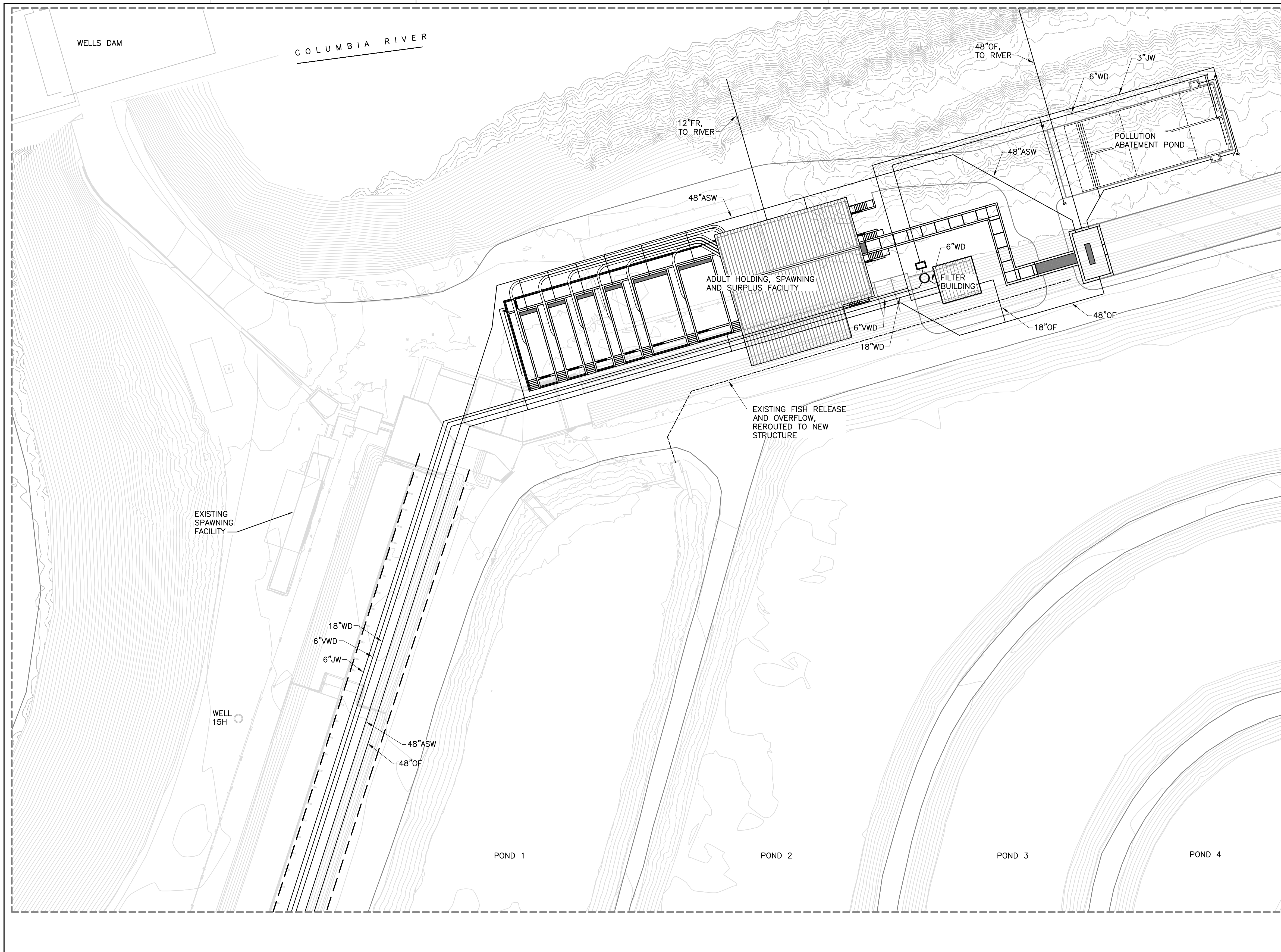
0 1" 2"

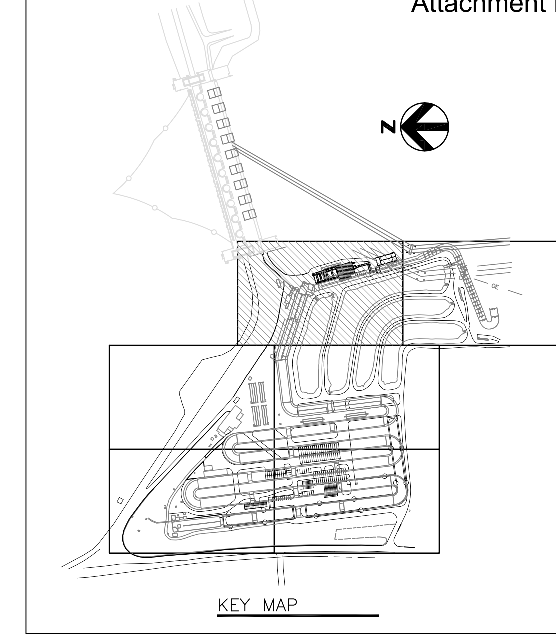
FILENAME	03P04.dwg
SCALE	SCALE AS NOTED

SHEET

03P04

Attachment B





HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

SITE

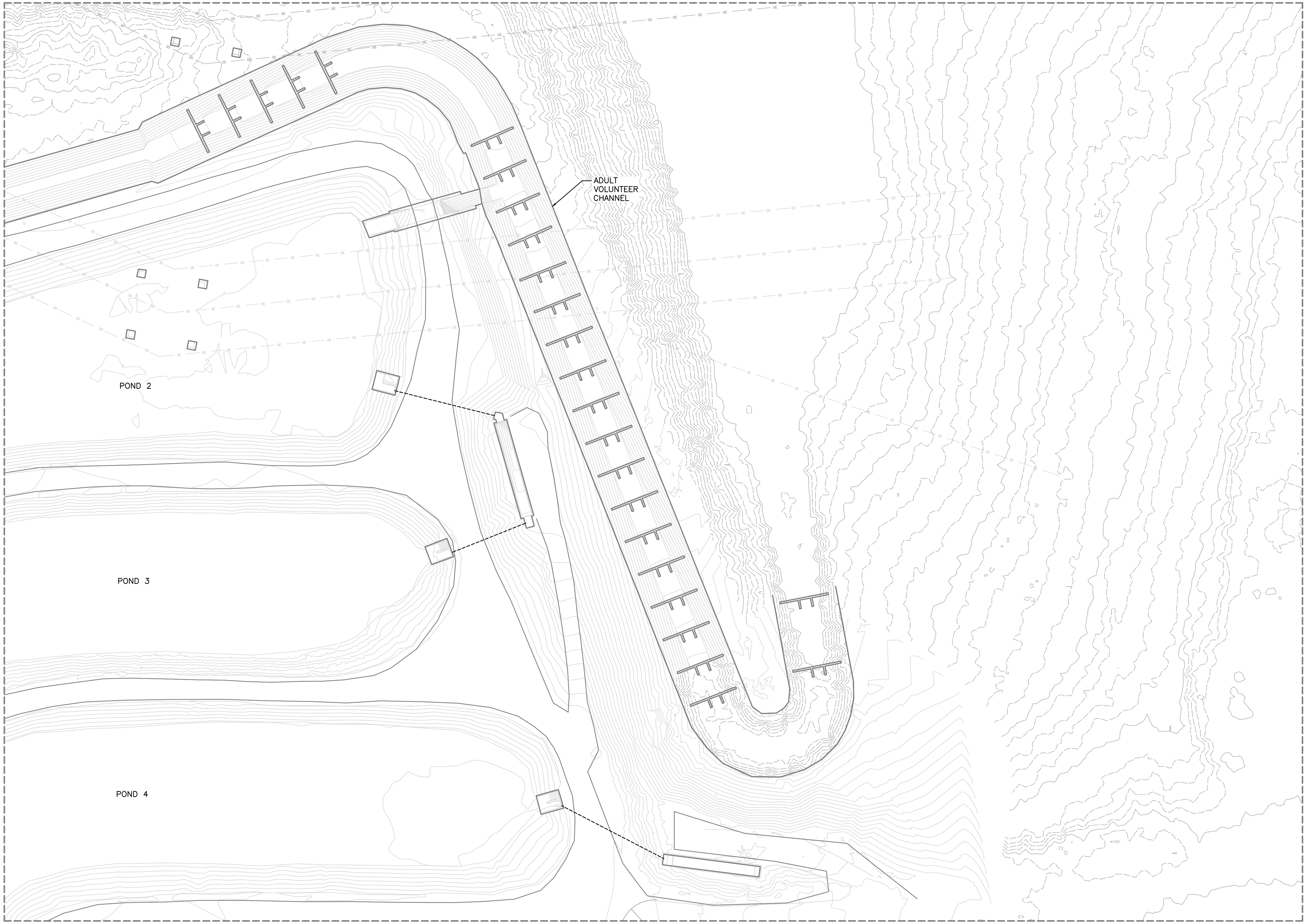
PIPING PLAN 5

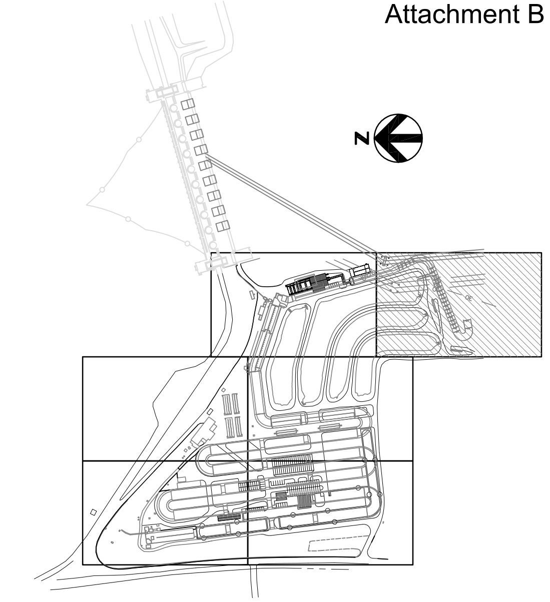
0 1" 2"

FILENAME	03P05.dwg
SCALE	SCALE AS NOTED

SHEET **03P05**

Attachment B





KEY MAP

N

0 30 60 90 FT
SCALE: 1"=30'

HDR
Fisheries
DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

SITE

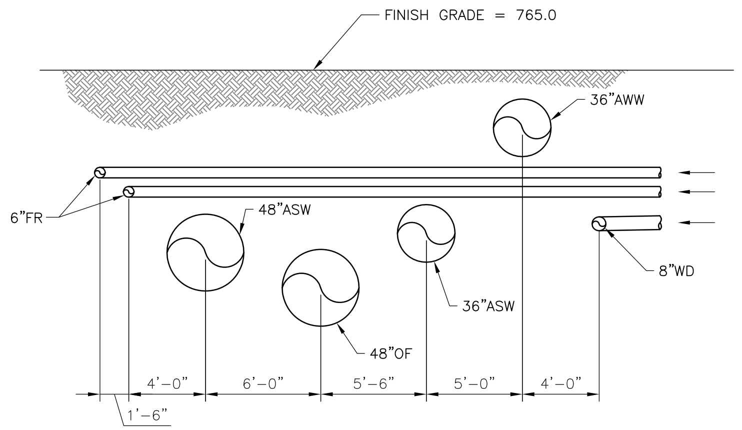
PIPING PLAN 6

0 1" 2"

FILENAME	03P06.dwg
SCALE	SCALE AS NOTED

SHEET
03P06

Attachment B



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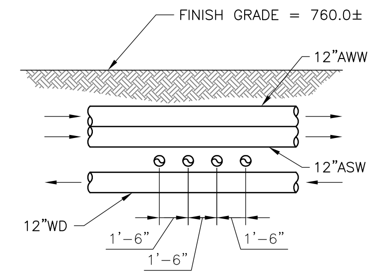
Scale: 1"=5'



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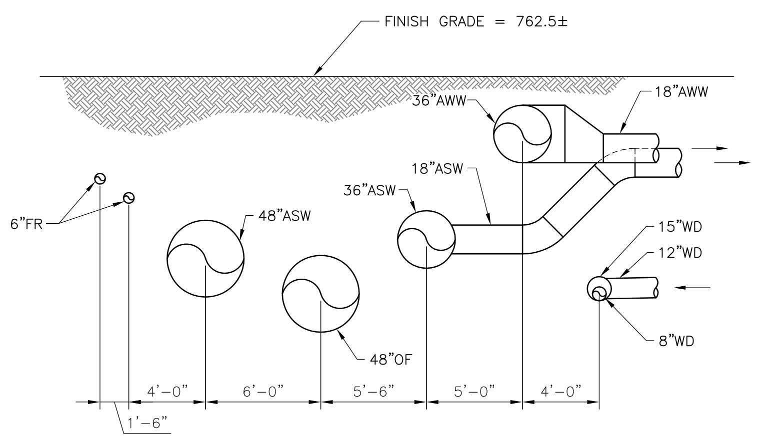
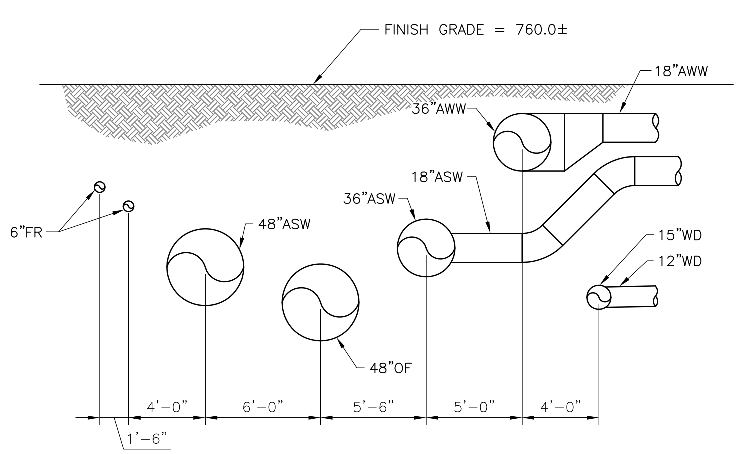


B SECTION
Scale: 1"=5'



C SECTION
Scale: 1"=5'

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	LKP
DESIGNER 2:	
DRAWN BY:	JLC
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

SITE

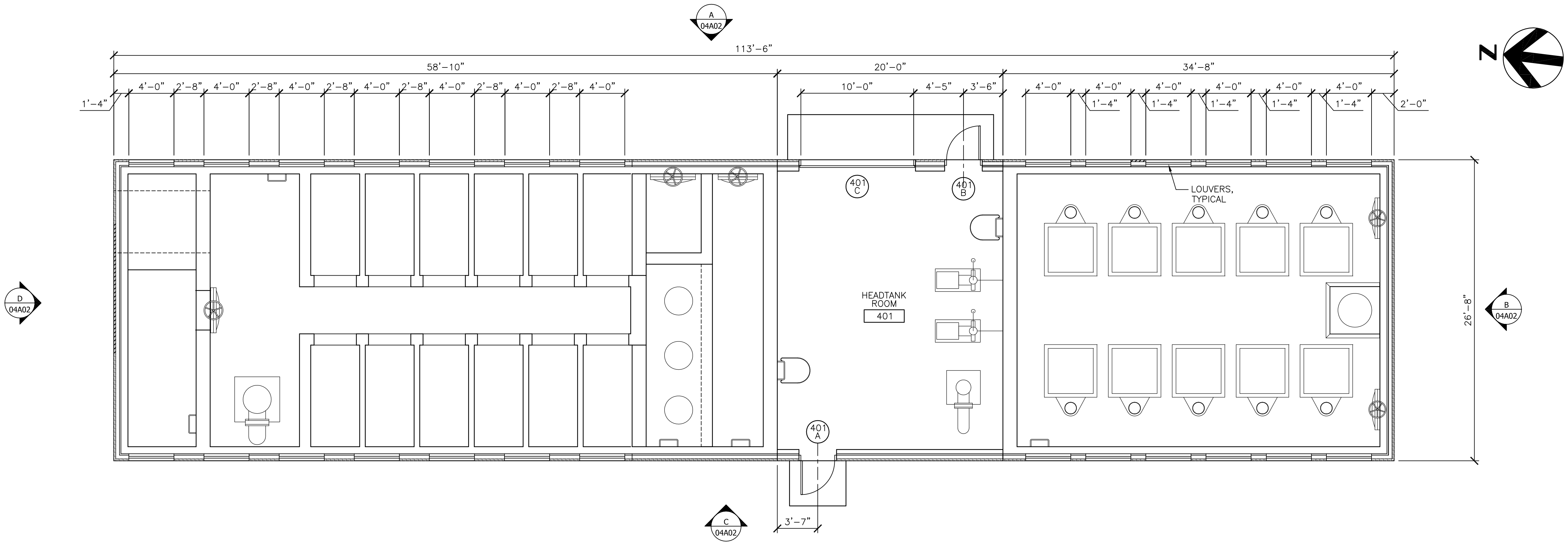
PIPING DETAILS 1

0 1" 2"

FILENAME	03P07.dwg
SCALE	SCALE

SHEET **03P07**

Attachment B



1 FLOOR PLAN- HEADTANK
Scale: 3/16"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

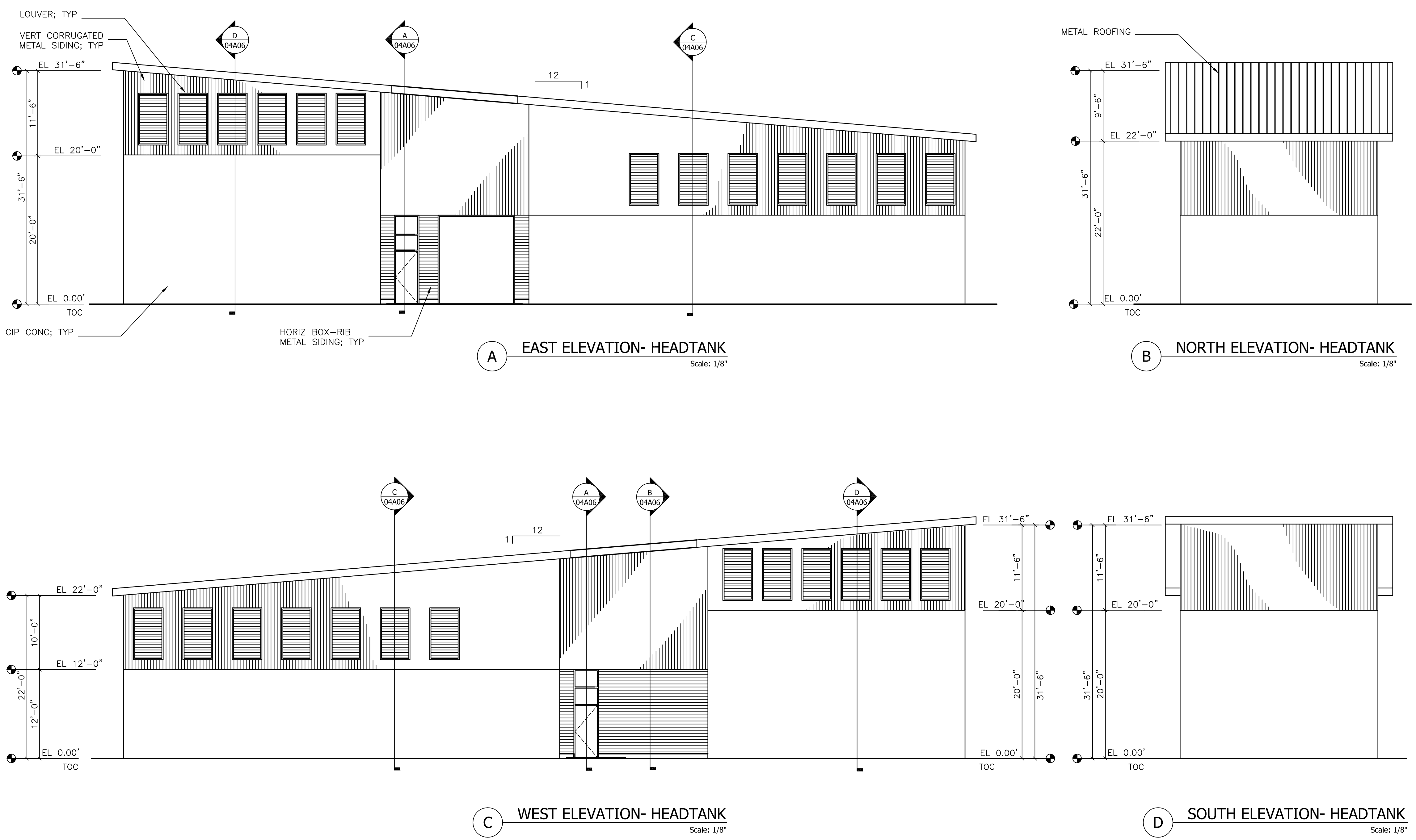
WELLS HATCHERY MODERNIZATION

HEADTANK
ARCHITECTURAL FLOOR PLAN

FILENAME	04A01.dwg
SCALE	SCALE AS NOTED

SHEET 04A01

Attachment B



PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	
DRAWN BY:	ACB/ MLDC
CHECKED BY:	
PROJECT NUMBER	000000000178576

ISSUE	DATE	DESCRIPTION

HDR Fisheries DESIGN CENTER

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

HEADTANK

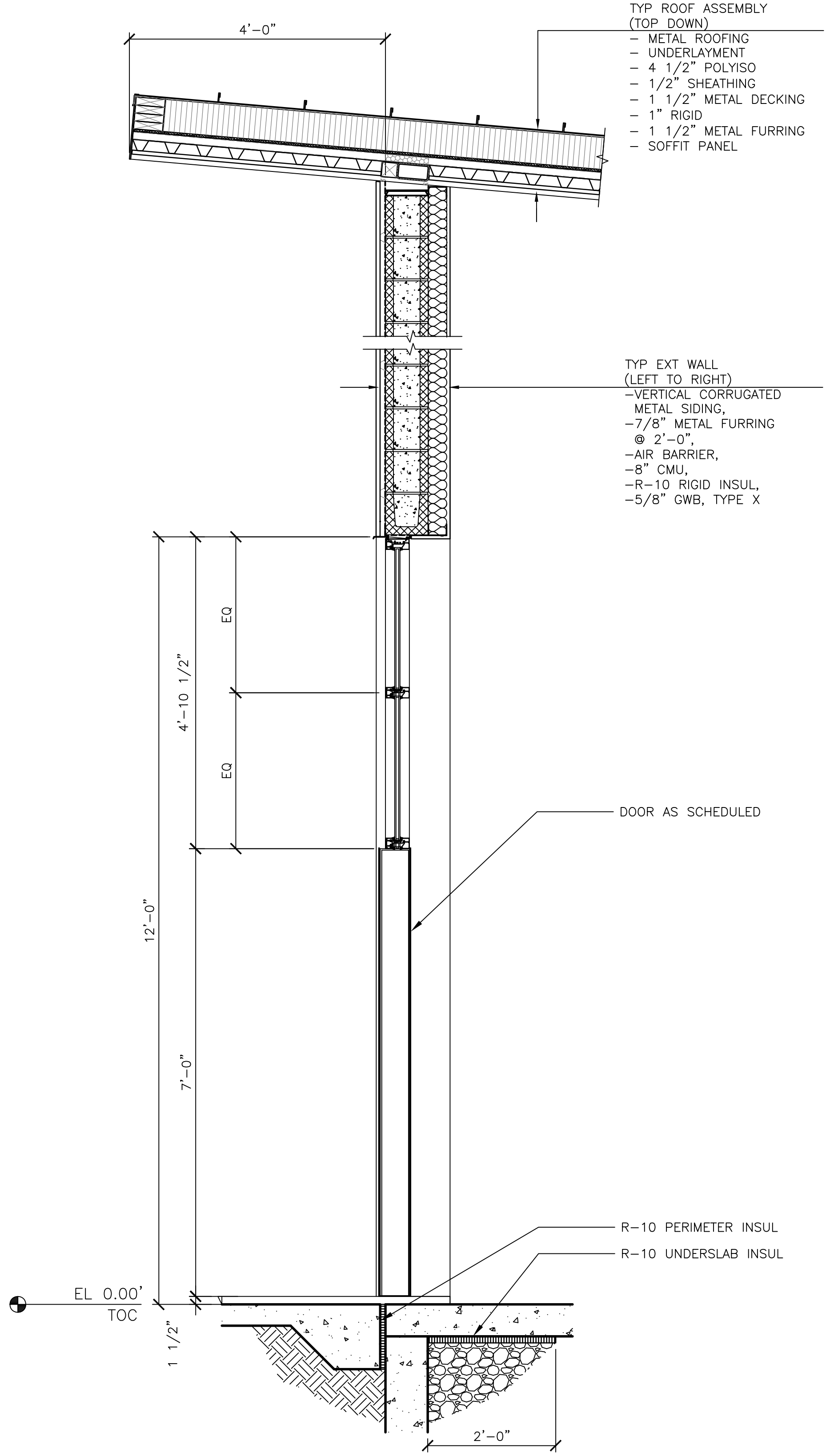
ARCHITECTURAL ELEVATIONS 1

0 1" 2"

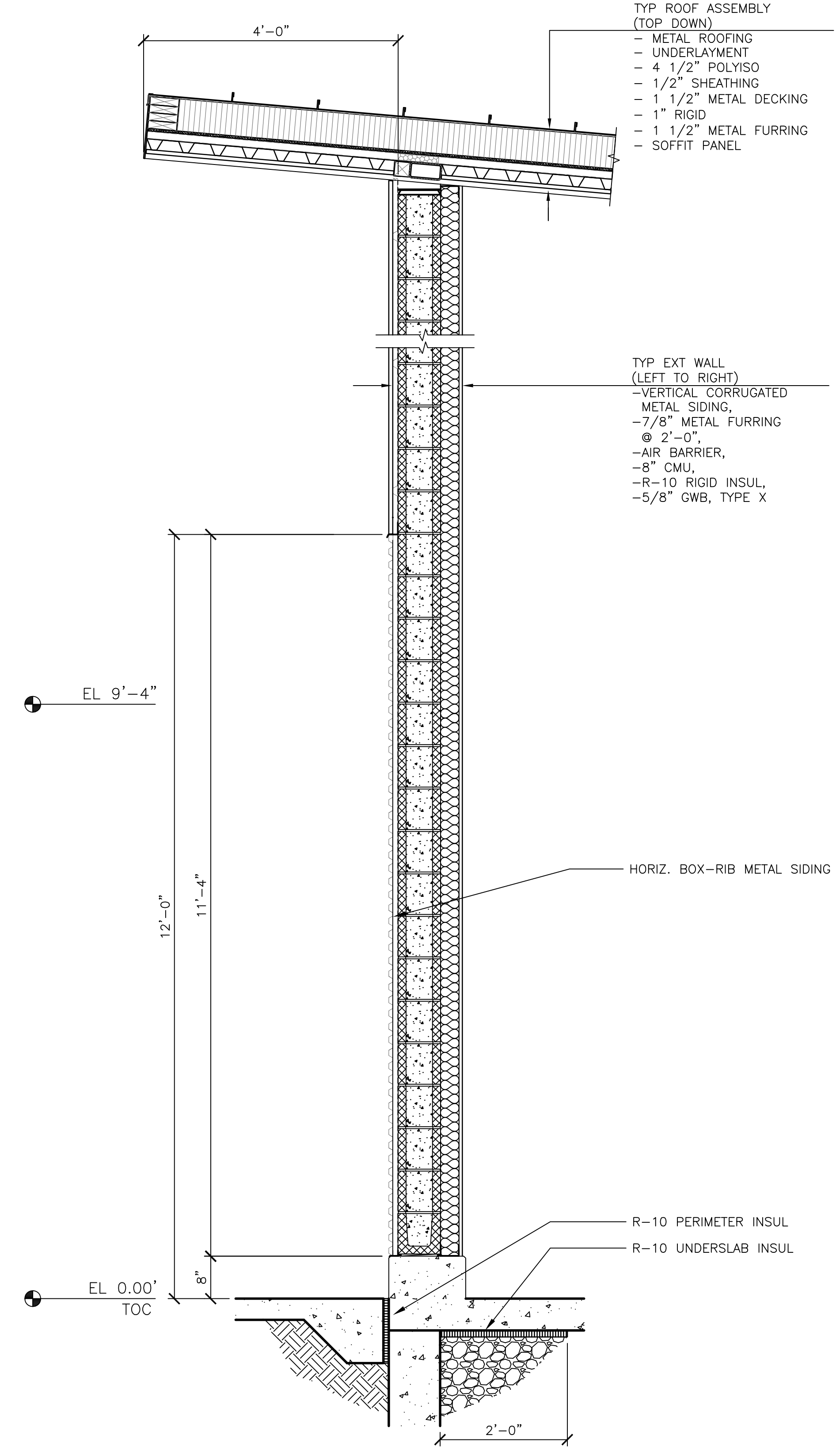
FILENAME	04A02.dwg
SCALE	SCALE AS NOTED

SHEET **04A02**

Attachment B



A WALL SECTION
Scale: 3/4"= 1'-0"



B WALL SECTION
Scale: 3/4"= 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	DH
DESIGNER 2:	
DRAWN BY:	MLDC
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

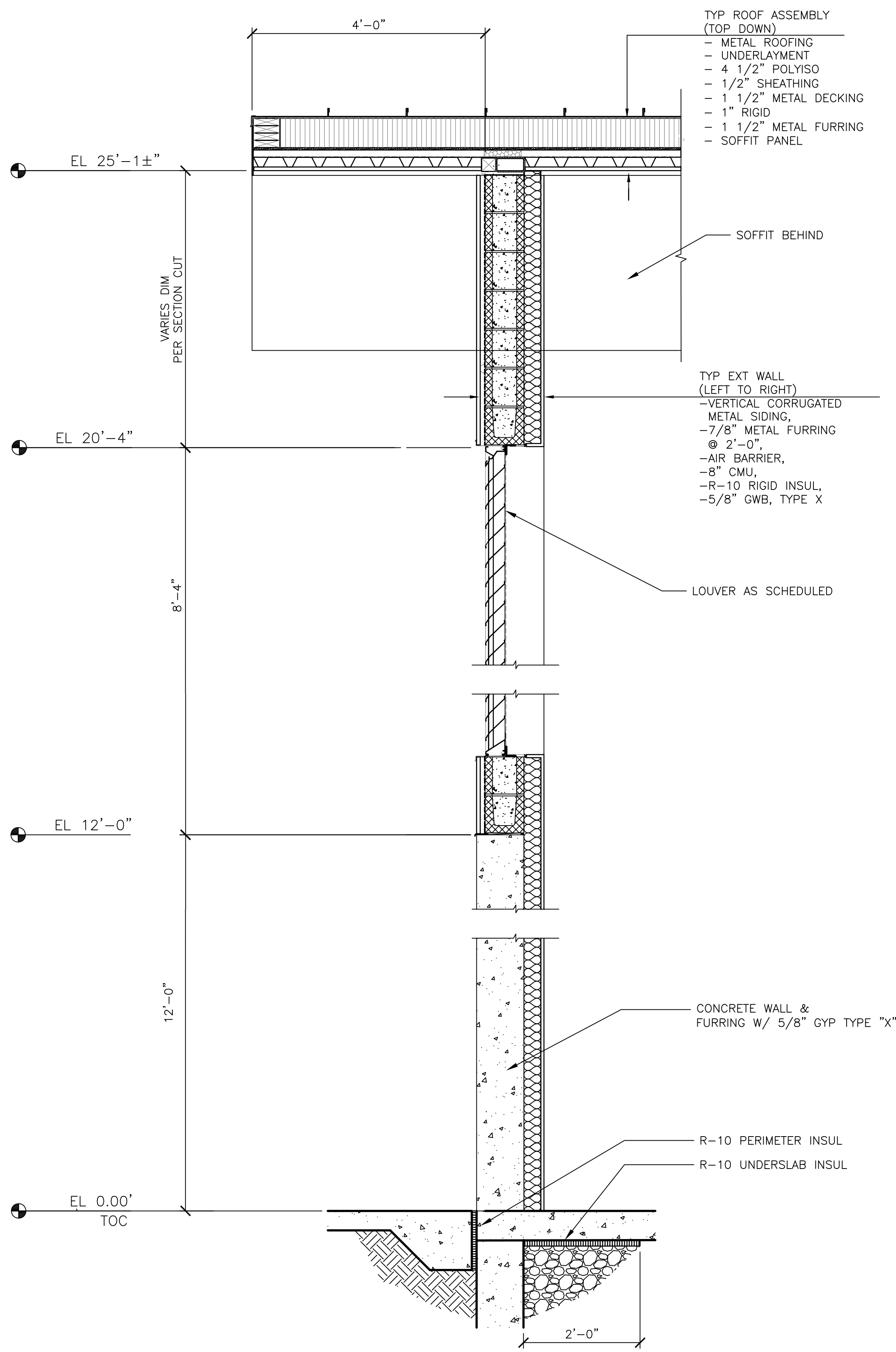
WELLS HATCHERY MODERNIZATION

HEADTANK

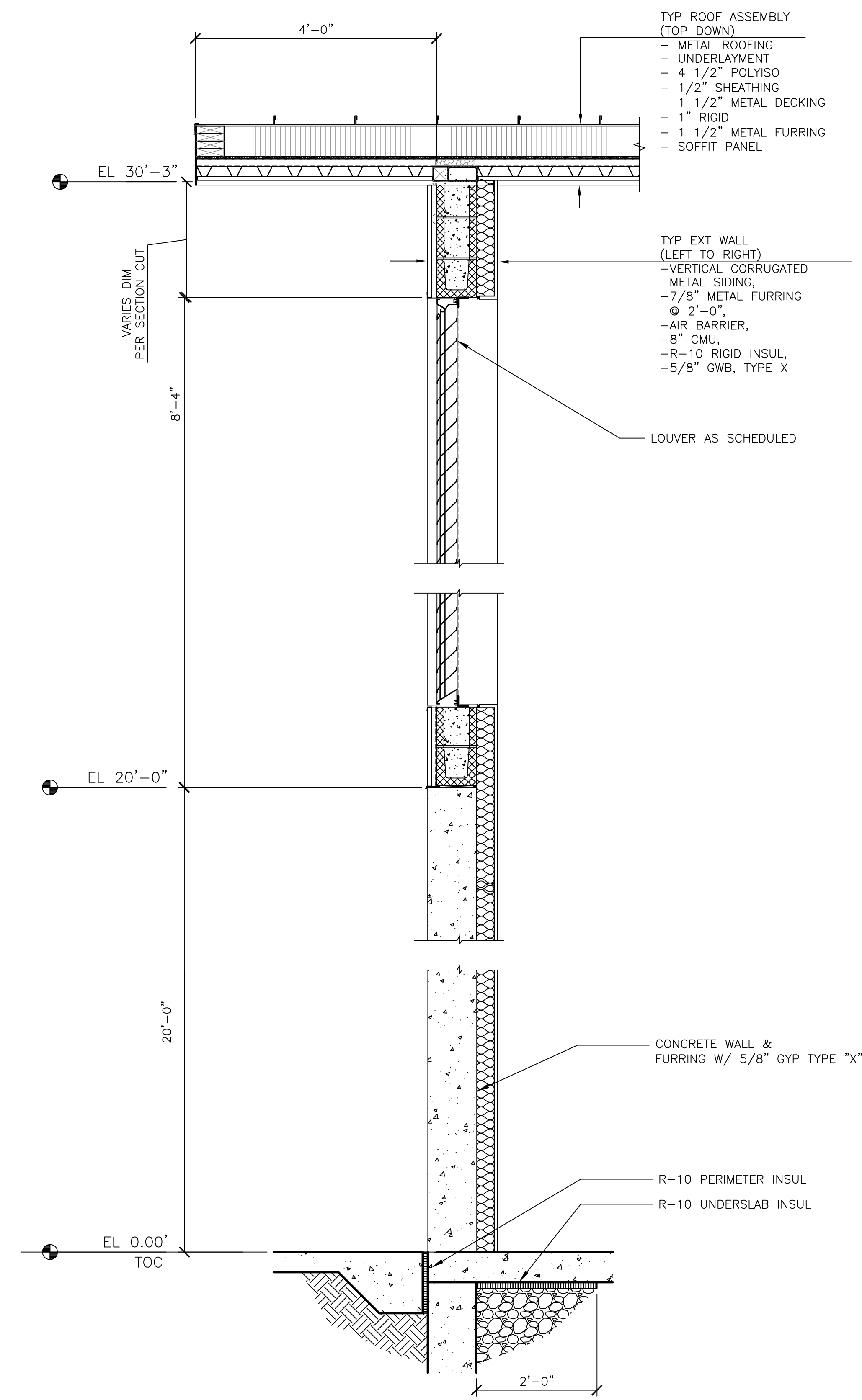
ARCHITECTURAL WALL SECTIONS 1

FILENAME	04A06.dwg	SHEET
SCALE	SCALE AS NOTED	04A06

Attachment B



C WALL SECTION
Scale: 3/4"= 1'-0"



D WALL SECTION
Scale: 3/4"= 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	DH
DESIGNER 2:	
DRAWN BY:	MLDC
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

HEADTANK

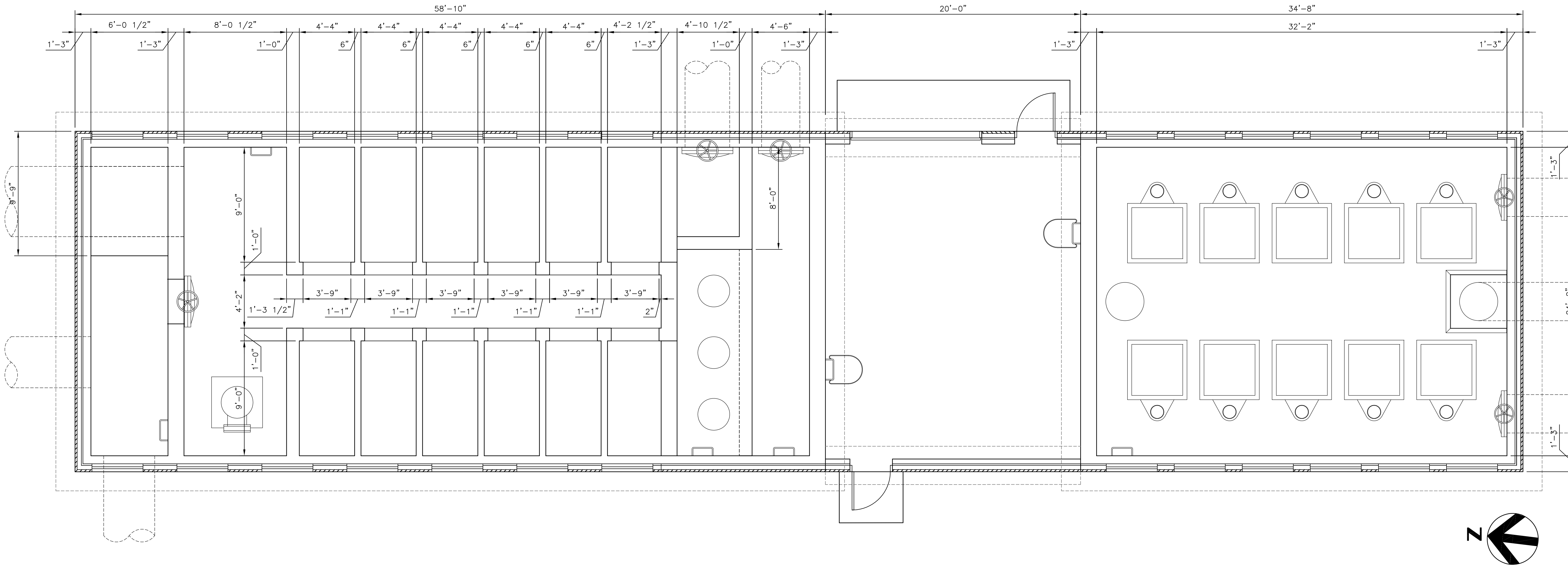
ARCHITECTURAL WALL SECTIONS 2

0 1" 2"

FILENAME	04A07.dwg
SCALE	SCALE AS NOTED

SHEET **04A07**

Attachment B



PLAN – HEADTANK
SCALE: 1/4" = 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

HEADTANK

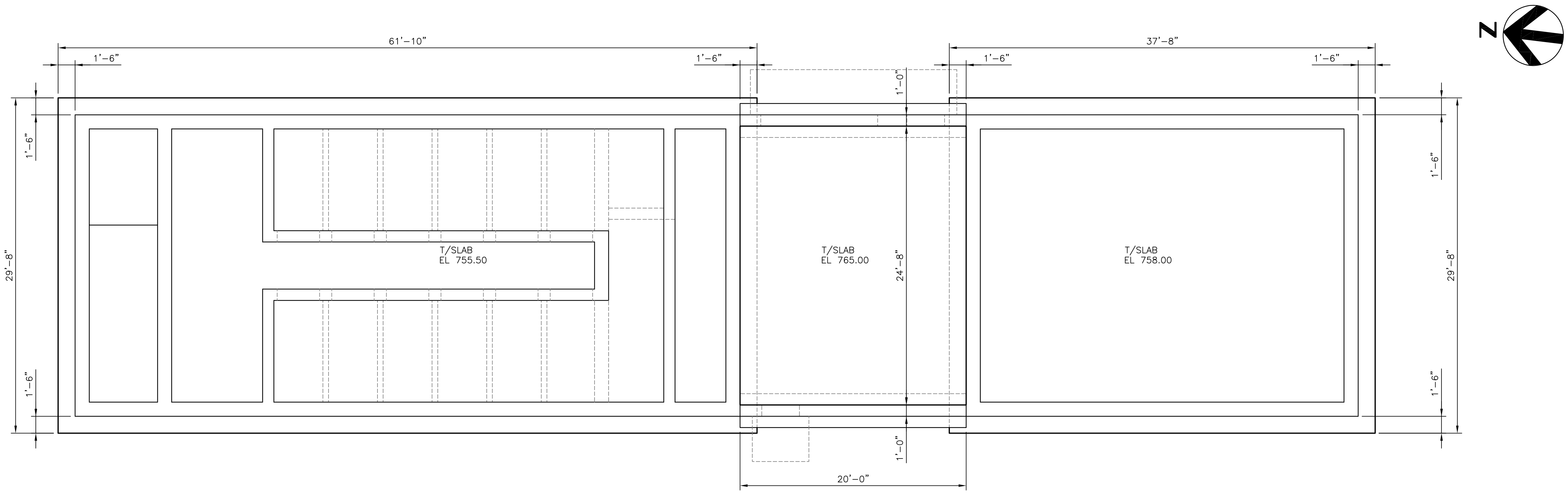
STRUCTURAL FLOOR PLAN

0 1" 2"

FILENAME	04S01.dwg
SCALE	SCALE AS NOTED

SHEET **04S01**

Attachment B



1 FOUNDATION PLAN
SCALE: 3/16" = 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

HEADTANK

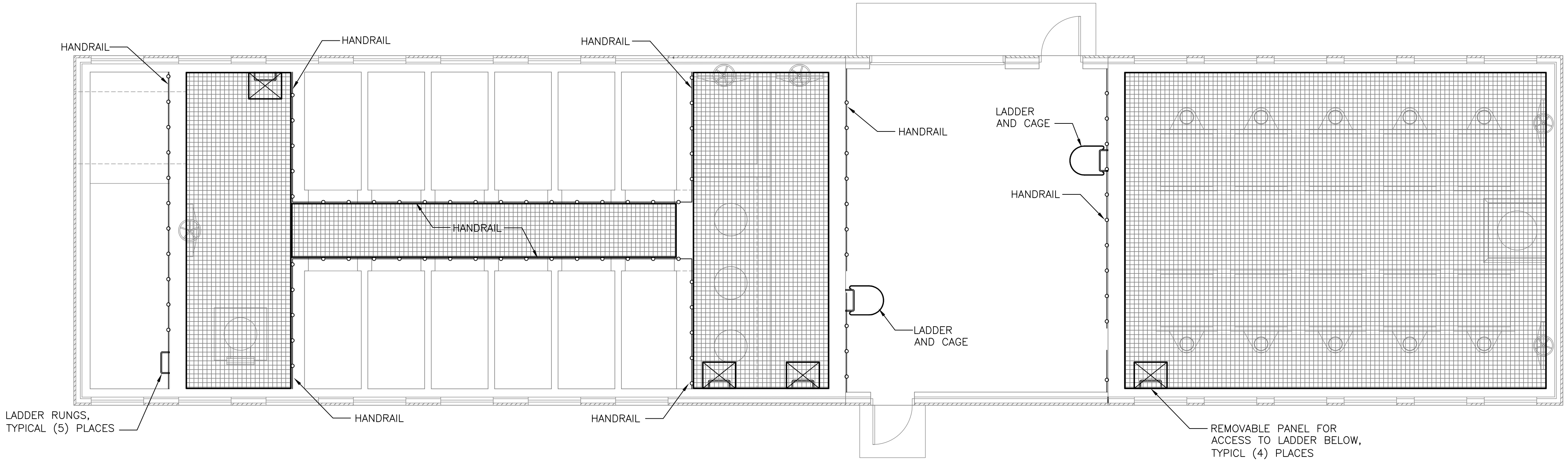
FOUNDATION PLAN

0 1" 2"

FILENAME	04S02.dwg
SCALE	SCALE AS NOTED

SHEET 04S02

Attachment B



1 PLAN
SCALE: 3/16" = 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

HEADTANK

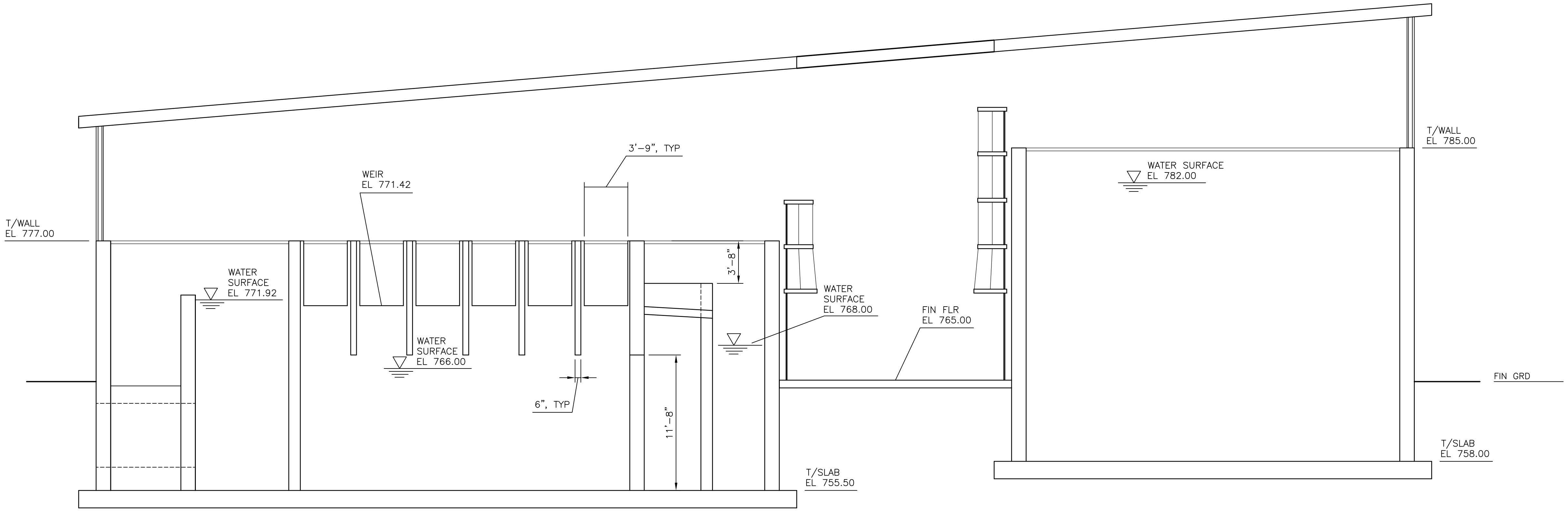
GRATING PLAN AND DETAILS

0 1" 2"

FILENAME	04S03.dwg
SCALE	SCALE AS NOTED

SHEET **04S03**

Attachment B



A SECTION
SCALE: 3/16" = 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

HEADTANK

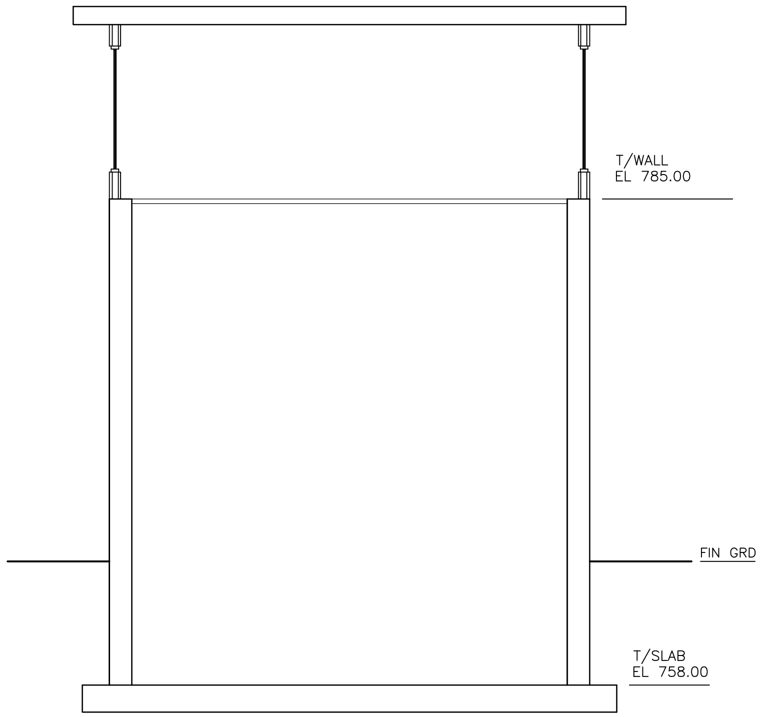
STRUCTURAL SECTIONS 1

0 1" 2"

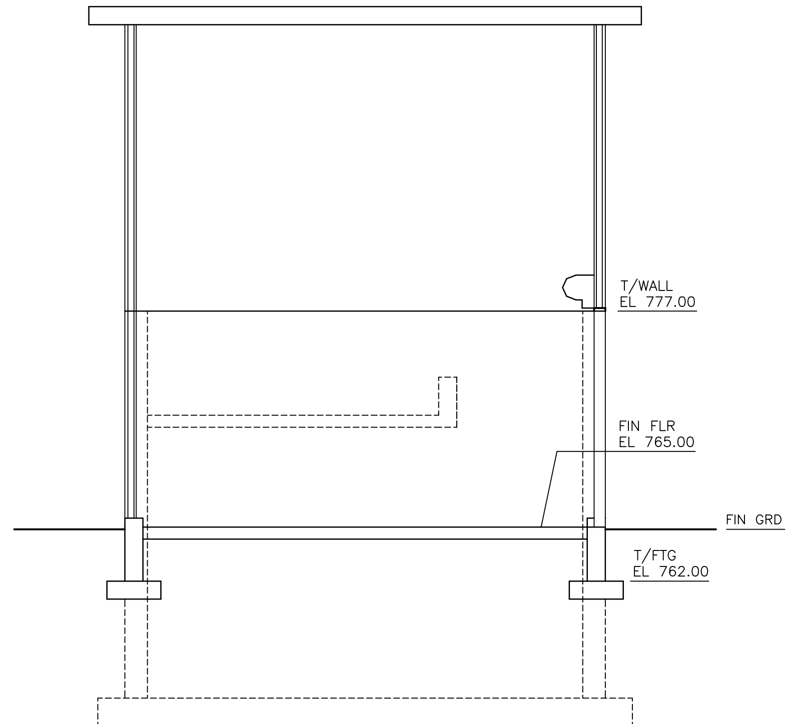
FILENAME	04S04.dwg
SCALE	SCALE AS NOTED

SHEET **04S04**

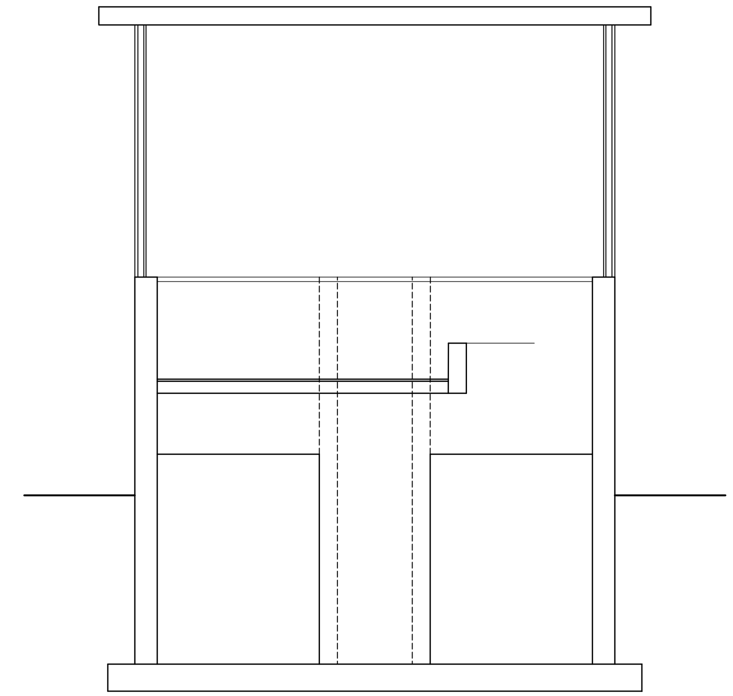
Attachment B

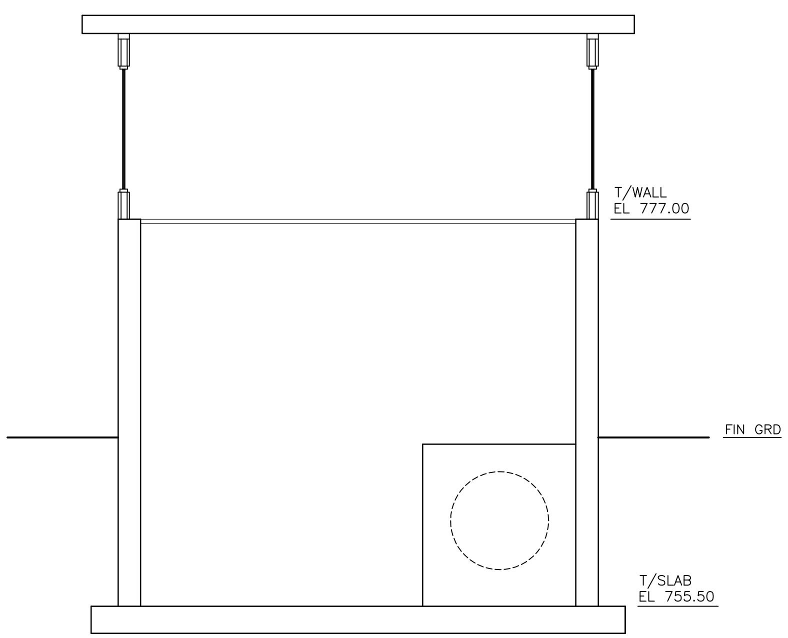


(A) SECTION
SCALE: 3/16" = 1'-0"

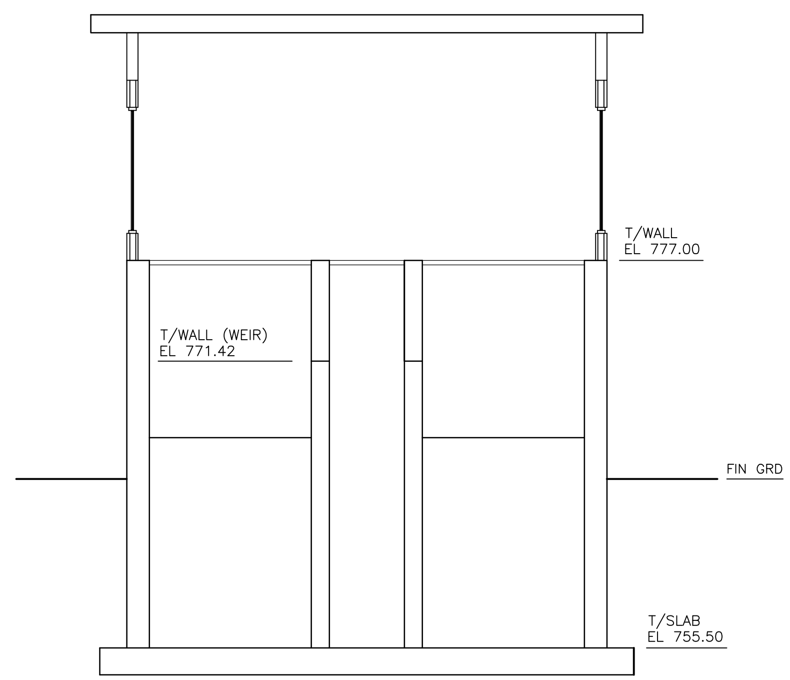


(B) SECTION
SCALE: 3/16" = 1'-0"





(A) SECTION
SCALE: 3/16" = 1'-0"



(C) SECTION
SCALE: 3/16" = 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

HEADTANK

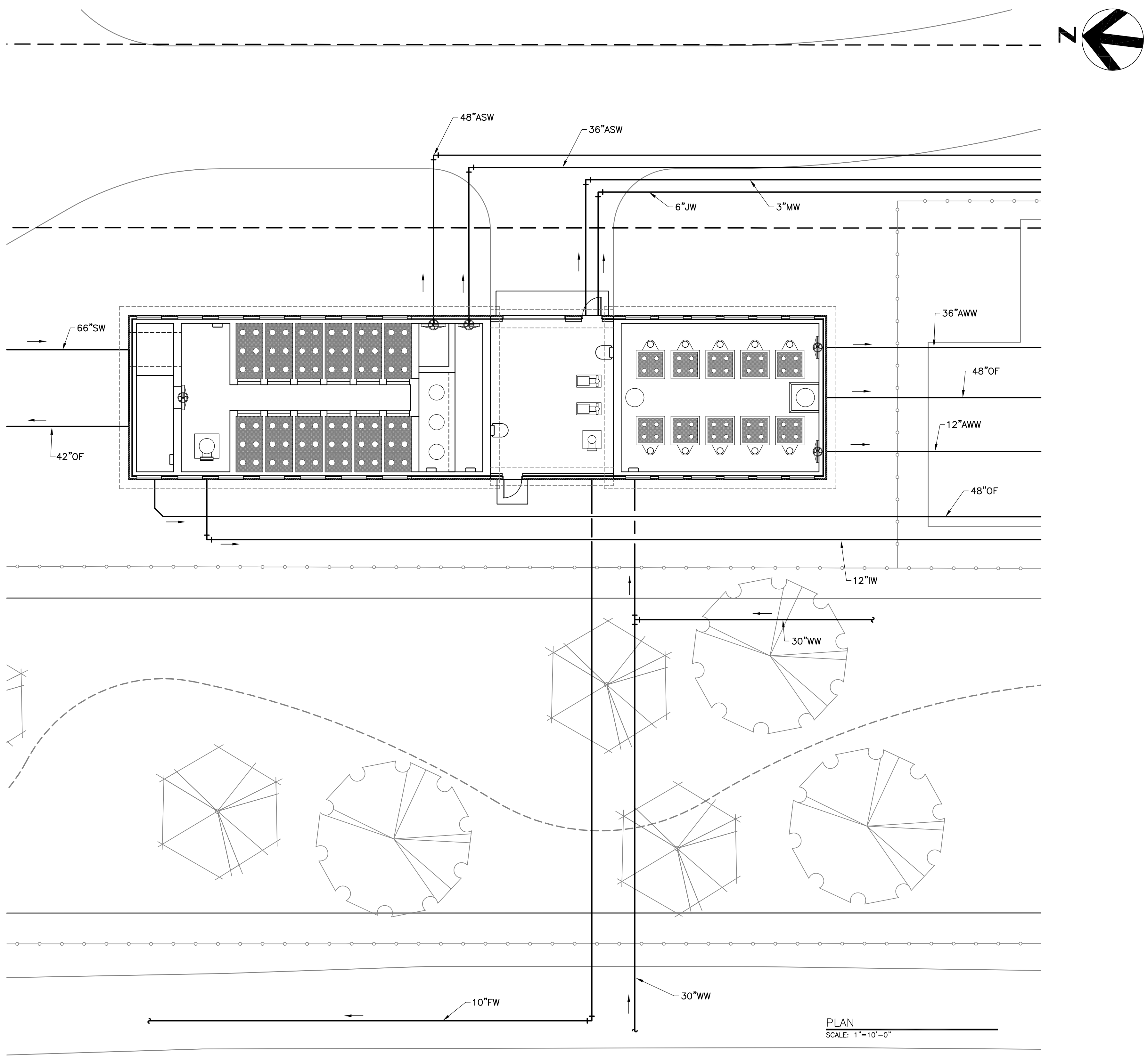
STRUCTURAL SECTIONS 2

0 1" 2"

FILENAME	04S05.dwg
SCALE	SCALE AS NOTED

SHEET 04S05

Attachment B



HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	LKP
DESIGNER 2:	
DRAWN BY:	JLC
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

HEADTANK

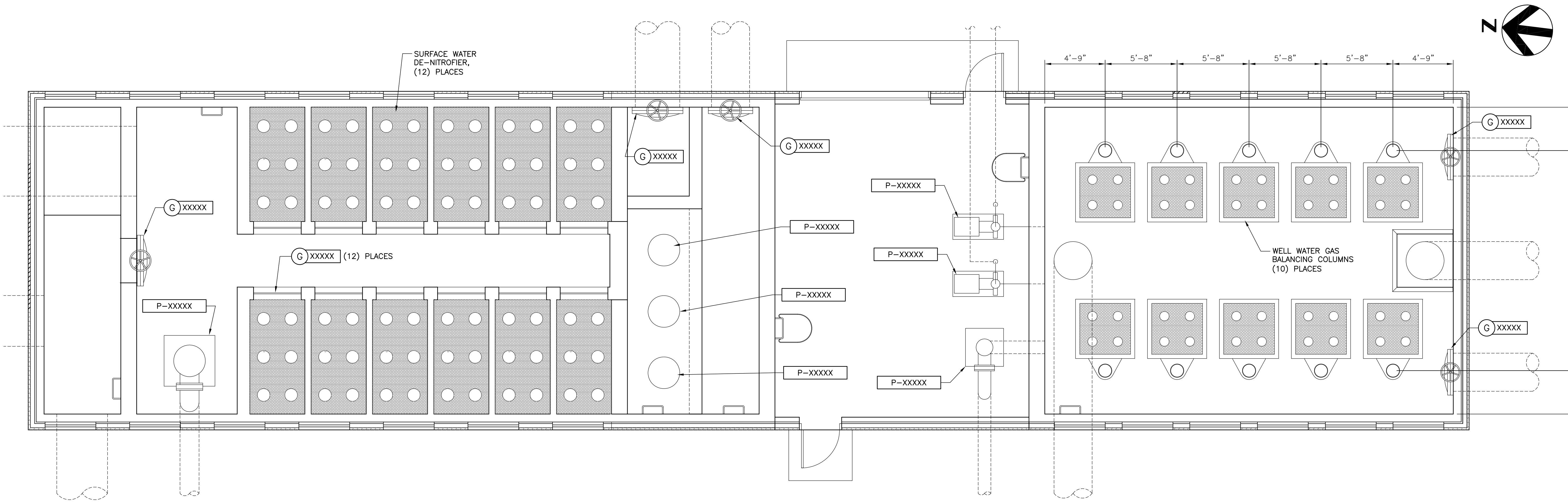
PARTIAL SITE PIPING PLAN

0 1" 2"

FILENAME	04P01.dwg
SCALE	SCALE

SHEET **04P01**

Attachment B



1 PLAN
SCALE: 1/4" = 1'-0"

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

HDR Fisheries DESIGN CENTER

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

HEADTANK

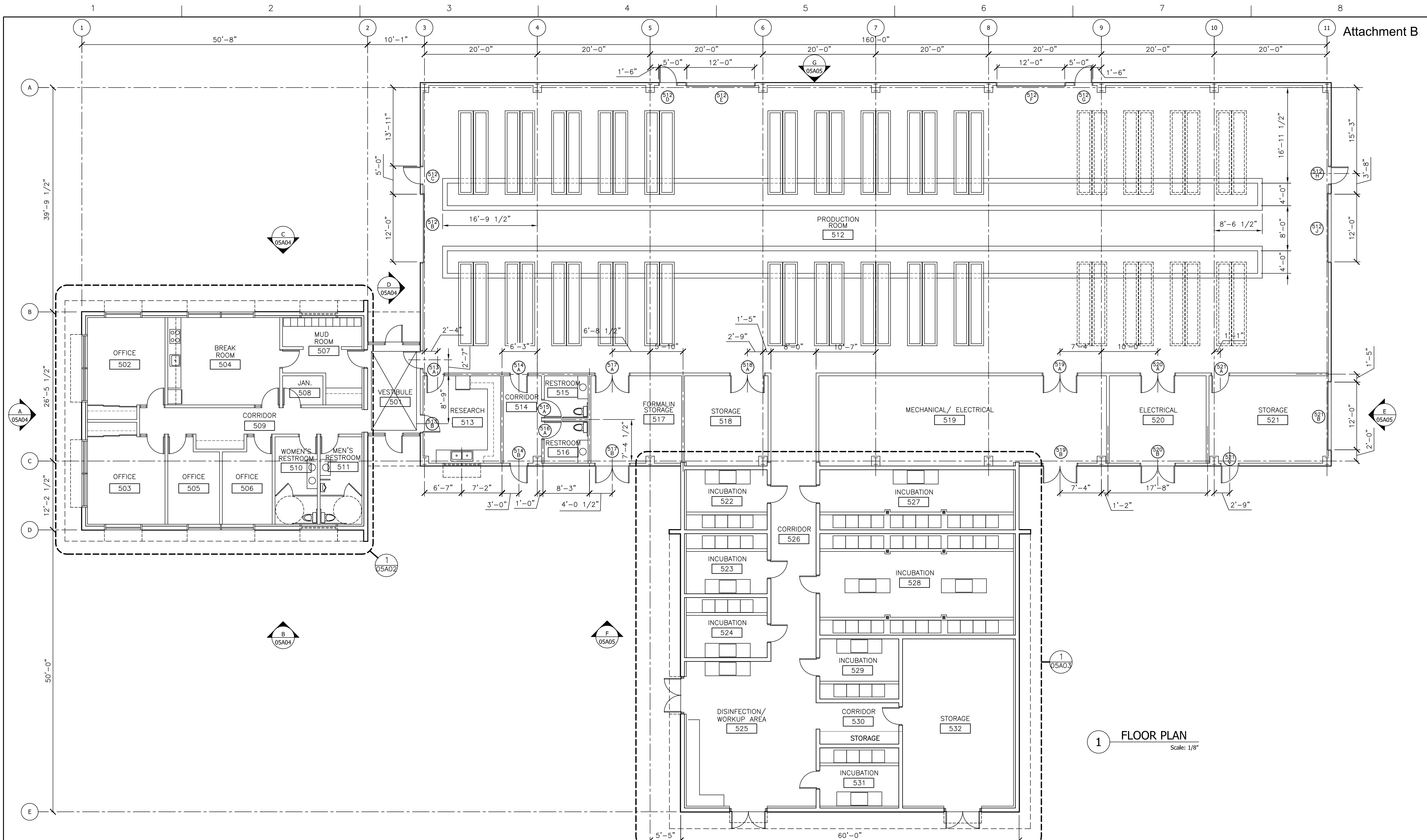
EQUIPMENT LAYOUT

0 1" 2"

FILENAME	04M01.dwg
SCALE	SCALE

SHEET **04M01**

Attachment B



1 FLOOR PLAN
Scale: 1/8"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	DH
DESIGNER 2:	
DRAWN BY:	AB/MLDC
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

HATCHERY BUILDING

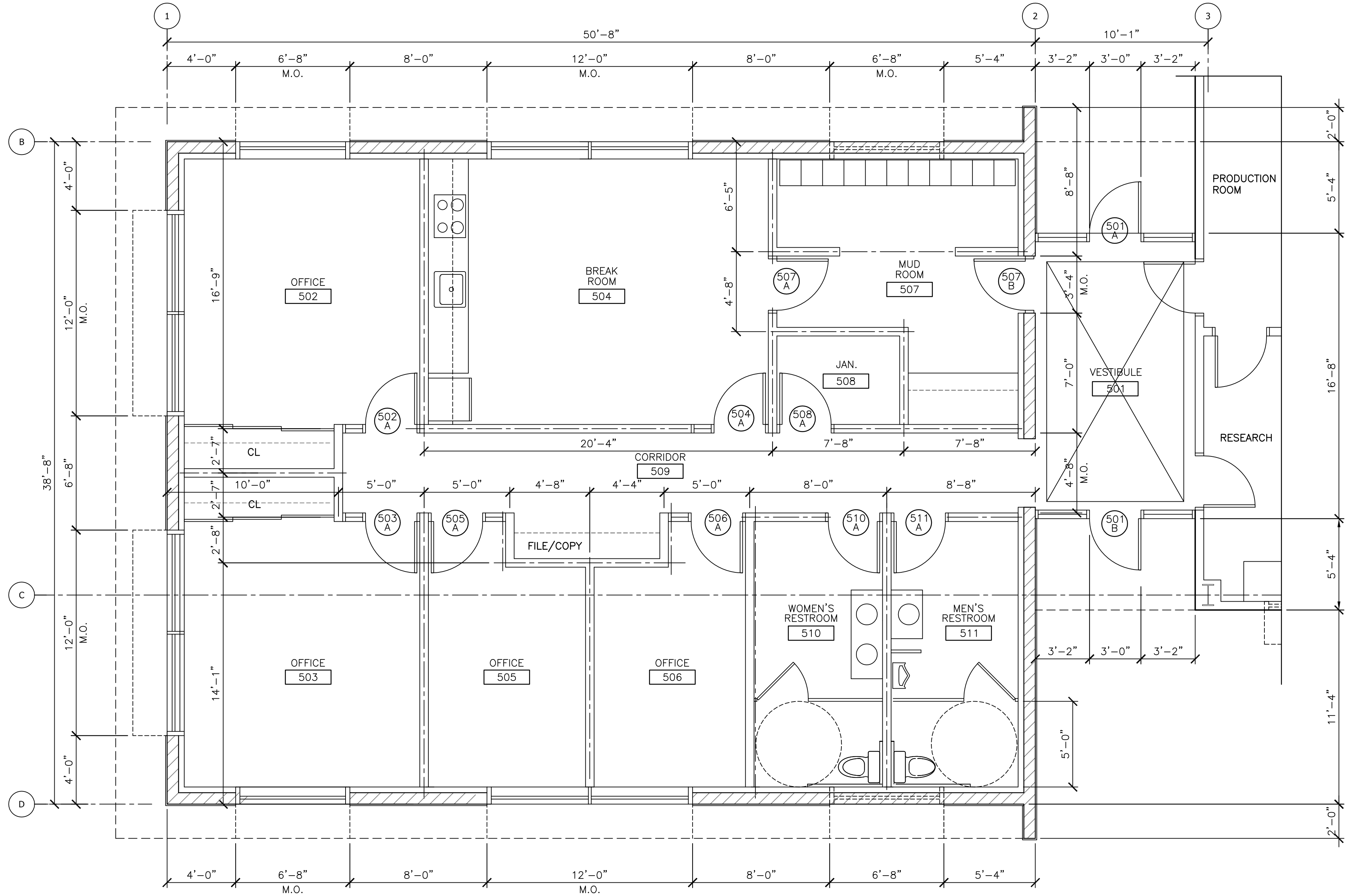
ARCHITECTURAL FLOOR PLAN

0 1" 2"

FILENAME	05A01.dwg
SCALE	SCALE AS NOTED

SHEET 05A01

Attachment B



1 PARTIAL PLAN- ADMINISTRATION AREA

Scale: 1/4"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	DH
DESIGNER 2:	
DRAWN BY:	AB
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

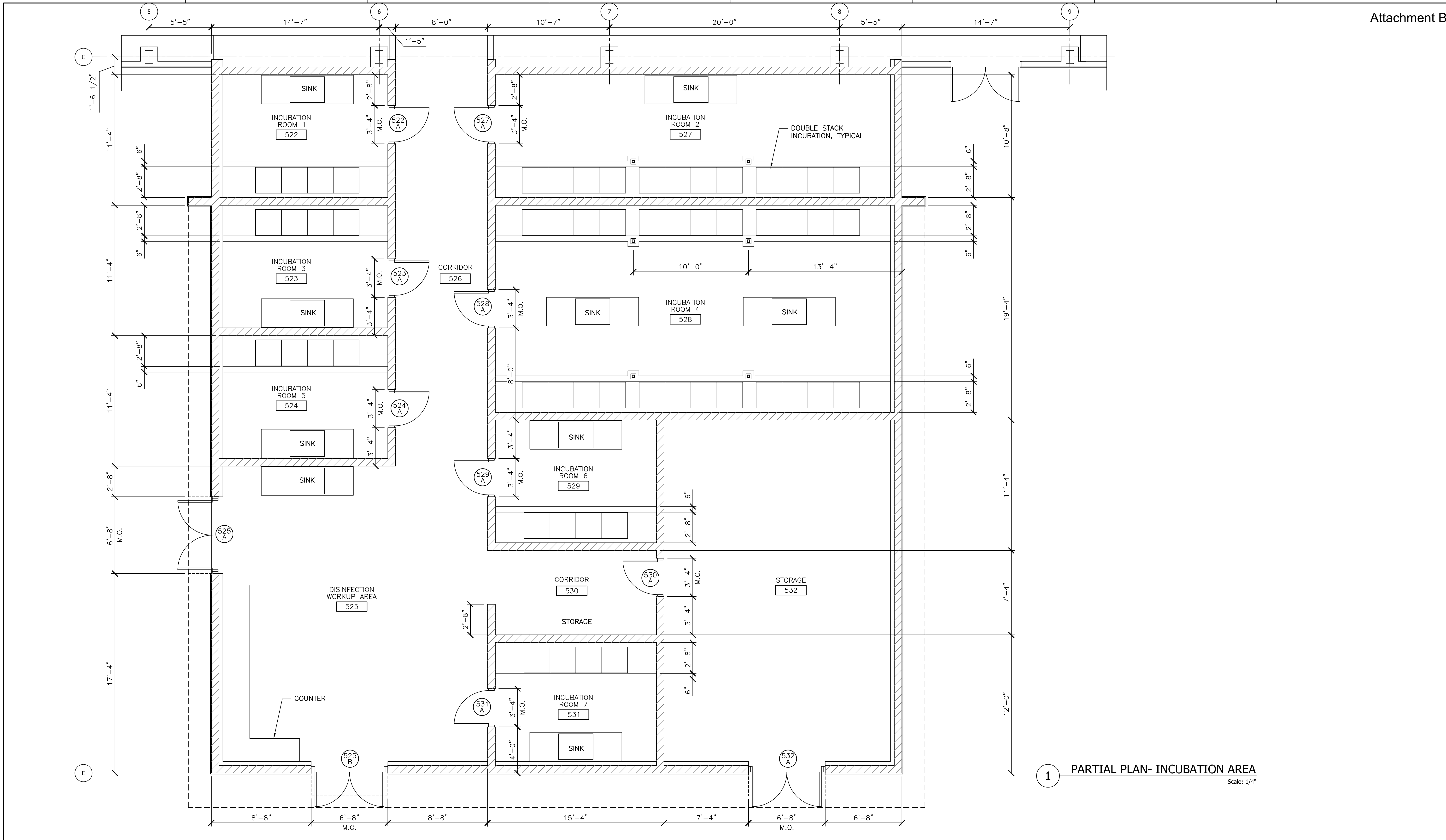
HATCHERY BUILDING

PARTIAL FLOOR PLAN ADMINISTRATION AREA

FILENAME	05A02.dwg
SCALE	SCALE AS NOTED

SHEET 05A02

Attachment B



1 PARTIAL PLAN- INCUBATION AREA
Scale: 1/4"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	DH
DESIGNER 2:	
DRAWN BY:	AB
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

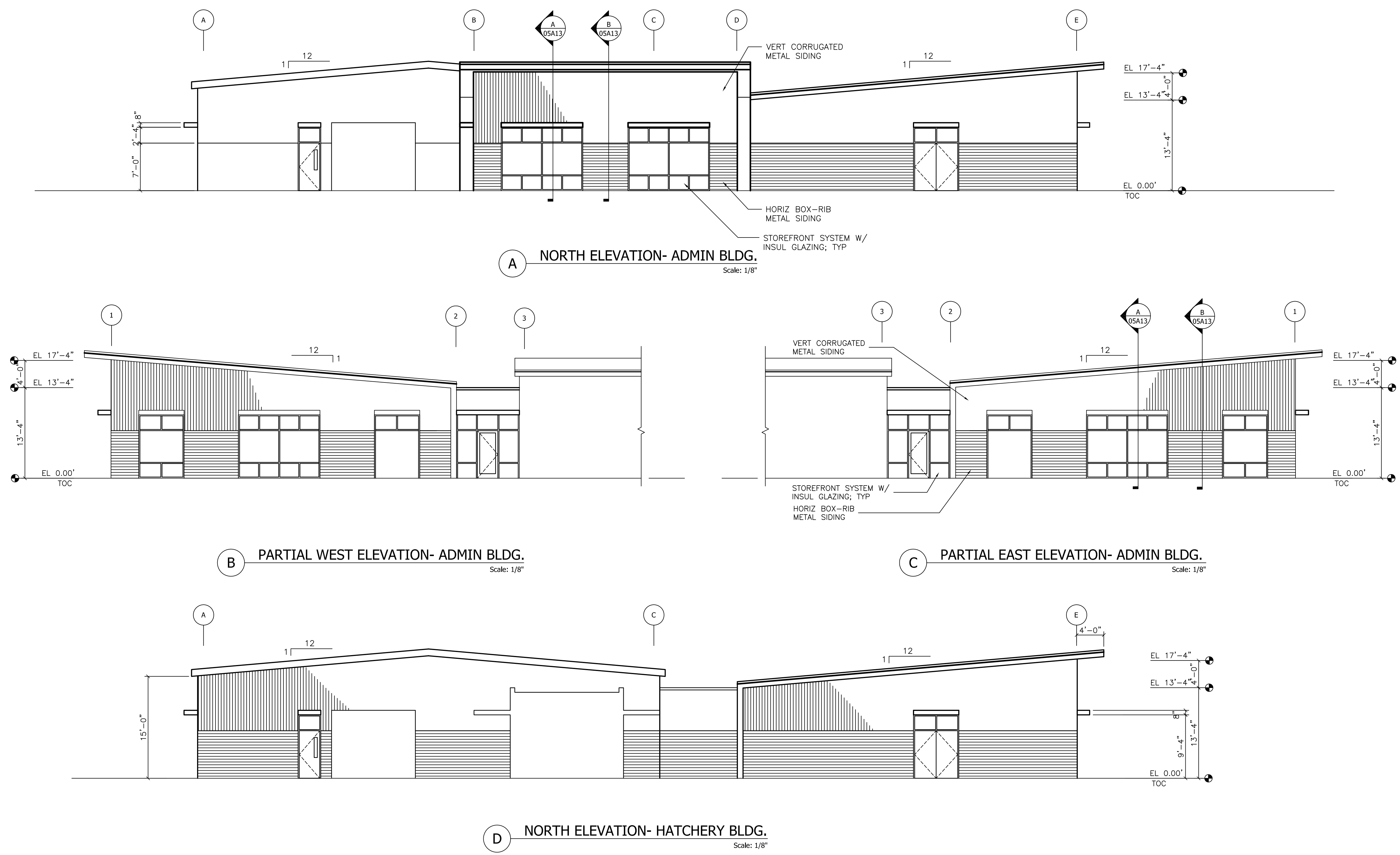
HATCHERY BUILDING

PARTIAL FLOOR PLAN INCUBATION AREA

FILENAME	05A03.dwg
SCALE	SCALE AS NOTED

SHEET 05A03

Attachment B



HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	DH
DESIGNER 2:	
DRAWN BY:	MLDC
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

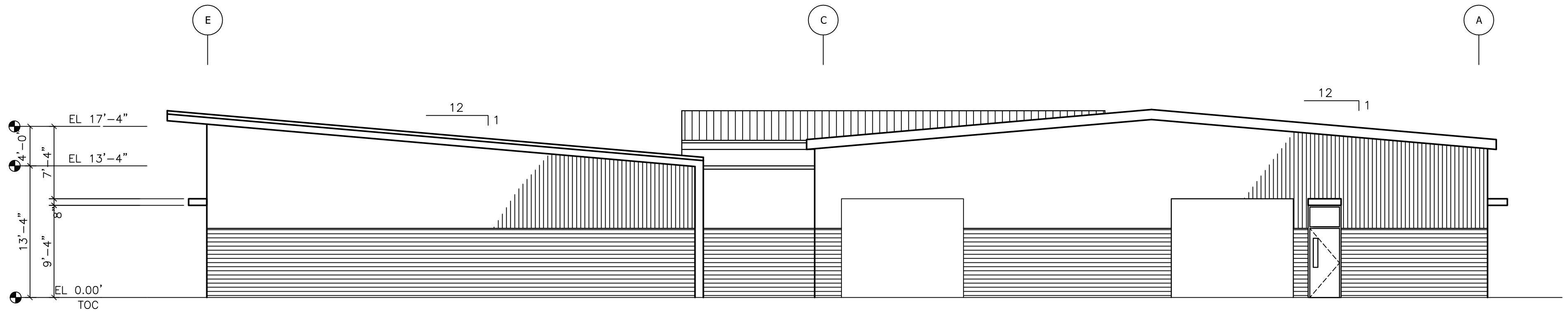
WELLS HATCHERY MODERNIZATION

HATCHERY BUILDING

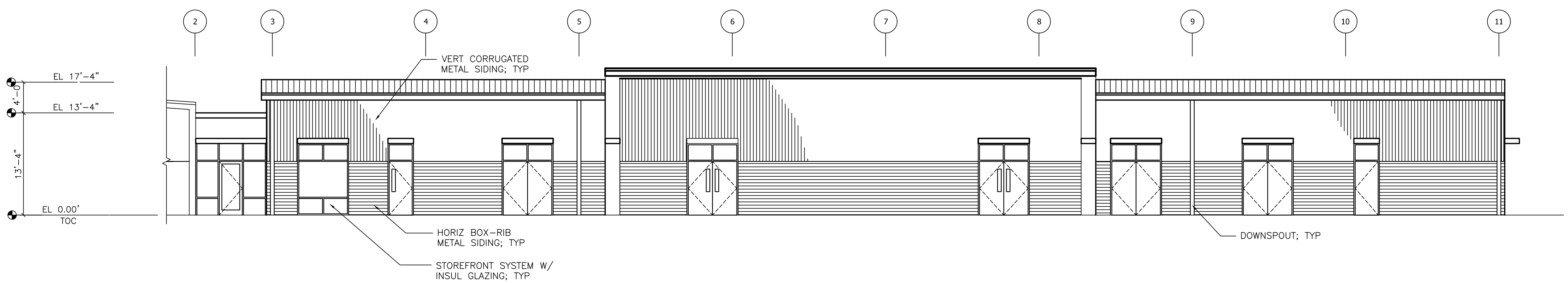
ARCHITECTURAL EXTERIOR ELEVATIONS 1

FILENAME	05A04.dwg
SCALE	SCALE AS NOTED
SHEET	05A04

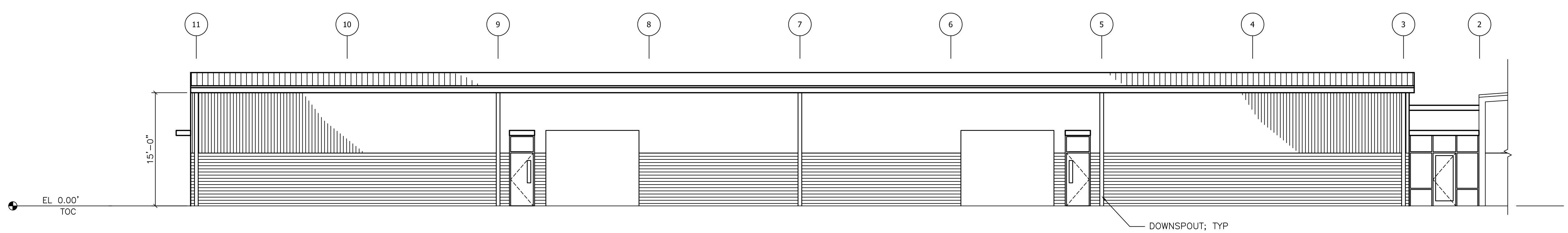
Attachment B



E SOUTH ELEVATION- HATCHERY BLDG.
Scale1/8"



F PARTIAL WEST ELEVATION- HATCHERY BLDG.
Scale:1/8"



G PARTIAL EAST ELEVATION- HATCHERY BLDG.
Scale: 1/8"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	DH
DESIGNER 2:	
DRAWN BY:	MLDC
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

HATCHERY BUILDING

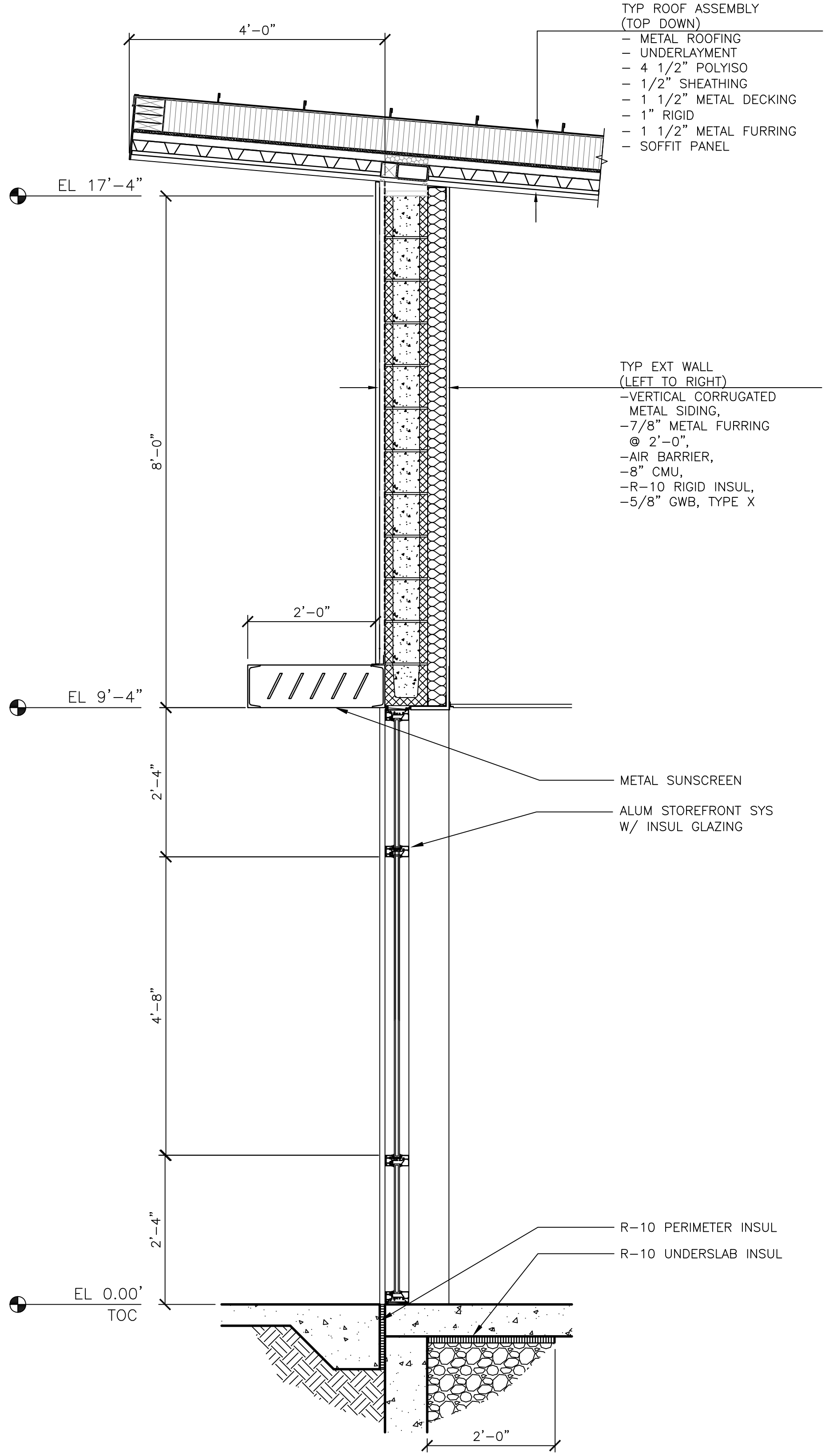
ARCHITECTURAL EXTERIOR ELEVATIONS 2

0 1" 2"

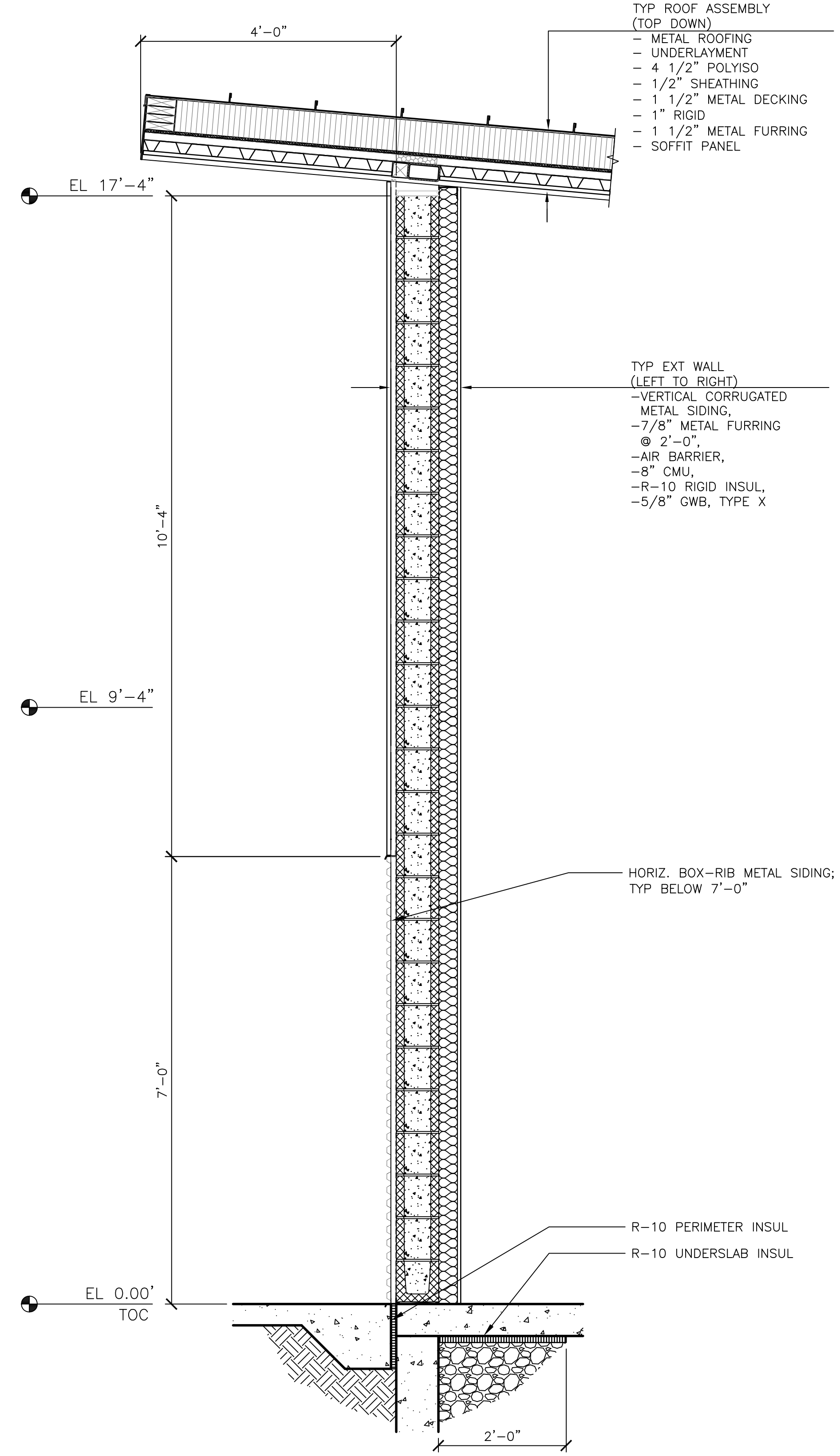
FILENAME	05A05.dwg
SCALE	SCALE AS NOTED

SHEET **05A05**

Attachment B



A WALL SECTION
Scale: 3/4"- 1'-0"



B WALL SECTION
Scale: 3/4"- 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	DH
DESIGNER 2:	
DRAWN BY:	MLDC
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

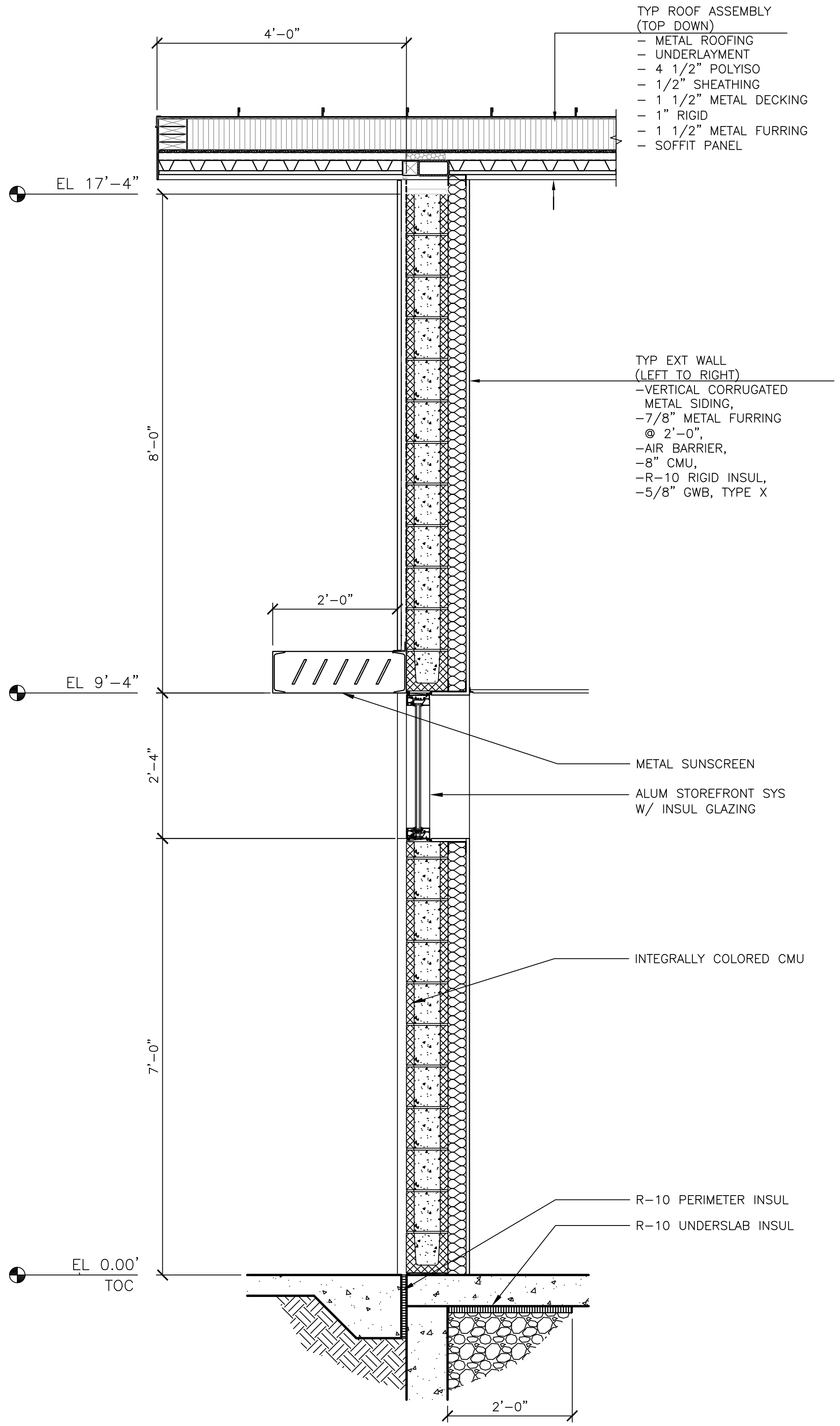
HATCHERY BUILDING
ARCHITECTURAL WALL SECTIONS 1

0 1" 2"

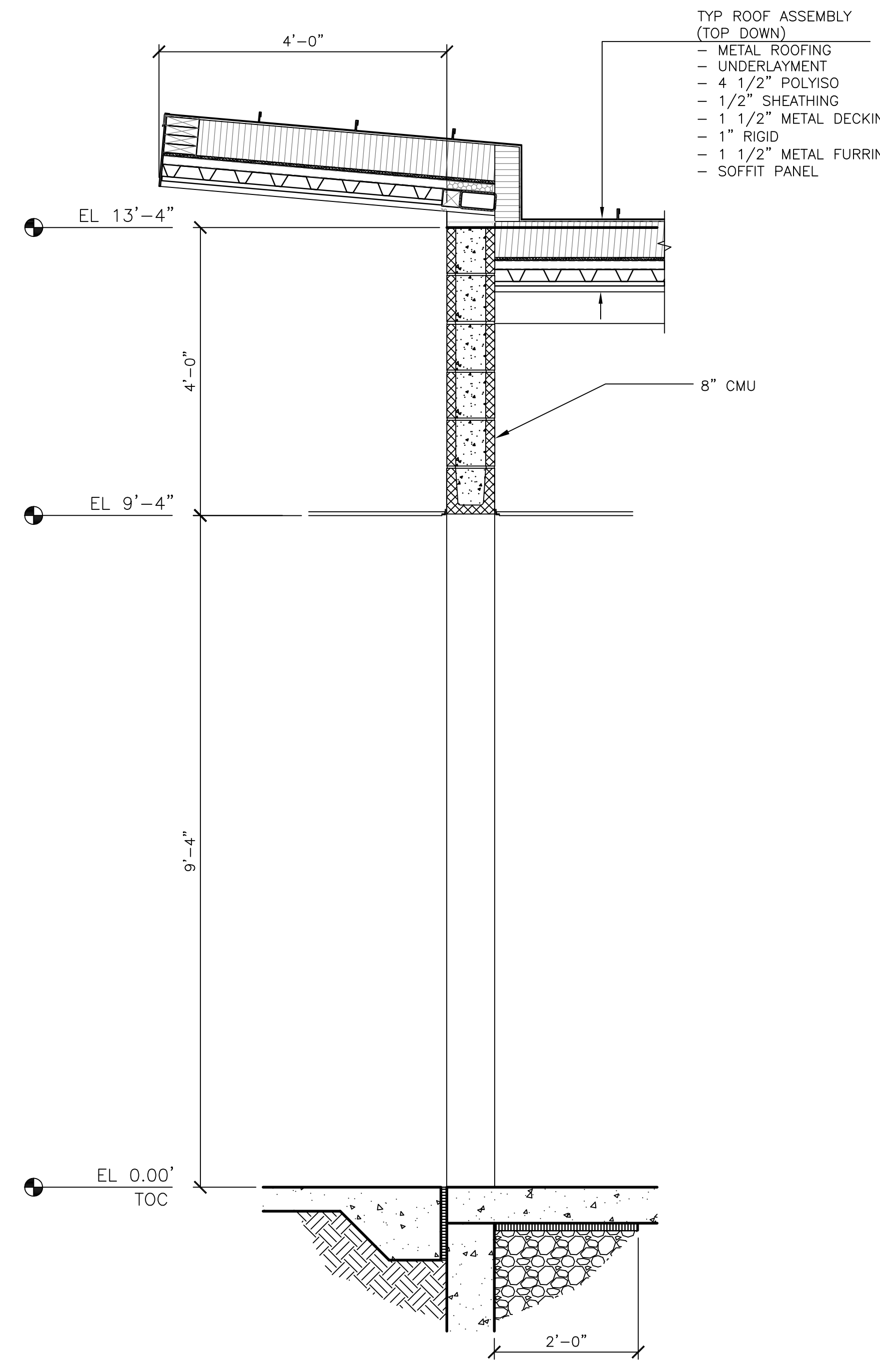
FILENAME	05A13.dwg
SCALE	SCALE AS NOTED

SHEET 05A13

Attachment B



C WALL SECTION
Scale: 3/4"= 1'-0"



D WALL SECTION
Scale: 3/4"= 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	DH
DESIGNER 2:	
DRAWN BY:	MLDC
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

HATCHERY BUILDING

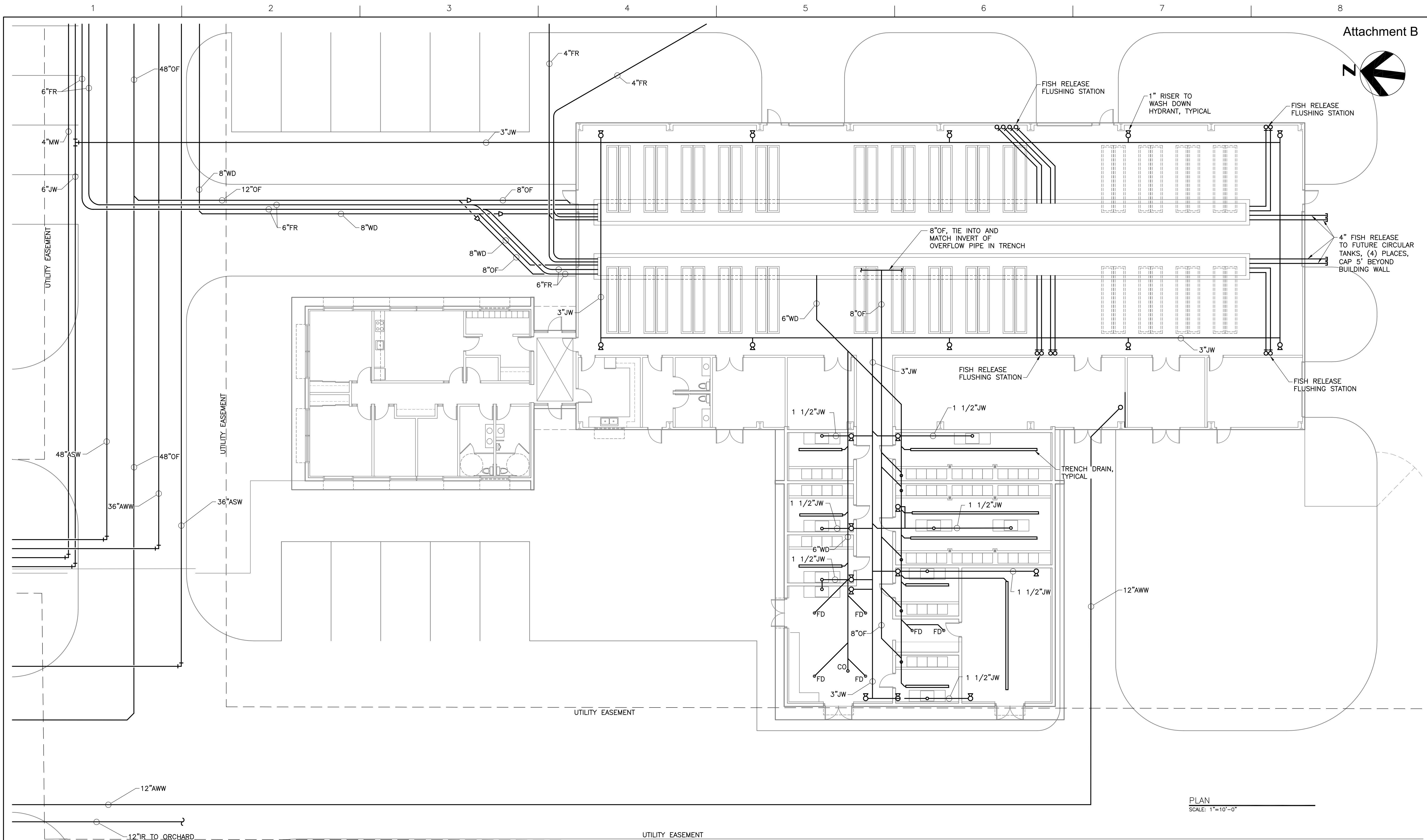
ARCHITECTURAL WALL SECTIONS 2

0 1" 2"

FILENAME	05A14.dwg
SCALE	SCALE AS NOTED

SHEET 05A14

Attachment B



HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

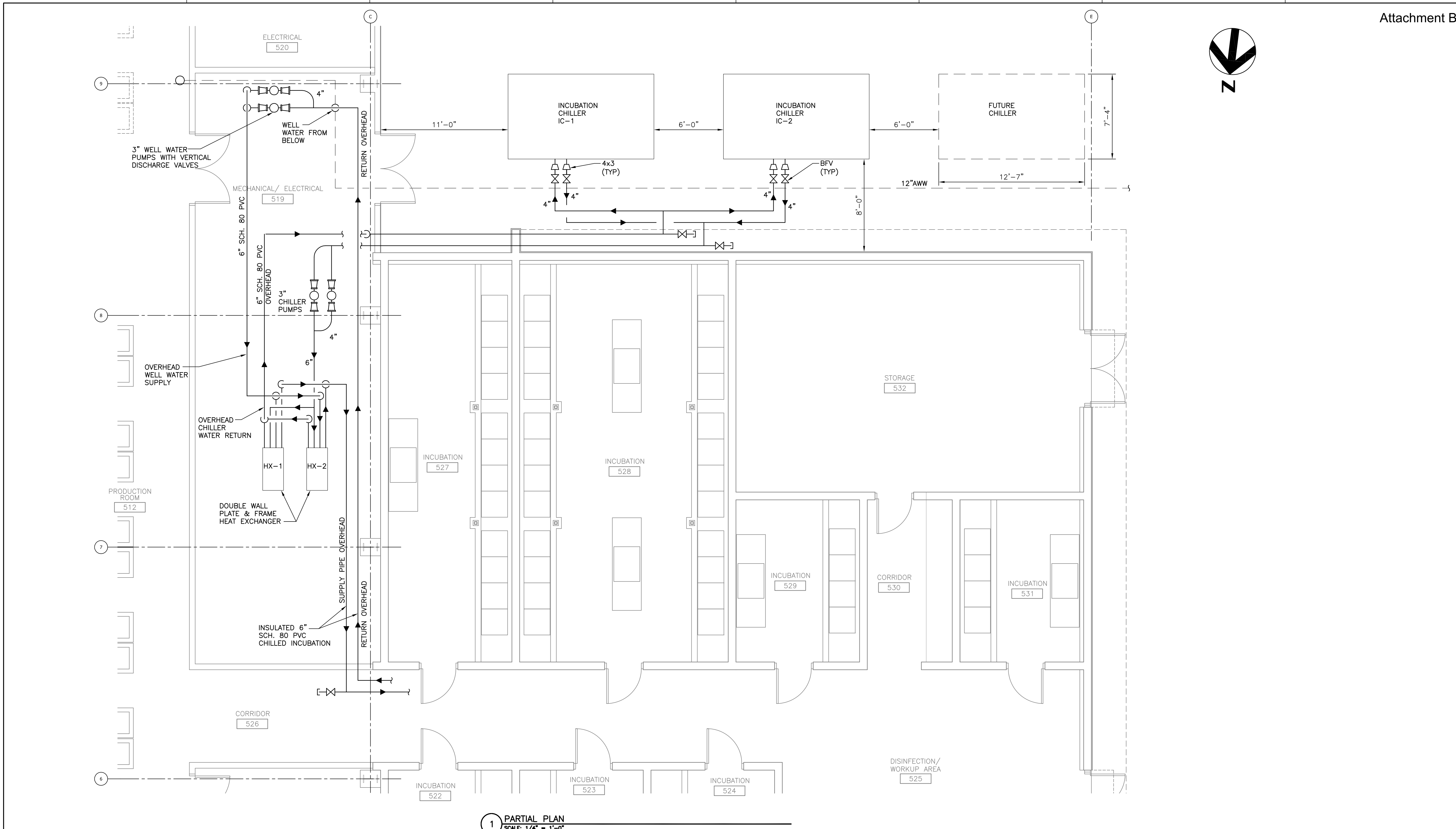
HATCHERY BUILDING

BELOW GRADE PIPING PLAN

0 1" 2"

FILENAME	05P02.dwg	SHEET
SCALE	SCALE	05P02

Attachment B



1 PARTIAL PLAN
SCALE: 1/4" = 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

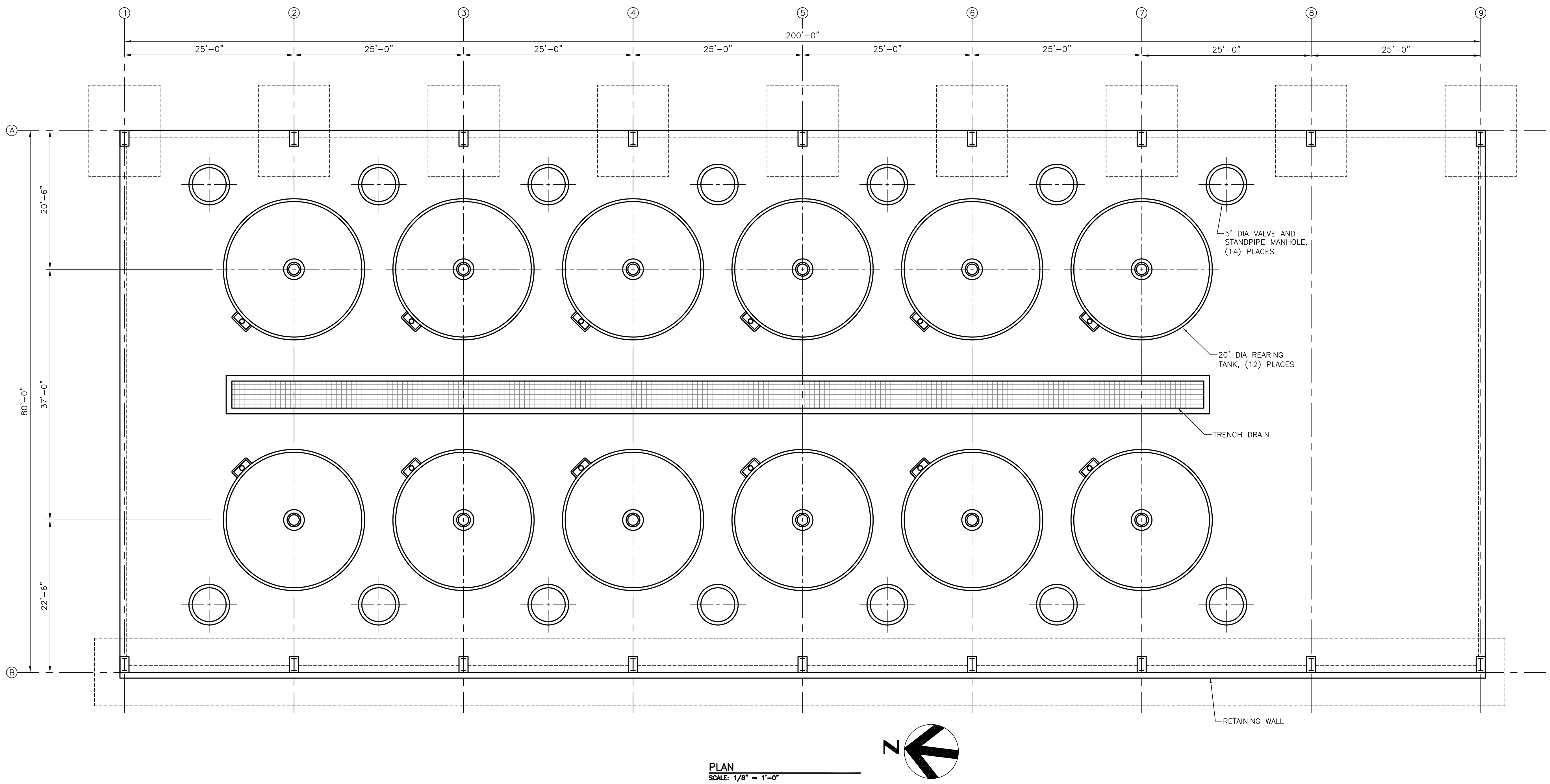
HATCHERY BUILDING

INCUBATION CHILLERS PLAN

FILENAME	05P05.dwg
SCALE	SCALEAS NOTED

SHEET 05P05

Attachment B



PLAN
SCALE: 1/8" = 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	LKP
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

CIRCULAR TANK FACILITY

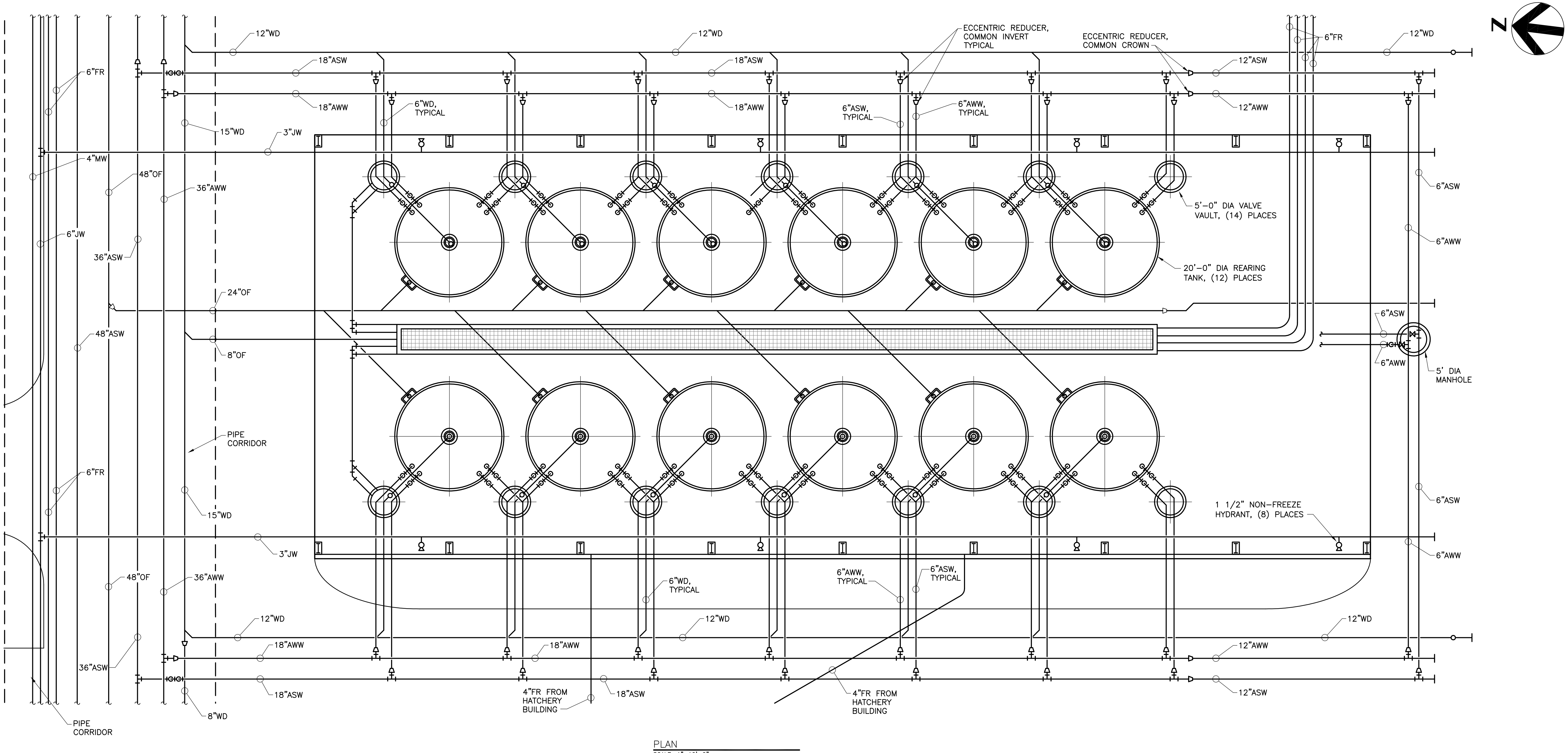
STRUCTURAL PLAN

0 1" 2"

FILENAME	06S01.dwg
SCALE	AS NOTED SCALE

SHEET 06S01

Attachment B



PLAN
SCALE: 1"=10'-0"

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

ISSUE	DATE	DESCRIPTION

HDR Fisheries DESIGN CENTER

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

CIRCULAR TANK FACILITY

PARTIAL SITE PIPING PLAN

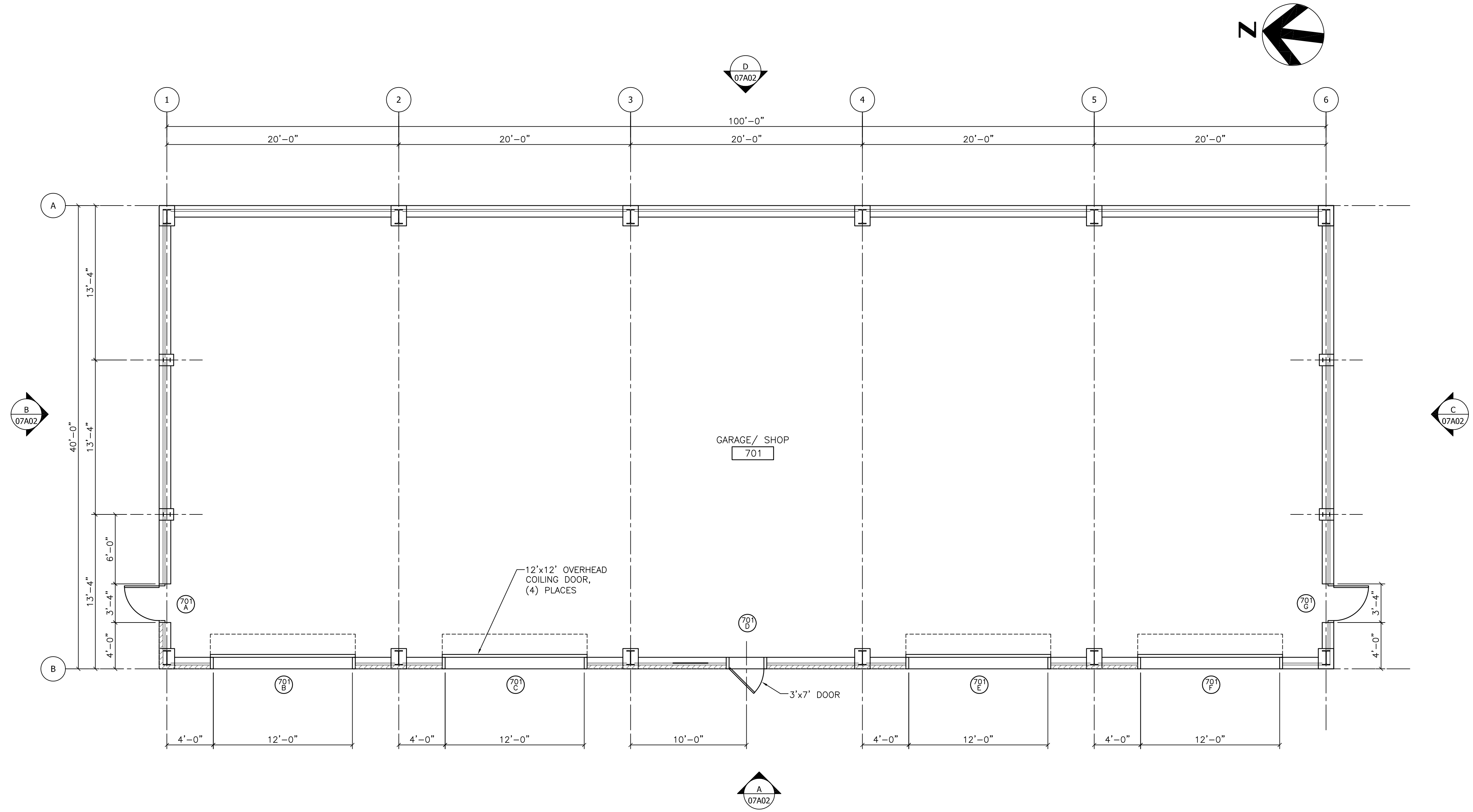
0 1" 2"

FILENAME 06P01.dwg

SCALE SCALE

SHEET 06P01

Attachment B



1 FLOOR PLAN- GARAGE/ SHOP
Scale: 3/16"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	DH
DESIGNER 2:	
DRAWN BY:	ACB/ MLDC
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

GARAGE/SHOP BUILDING

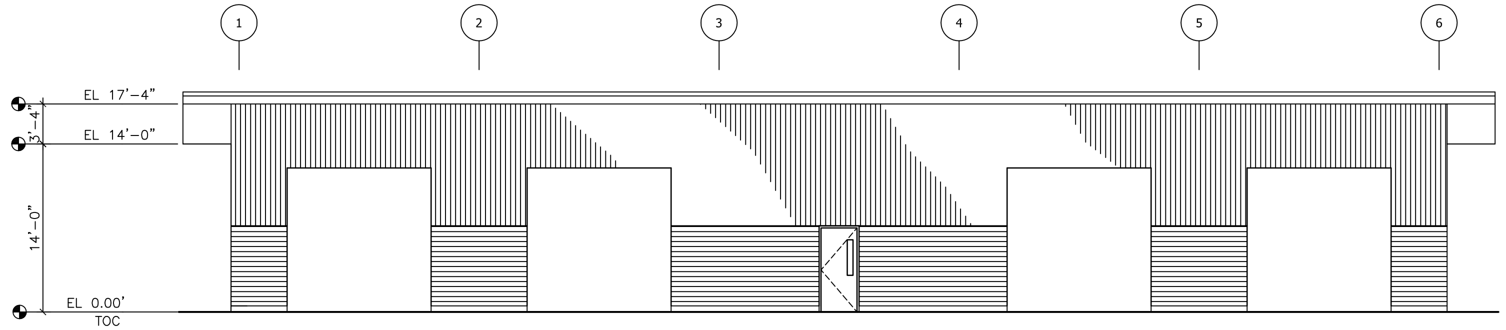
ARCHITECTURAL FLOOR PLAN

0 1" 2"

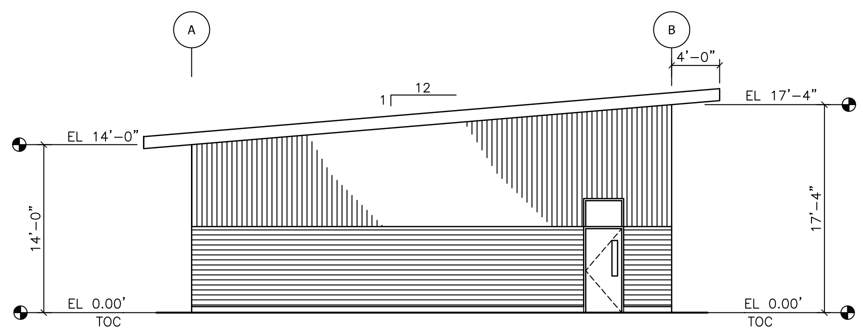
FILENAME	07A01.dwg
SCALE	AS NOTED

SHEET 07A01

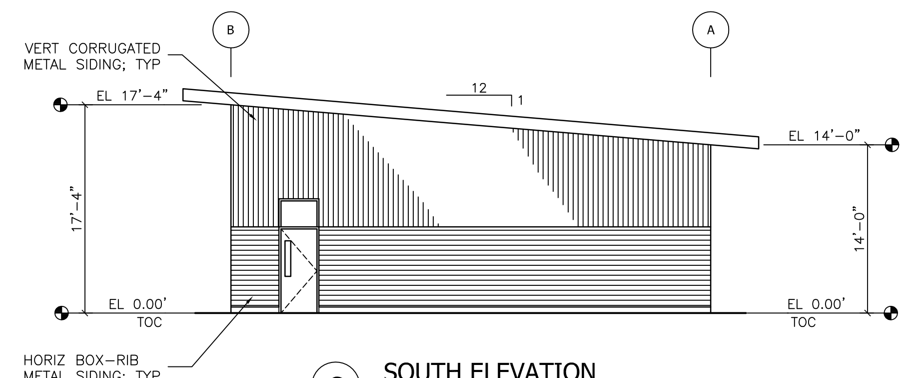
Attachment B



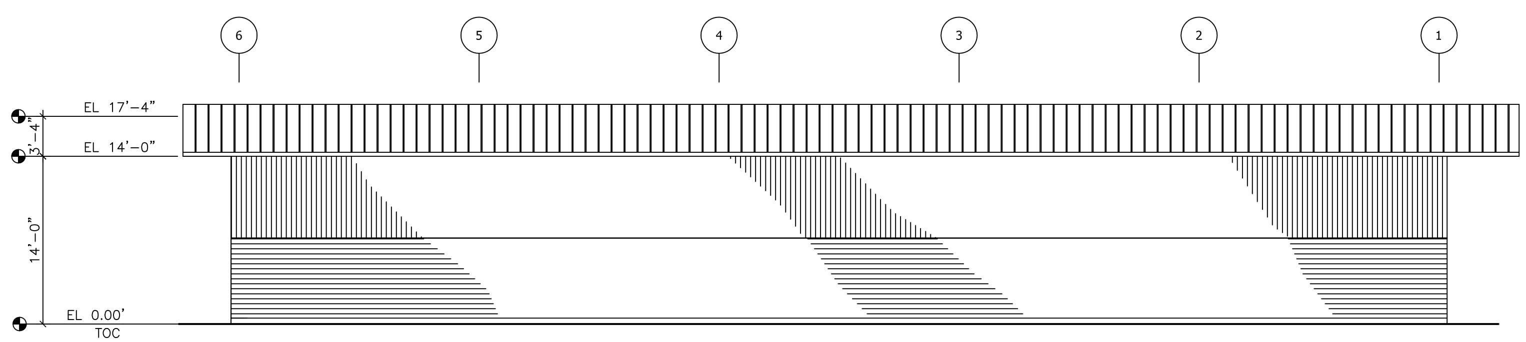
A WEST ELEVATION
Scale: 1/8"



B NORTH ELEVATION
Scale: 1/8"



C SOUTH ELEVATION
Scale: 1/8"



D EAST ELEVATION
Scale: 1/8"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	DH
DESIGNER 2:	
DRAWN BY:	MLDC
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

GARAGE/SHOP BUILDING

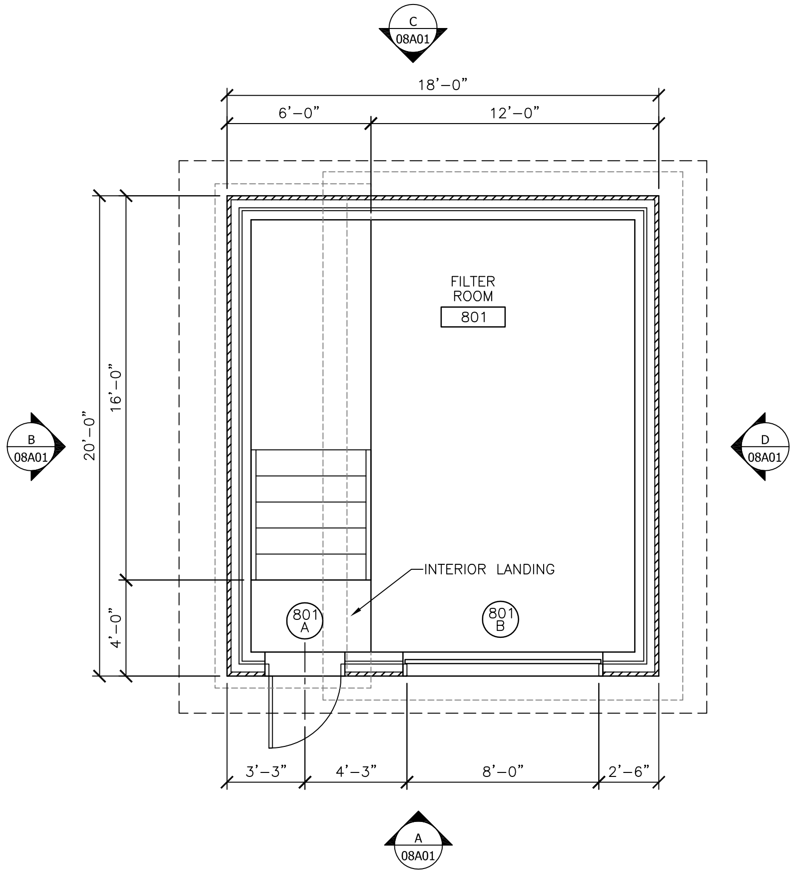
ARCHITECTURAL ELEVATIONS 1

0 1" 2"

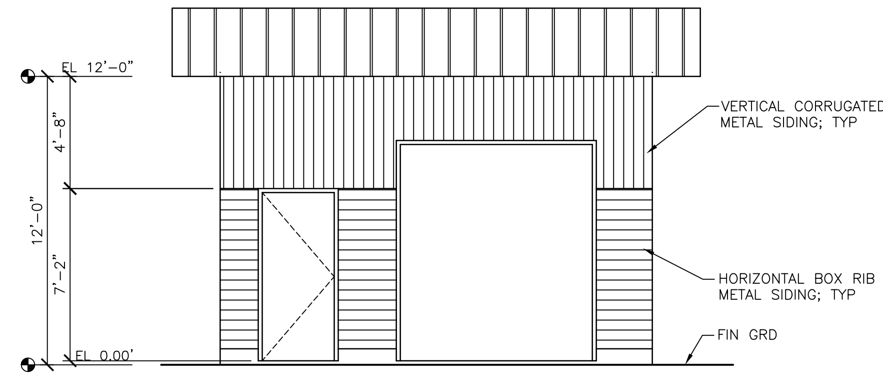
FILENAME	07A02.dwg
SCALE	AS NOTED

SHEET **07A02**

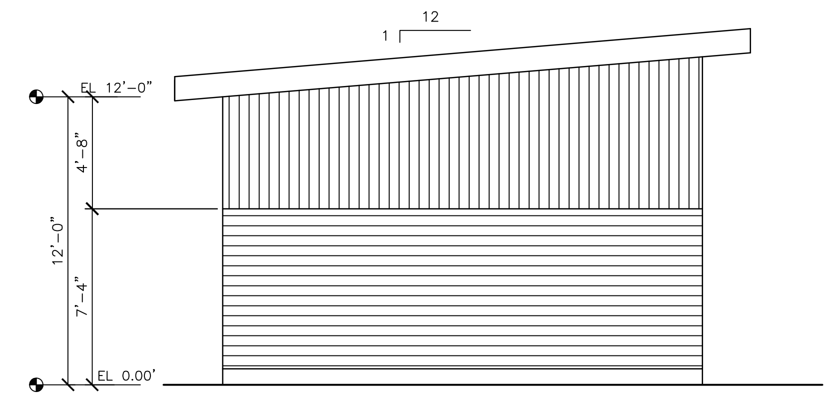
Attachment B



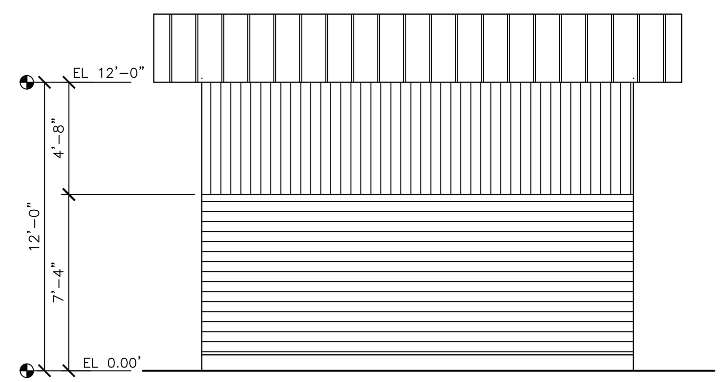
1 FLOOR PLAN- FILTER BLDG.
Scale: 1/4"



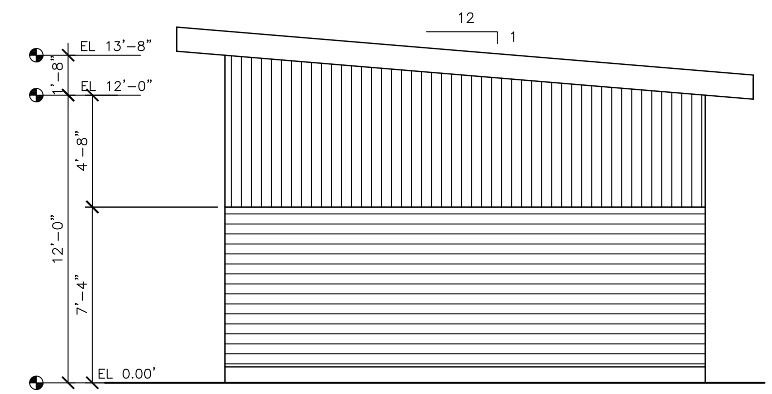
A WEST ELEVATION
Scale: 1/4"



C NORTH ELEVATION
Scale: 1/4"



C EAST ELEVATION
Scale: 1/4"



D SOUTH ELEVATION
Scale: 1/4"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

FILTER BUILDING

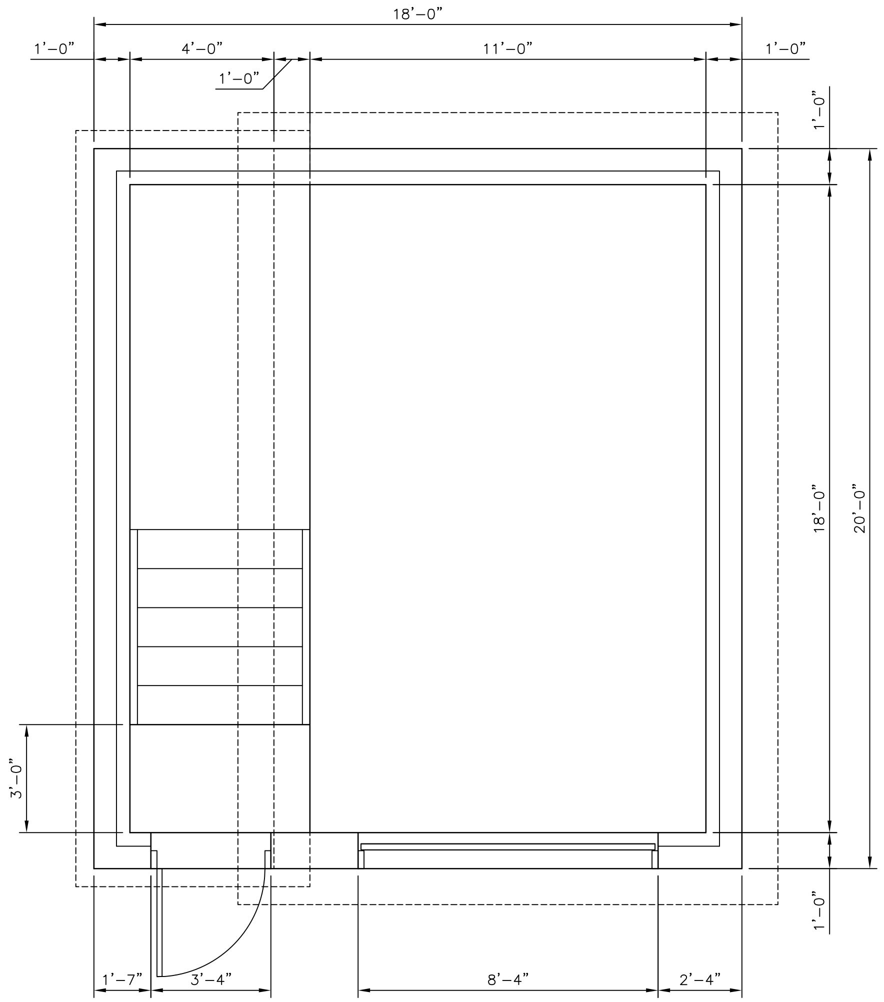
ARCHITECTURAL PLAN AND ELEVATIONS

0 1" 2"

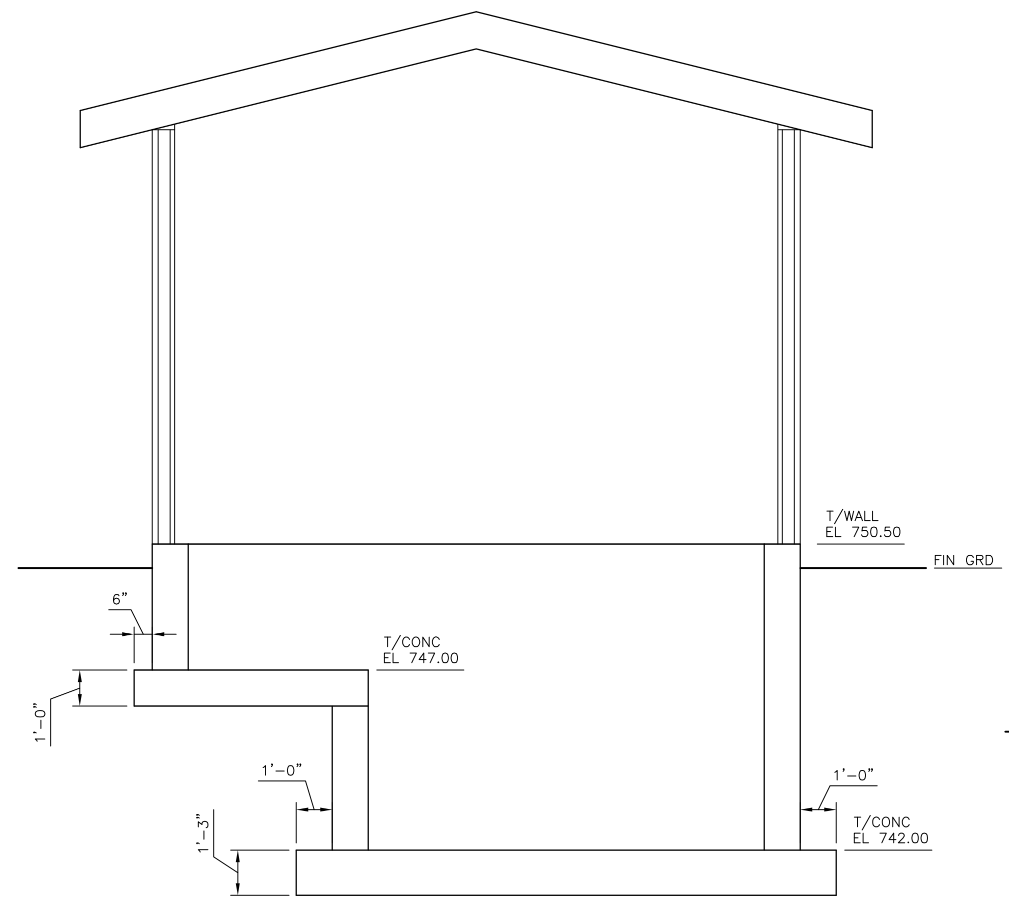
FILENAME	08A01.dwg
SCALE	SCALE

SHEET **08A01**

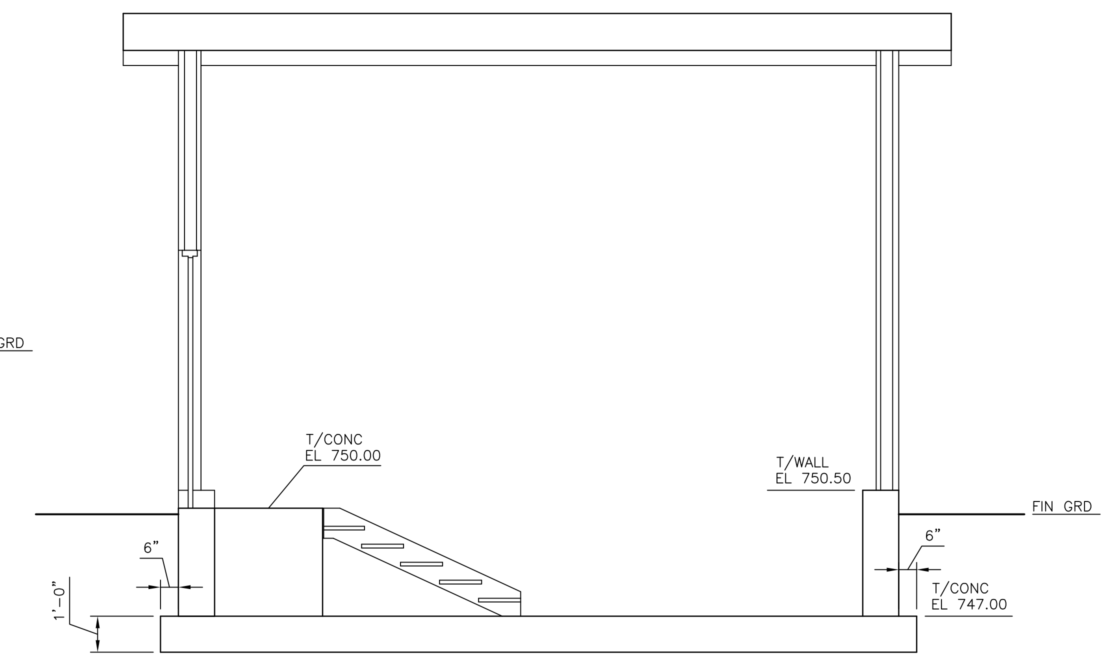
Attachment B



1 PLAN
SCALE: 3/8" = 1'–0"



A SECTION
SCALE: 3/8" = 1'–0"



B SECTION
SCALE: 3/8" = 1'–0"

HDR
Fisheries
DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

FILTER BUILDING

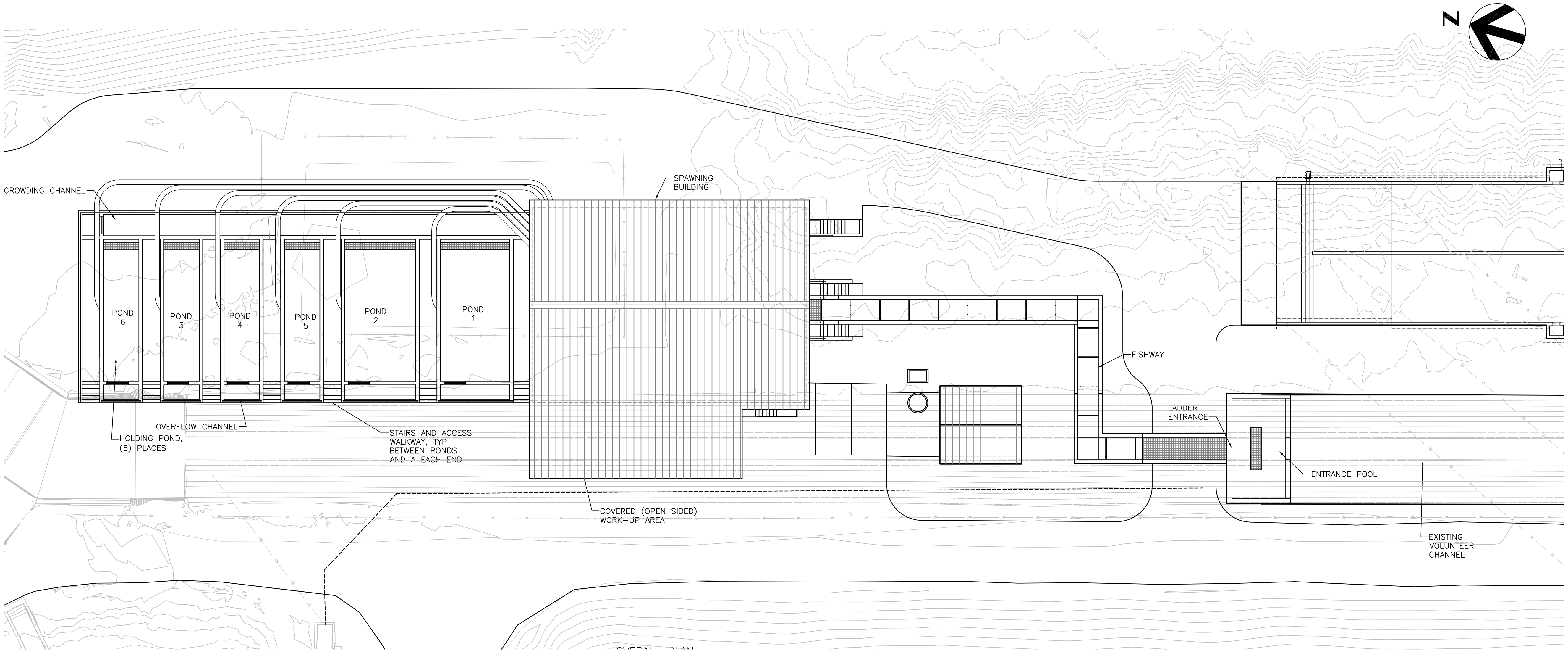
STRUCTURAL PLAN AND SECTIONS

0 1" 2"

FILENAME	08S01.dwg
SCALE	SCALE

SHEET
08S01

Attachment B



HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	ACB
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

ADULT HANDLING FACILITY

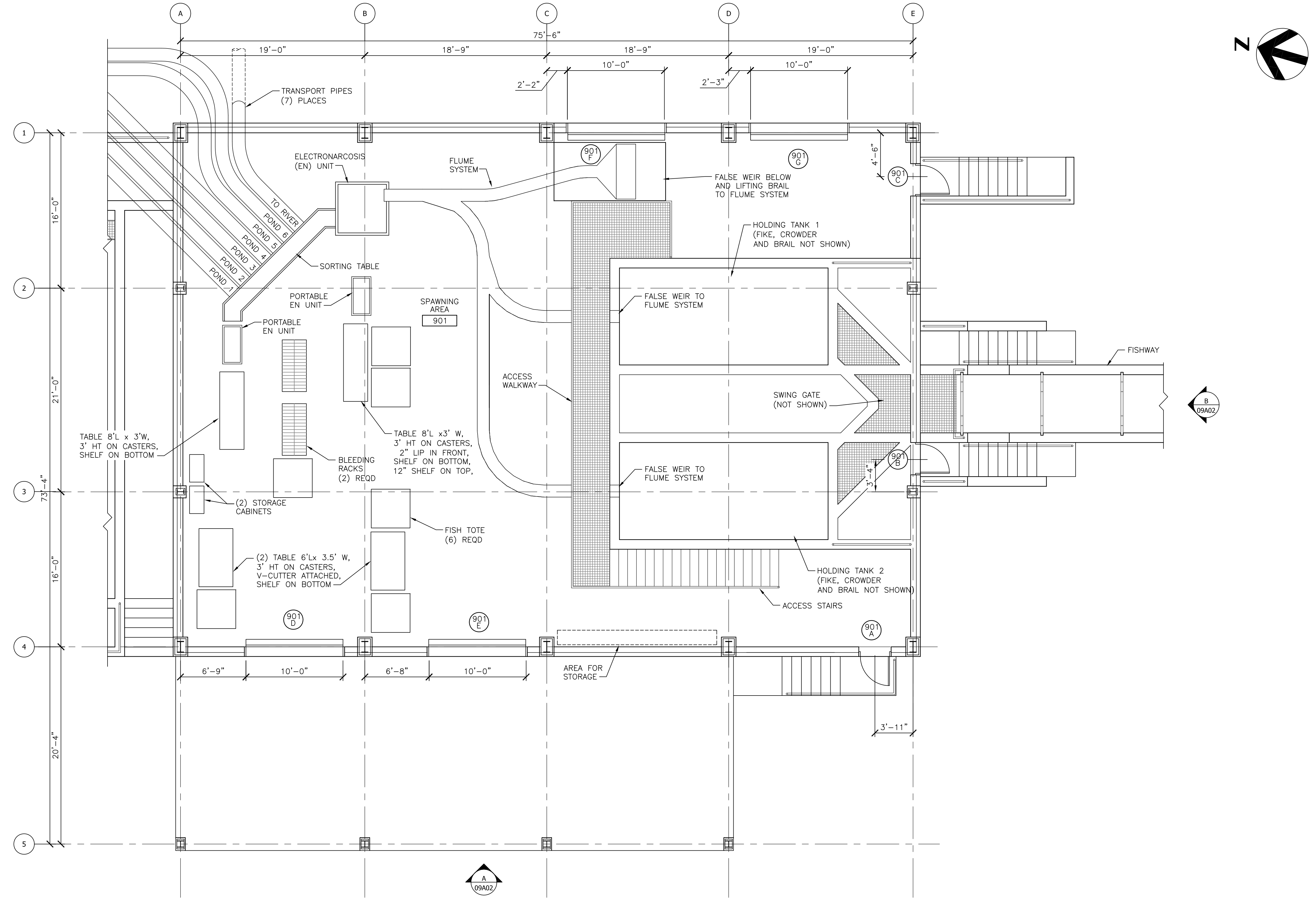
OVERALL PLAN

0 1" 2"

FILENAME	09G01.dwg
SCALE	AS NOTED

SHEET 09G01

Attachment B



1 FLOOR PLAN- SPAWNING BLDG

Scale: 3/16"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	ACB
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

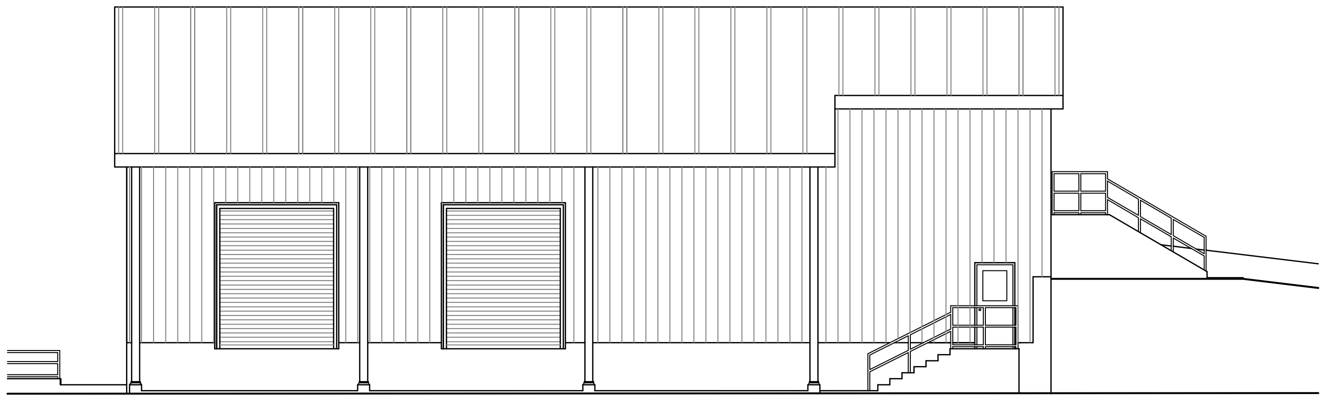
ADULT HANDLING FACILITY

SPAWNING BUILDING PLAN

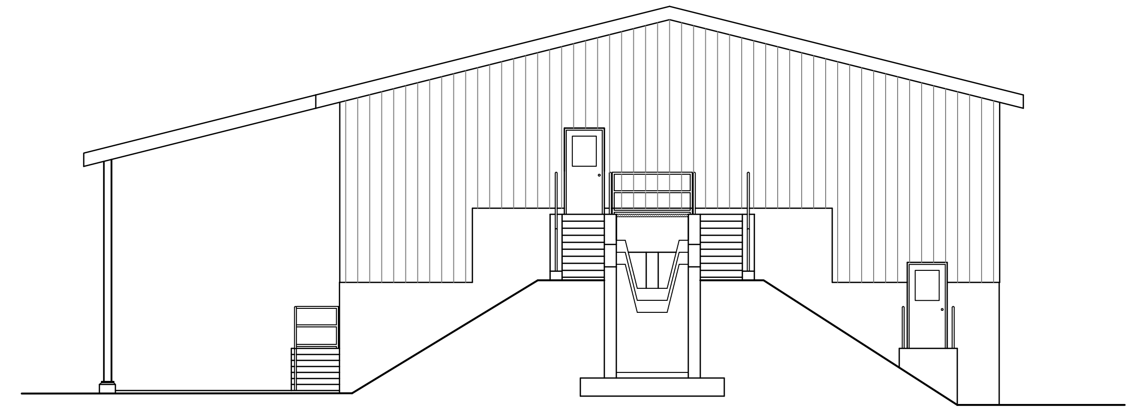
FILENAME	09A01.dwg
SCALE	AS NOTED

SHEET 09A01

Attachment B



A ELEVATION
Scale: 1/8"



B ELEVATION
Scale: 1/8"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	ELE
DESIGNER 1:	EEO
DESIGNER 2:	ACB
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

ELEVATIONS

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

ADULT HANDLING FACILITY

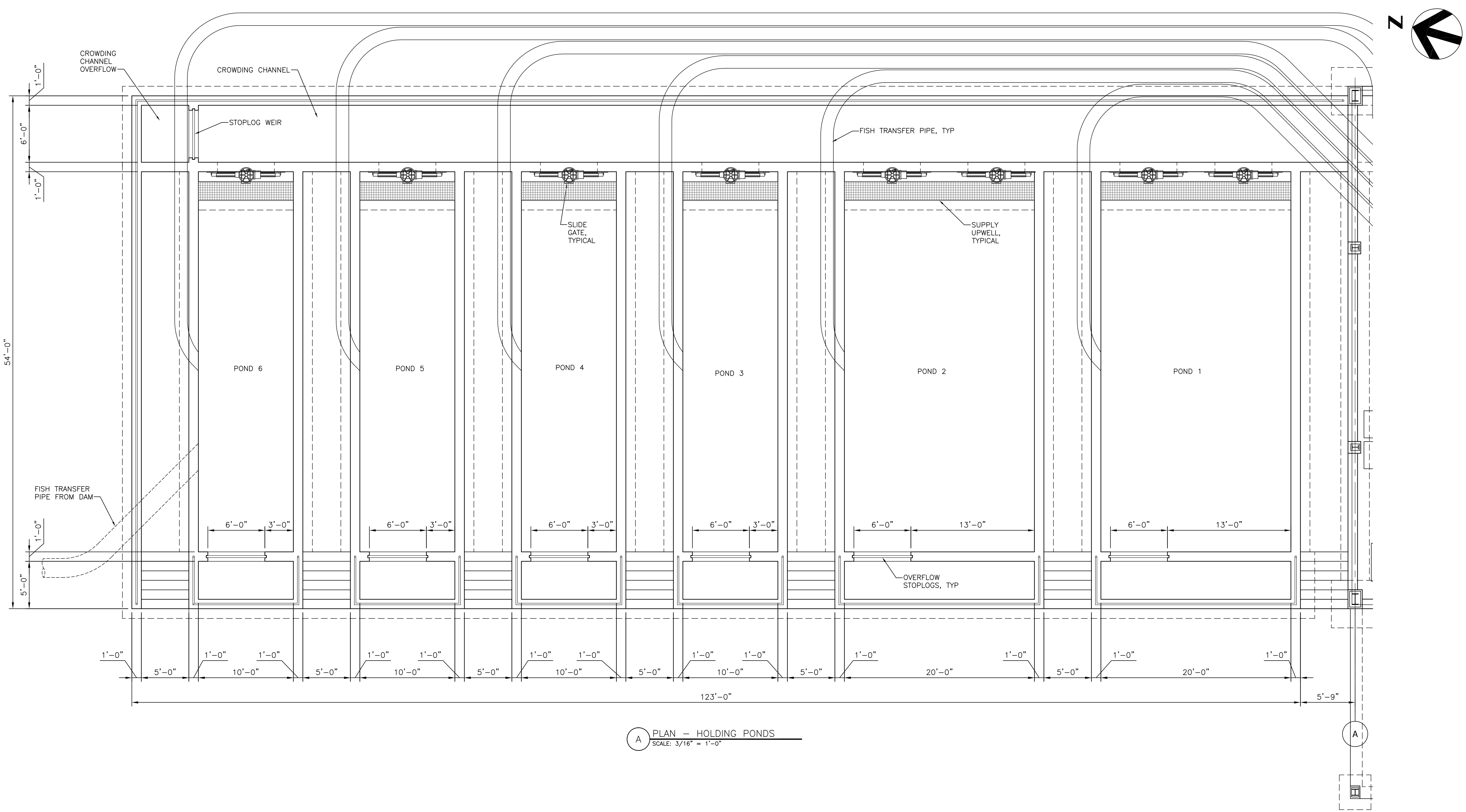
SPAWNING BUILDING
ELEVATIONS 1

0 1" 2"

FILENAME 09A02.dwg
SCALE AS NOTED

SHEET 09A02

Attachment B



A PLAN – HOLDING PONDS
SCALE: 3/16" = 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	ACB
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

ADULT HANDLING FACILITY

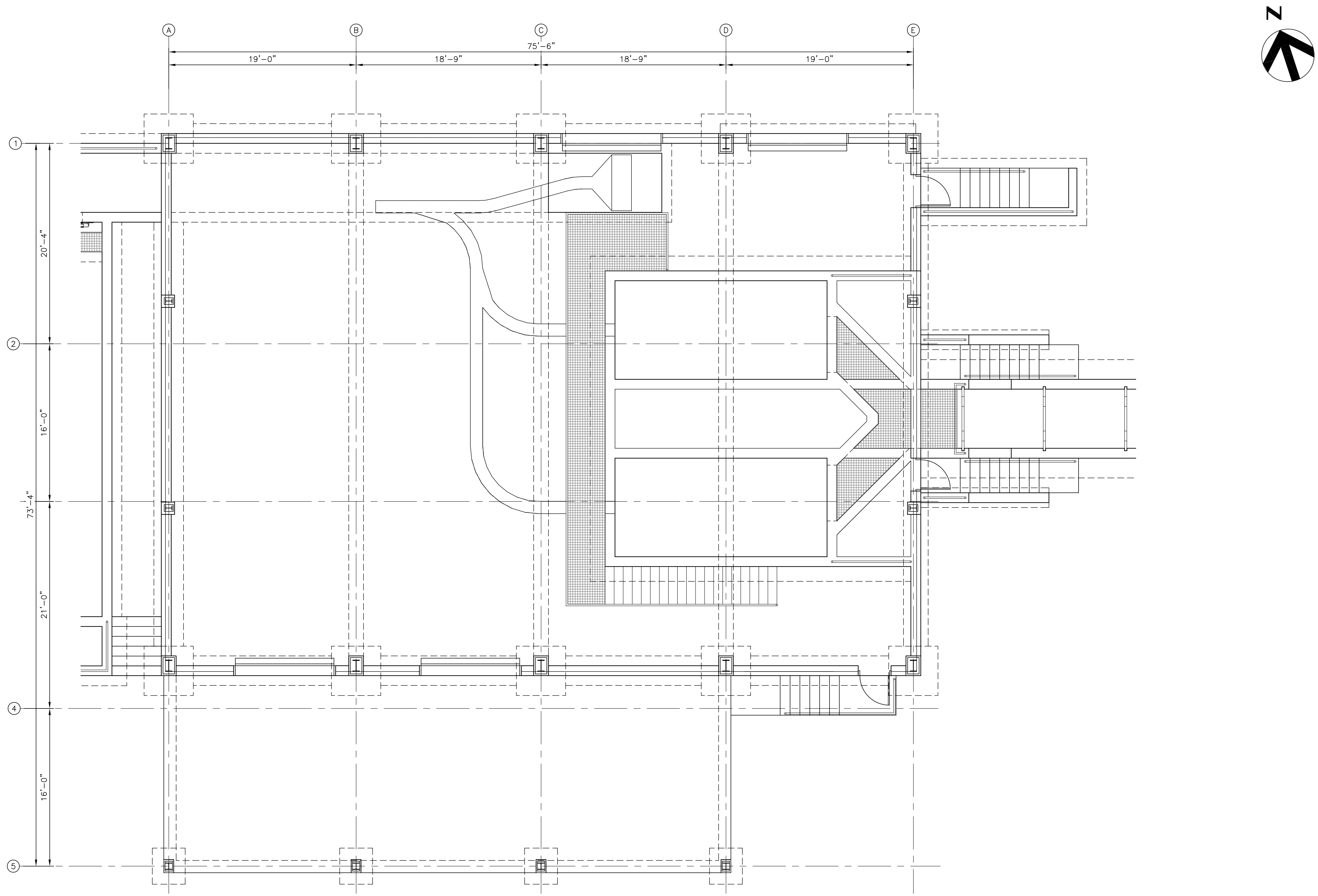
STRUCTURAL PARTIAL PLAN HOLDING PONDS

0 1" 2"

FILENAME 09S01.dwg
SCALE AS NOTED

SHEET 09S01

Attachment B



A PLAN – SPAWNING BUILDING
SCALE: 3/16" = 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	ACB
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

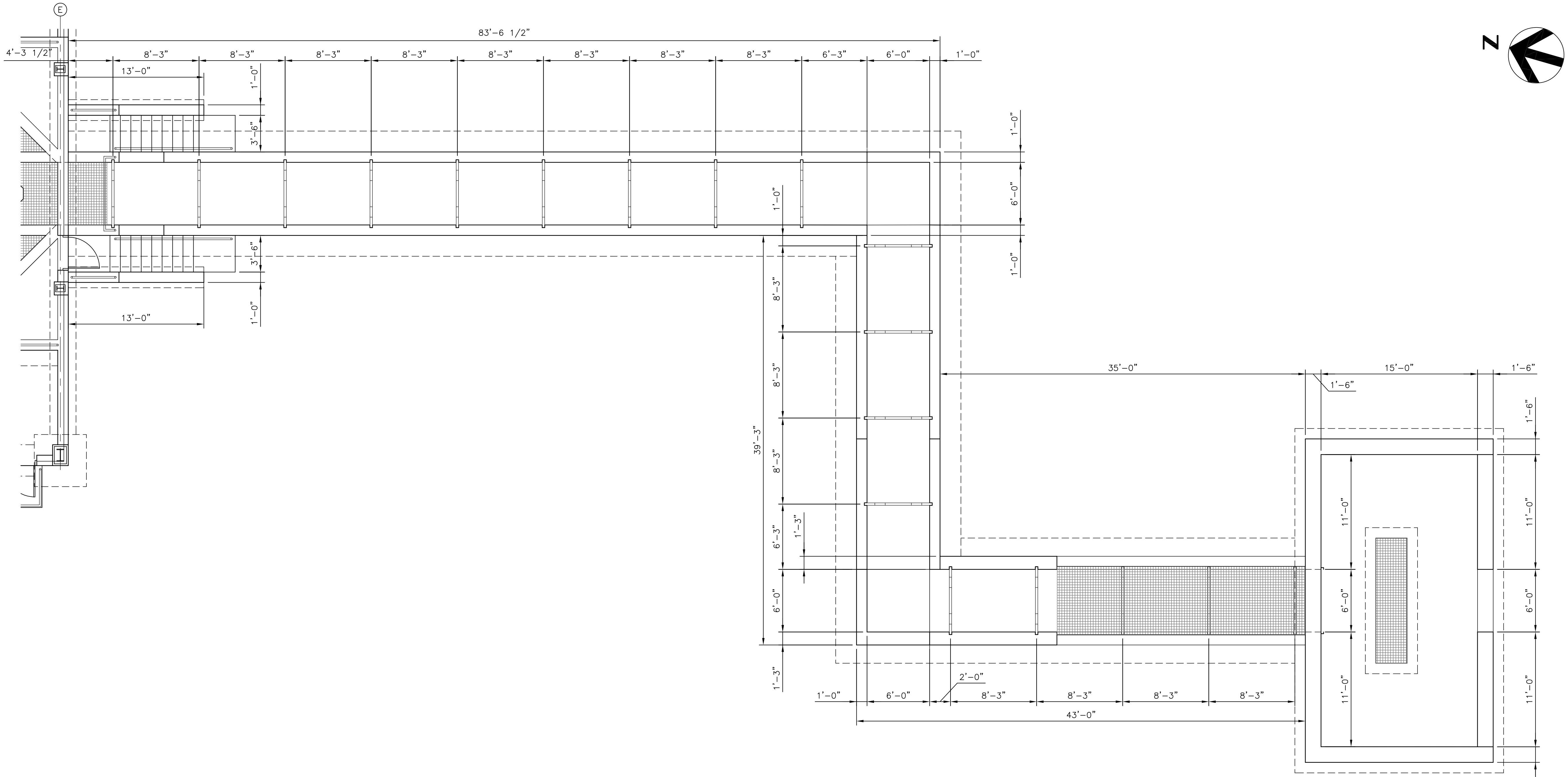
ADULT HANDLING FACILITY

STRUCTURAL PARTIAL PLAN SPAWNING BUILDING

FILENAME	09S02.dwg
SCALE	AS NOTED

SHEET **09S02**

Attachment B



A PLAN – FISHWAY
SCLAE: 3/16" = 1'-0"

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	ACB
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

ISSUE	DATE	DESCRIPTION

HDR Fisheries DESIGN CENTER

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

ADULT HANDLING FACILITY

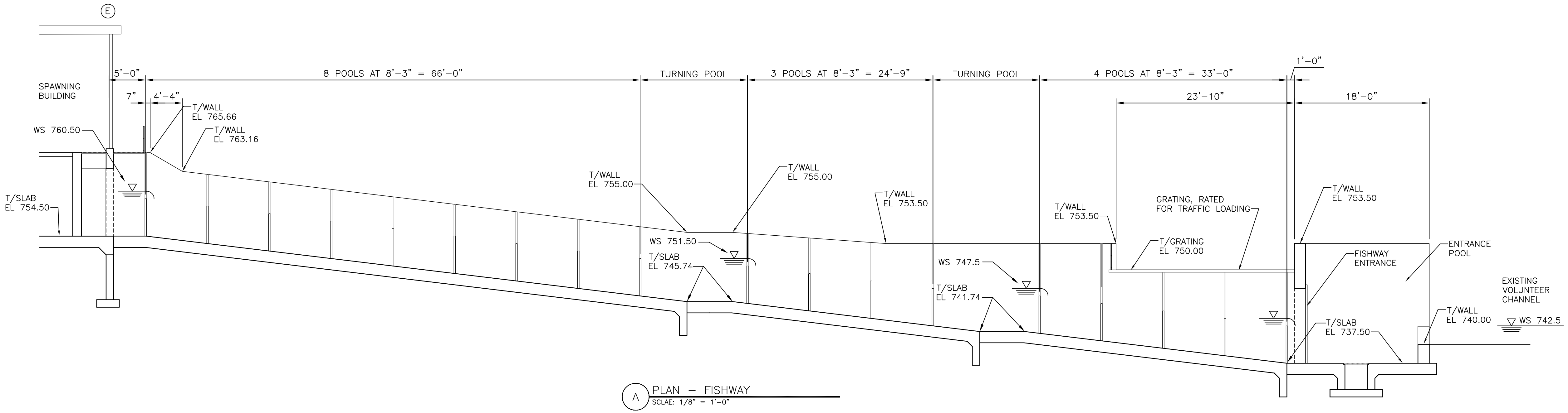
STRUCTURAL PARTIAL PLAN FISHWAY

0 1" 2"

FILENAME	09S03.dwg
SCALE	AS NOTED

SHEET 09S03

Attachment B



A PLAN – FISHWAY
SCLAE: 1/8" = 1'-0"

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	ACB
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

HDR Fisheries DESIGN CENTER

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

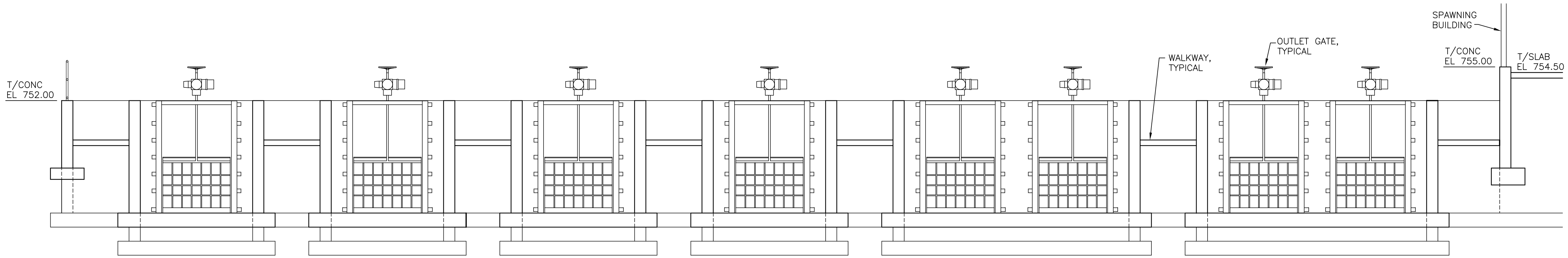
ADULT HANDLING FACILITY

STRUCTURAL SECTIONS 1

FILENAME	09S04.dwg
SCALE	AS NOTED

SHEET 09S04

Attachment B



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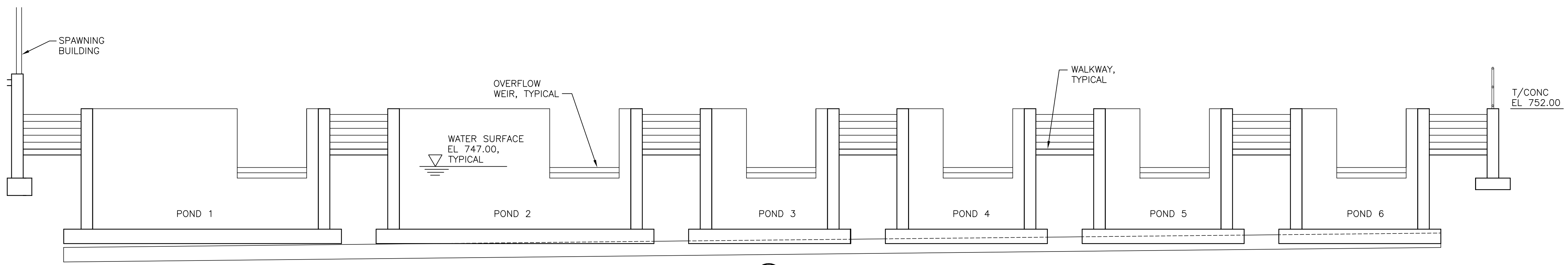

B SECTION
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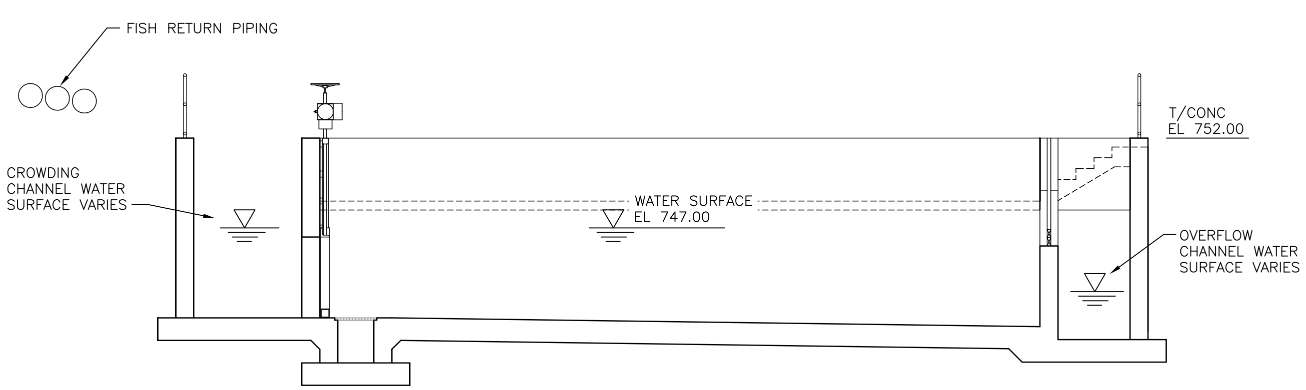

C SECTION
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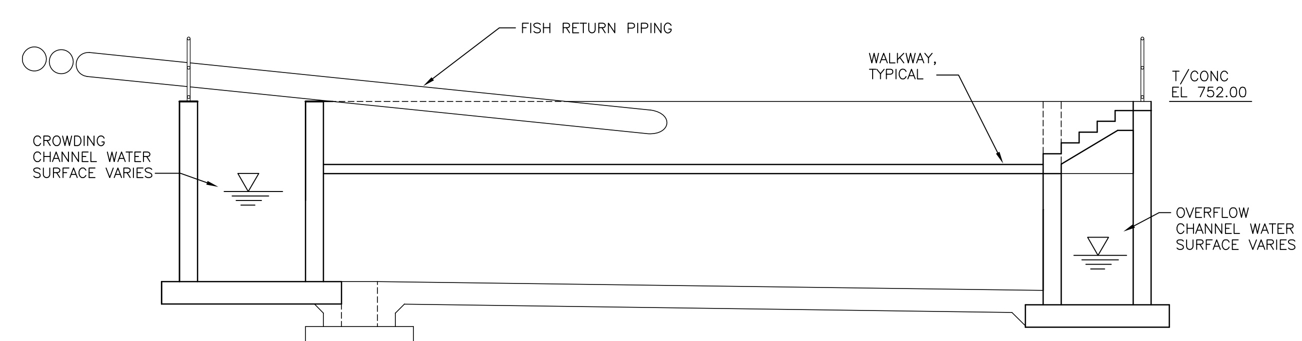


D SECTION
SCALE: 3/16" = 1'-0"

HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	ACB
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

ADULT HANDLING FACILITY

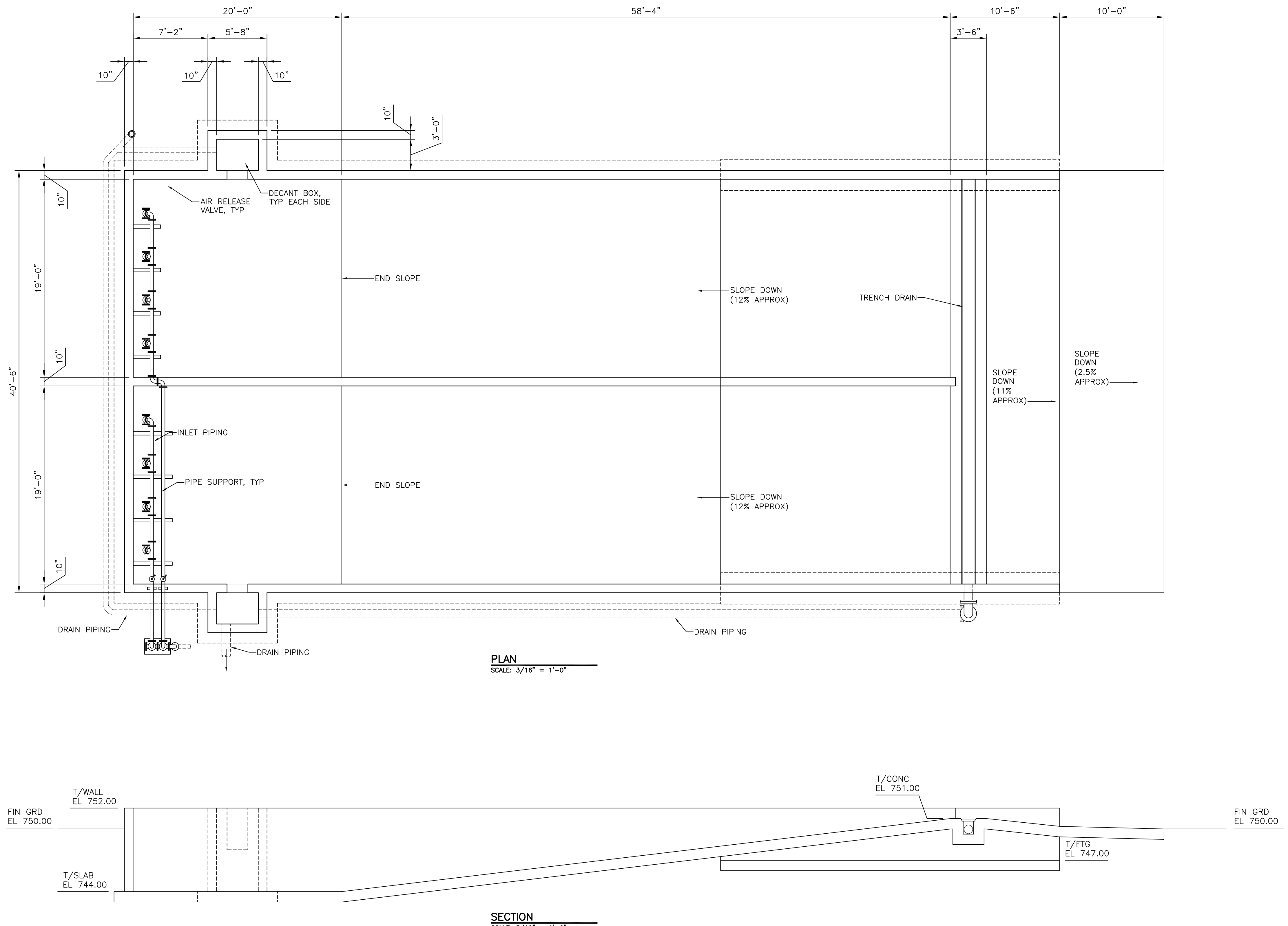
STRUCTURAL SECTIONS 2

0 1" 2"

FILENAME	09S05.dwg
SCALE	AS NOTED

SHEET **09S05**

Attachment B



HDR Fisheries DESIGN CENTER

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	JLH
DESIGNER 1:	EEO
DESIGNER 2:	
DRAWN BY:	ACB
CHECKED BY:	
PROJECT NUMBER	000000000178576

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

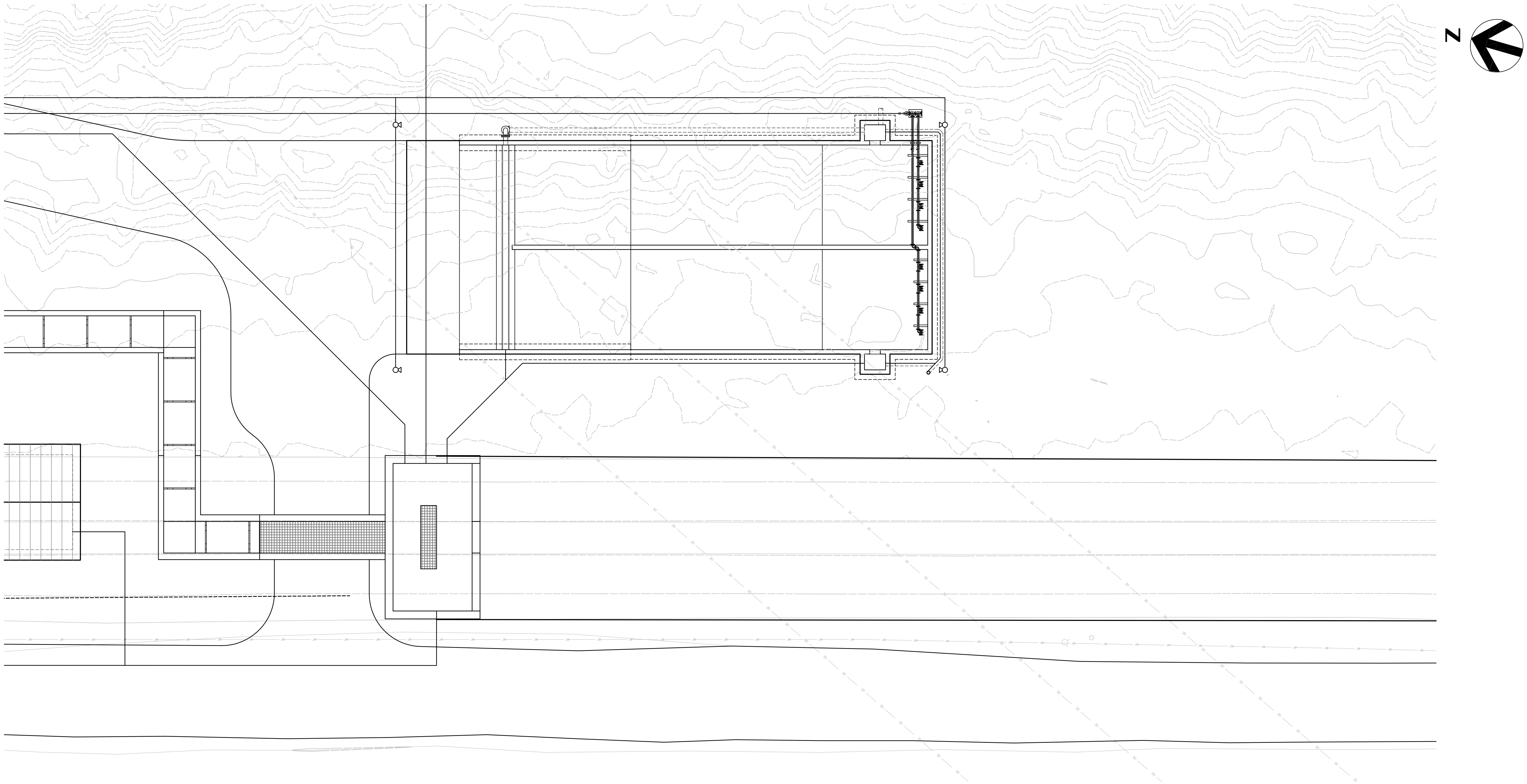
POLLUTION ABATEMENT POND

PLAN AND SECTION

FILENAME	10S01.dwg
SCALE	AS NOTED SCALE

SHEET 10S01

Attachment B



PLAN
SCALE: 1"=10'-0"

PROJECT MANAGER	JLH
DESIGNER 1:	
DESIGNER 2:	
DRAWN BY:	
CHECKED BY:	
PROJECT NUMBER	000000000178576

ISSUE	DATE	DESCRIPTION

HDR Fisheries DESIGN CENTER

Public Utility District No. 1 of Douglas County

WELLS HATCHERY MODERNIZATION

POLLUTION ABATEMENT POND

PIPING PLAN

FILENAME	10P01.dwg
SCALE	SCALE

SHEET 10P01

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	April 16, 2014
From:	Mike Schiewe, Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the March 19, 2014 HCP Hatchery Committees Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees' meeting was held at Douglas PUD headquarters in East Wenatchee, Washington, on Wednesday, March 19, 2014, from 9:30 am to 12:00 pm. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- Hatchery Committees representatives will submit comments and/or their approval of the revised draft February 19, 2014, Wells Modernization Workshop minutes to Kristi Geris no later than Friday, April 4, 2014. No comments received will be considered an approval (Item I).
- Alene Underwood will review the status of pending water recirculation pilot studies at Eastbank Fish Hatchery and Chiwawa Fish Hatchery, and will report back to the Hatchery Committees at the April 16, 2014 meeting (Item I).
- Chelan PUD will provide video from the Rocky Reach Trap 2013 Pilot Study to Kristi Geris to post on the HCP Hatchery Committees Extranet Site (Item I).
- The Hatchery Evaluation Technical Team (HETT) will provide the draft Non-Target Taxa of Concern (NTTOC) Report for a 60-day review to Kristi Geris for distribution to the Hatchery Committee prior to the April 16, 2014, meeting (Item I).
- Chelan PUD will develop for review a list of questions for Karl Halupka (U.S. Fish and Wildlife Service [USFWS]) regarding how incidental take is assigned (Item I).
- Hatchery Committees representatives will submit an email vote on the revised draft Rocky Reach Trap/Methow Spring Chinook Broodstock Collection Proposal to Chelan PUD (with a copy to Kristi Geris) no later than Friday, April 4, 2014 (Item III-A).

- The Washington Department of Fish and Wildlife (WDFW) will distribute the draft 2014 Broodstock Protocols to the Hatchery Committees for review on March 25, 2014. Initial comments on the draft protocols will be due to WDFW on April 10, 2014, and discussions on the revised draft protocols will continue during the Hatchery Committees meeting on April 16, 2014 (Item III-B).
- Lynn Hatcher will inquire internally about requiring Hatchery Committees approval of the annual Broodstock Protocols (Item IV-A).
- Hatchery Committees representatives will submit comments on the sample size section in the memorandum clarifying standardized methods for Hatchery Monitoring and Evaluation (M&E) Plan Objective 8.3, Fecundity at Size, to Mike Tonseth (Item IV-B).
- WDFW will add a summary table to the draft 2014 Wenatchee Basin Steelhead Release Proposal, and will redistribute the revised draft to the Hatchery Committees. Hatchery Committees representatives will provide comments to Tonseth no later than Friday, March 28, 2014. No comments received will be considered an approval (Item IV-C).

DECISION SUMMARY

- The Hatchery Committees representatives approved the Chelan PUD Methow Spring Chinook Hatchery and Genetic Management Plan (HGMP) via email on March 12, 2014, with National Marine Fisheries Service (NMFS) abstaining.

AGREEMENTS

- There were no agreements discussed at today's meeting.

REVIEW ITEMS

- Kristi Geris distributed a memorandum to the Hatchery Committees on February 24, 2014, that clarified standardized methods for Hatchery M&E Plan Objective 8.3, Fecundity at Size. Comments on this memorandum, with regards to sample size, are due to Mike Tonseth (Item IV-B).
- Kristi Geris sent an email to the Hatchery Committees on March 18, 2014, notifying them that the revised draft February 19, 2014 Wells Modernization Workshop

minutes are available for review. Comments on the revised draft minutes are due to Kristi Geris no later than Friday, April 4, 2014. No comments received will be considered an approval (Item I).

- Kristi Geris sent an email to the Hatchery Committees on March 19, 2014, notifying them that the revised draft Rocky Reach Trap/Methow Spring Chinook Broodstock Collection Proposal is available for review with an email vote due to Chelan PUD (with a copy to Geris) no later than Friday, April 4, 2014 (Item III-A).
- Kristi Geris sent an email to the Hatchery Committees on March 28, 2014, notifying them that the draft 2014 Broodstock Protocols are available for review with comments due to WDFW no later than Thursday, April 10, 2014 (Item III-B).

FINALIZED DOCUMENTS

- The revised Wenatchee Spring Chinook Reproductive Success Study (RSS) Extension Memorandum that was approved by the Hatchery Committees on January 15, 2014, was finalized and distributed to the Hatchery Committees by Kristi Geris on February 24, 2014.
- The Final Wells 2013 HCP Annual Report was distributed to the Hatchery Committees by Kristi Geris on March 31, 2014.

I. Welcome, Agenda Review, Meeting Minutes, and Action Items

Mike Schiewe welcomed the Hatchery Committees and asked for any additions or other changes to the agenda. Greg Mackey added a brief update on Wells Modernization, and Alene Underwood added a brief update on impacts of the Wanapum Dam situation on operations at Rock Island Dam.

The Hatchery Committees reviewed the revised draft February 6, 2014 conference call minutes. Kristi Geris said that all comments and revisions received from members of the Committees were incorporated in the revised minutes, and that there were no outstanding edits to discuss. The Hatchery Committees members present approved the draft February 6, 2014 conference call minutes, as revised. Geris will finalize the conference call minutes and distribute them to the Committees.

The Hatchery Committees reviewed the revised draft February 19, 2014 Wells Modernization Workshop minutes. Geris said that all comments and revisions received from members of the Committees were incorporated in the revised minutes, and that there were no outstanding edits to discuss. Greg Mackey said that because the revised draft minutes were only distributed yesterday, he suggested deferring approval of the minutes to provide an adequate review period. Hatchery Committees representatives will submit comments and/or their approval of the revised draft February 19, 2014 Wells Modernization Workshop minutes to Kristi Geris no later than Friday, April 4, 2014. No comments received will be considered an approval.

The Hatchery Committees reviewed the revised draft February 19, 2014 meeting minutes. Geris said that comments and revisions received from members of the Committees were incorporated in the revised minutes, and that there were two items remaining to be discussed. First, Geris noted that text was unintentionally duplicated in NMFS's HGMP Update, which she indicated will remove. Secondly, regarding a comment made by Bill Gale during Chelan PUD's Rocky Reach Trap discussion, it was clarified that Winthrop National Fish Hatchery (NFH) is evaluating adult management by monitoring how many Winthrop-origin fish return to Winthrop NFH—not Methow Hatchery—based on passive integrated transponder (PIT)-tag detections. The Hatchery Committees members present approved the draft February 19, 2014 meeting minutes, as revised. Geris will finalize the meeting minutes and distribute them to the Committees.

Action items from the last Hatchery Committees meeting on February 19, 2014, and follow-up discussions were as follows: *(Note: italicized item numbers below correspond to agenda items from the February 19, 2014 meeting.)*

- *Mike Tonseth will revise the Extension Request for the Wenatchee Spring Chinook RSS, as discussed, and will provided the final request to Kristi Geris for distribution to the Hatchery Committees no later than February 28, 2014 (Item I).*
  Tonseth provided the final request to Geris on February 24, 2014, which Geris distributed to the Hatchery Committees that same day.
- *Mike Tonseth will develop a draft protocol for measuring fecundity at size, and provide the draft protocol to Kristi Geris for distribution to the Hatchery Committees*

no later than February 28, 2014 (Item I).

Tonseth provided a draft protocol to Geris on February 24, 2014, which Geris distributed to the Hatchery Committees that same day.

- *Alene Underwood will review the status of pending water recirculation pilot studies at Eastbank Fish Hatchery and Chiwawa Fish Hatchery, and will report back to the Hatchery Committees by the April 16, 2014 meeting (Item I).*

  This action item will be carried forward.
- *Chelan PUD will provide the revised draft Chelan PUD Methow Spring Chinook HGMP in redline strikeout to Kristi Geris for distribution to the Hatchery Committee by February 20, 2014; Hatchery Committees members will document their approval or request for additional changes to the draft HGMP via email to Chelan PUD no later than Friday, February 28, 2014 (Item II-B).*

  Chelan PUD provided the revised draft HGMP for approval, and the Hatchery Committees approved the Chelan PUD Methow Spring Chinook HGMP via email on March 12, 2014, with NMFS abstaining.
- *Chelan PUD will provide an electronic copy of the Rocky Reach Trap Proposal to Kristi Geris for distribution to the Hatchery Committees (Item II-C).*

  Chelan PUD provided the proposal to Geris on February 20, 2014, which Geris distributed to the Hatchery Committees on February 21, 2014.
- *Chelan PUD will consider modifying the visual and auditory PIT-tag detection signals leading up to the Rocky Reach Trap to differentiate between detection locations (Item II-C).*

  Chelan PUD indicated that the modifications were made, and will be discussed during today's meeting.
- *Chelan PUD will provide video from the Rocky Reach Trap 2013 Pilot Study to Kristi Geris to post on the HCP Hatchery Committees Extranet Site (Item II-C).*

  Alene Underwood said that the video was recorded in VHS format and is currently being digitized, and will be posted on the Hatchery Committees Extranet site when available. This action item will be carried forward.
- *Chelan PUD will revise Table 1 of the draft Rocky Reach Trap Proposal, including: 1) correcting for age at return; and 2) verifying Chewuch numbers (Item II-C).*

  Chelan PUD indicated that the modifications were made, and will be discussed during today's meeting.

- *Chelan PUD will develop a flow diagram describing the sequence of options for collecting Methow spring Chinook broodstock to meet Chelan PUD's 2014 production obligation (Item II-C).*

  Chelan PUD indicated that the modifications were made, and will be discussed during today's meeting.
- *Greg Mackey will provide the draft NTTOC Report for a 60-day review to Kristi Geris for distribution to the Hatchery Committee prior to the meeting on March 19, 2014 (Item III-C).*

  Mackey said that comments were received from HETT participants on the NTTOC Report, and the revised report will be distributed to the Hatchery Committees soon. This action item will be carried forward.
- *The Yakama Nation (YN), Douglas PUD, and Chelan PUD will develop a list of questions for Karl Halupka (USFWS) regarding how incidental take is assigned for discussion at the NMFS/USFWS Biological Opinion Coordination Meeting on March 10, 2014 (Item V-A).*

  Chelan PUD agreed to develop for review a list of questions for Halupka regarding how incidental take is assigned.

II. Douglas PUD

A. HETT NTTOC Report Update (Greg Mackey)

Greg Mackey said that comments have been received from the HETT and the revised report will soon be distributed to the Hatchery Committees for their review, as discussed during the review of last meeting's action items.

B. Wells Hatchery Steelhead Broodstock Update (Jayson Wahls)

Jayson Wahls said that since the Hatchery Committees meeting on February 19, 2014, Wells Hatchery steelhead broodstock collection efforts have yielded 17 females and 19 males—6 females and 4 males were obtained by collection in the Wells Hatchery volunteer channel and hook and line angling, and 11 females and 15 males were obtained from Ringold. He added that 1 or 2 more steelhead were collect this morning at Wells. He said that last week, trapping efforts began at the Wells Dam west ladder trap and the Twisp Weir was installed.

He said that collections will also soon begin at Winthrop NFH and at Methow Hatchery. He said that 60 females are needed to fill all of the programs. He added that there are currently several steelhead in the volunteer channel but they are not moving into the trap.

Lynn Hatcher asked about the progress of the Colville Confederated Tribes' (CCT's) efforts. Wahls said that the CCT's collection efforts are also underway. He said they collected one Omak fish this week, but he has not heard of any collected at the other weir. He added that hook and line angling collection efforts are also being locally advertised on television for the Ringold area. Mike Schiewe asked what the odds are of obtaining the 60 females, and Wahls said they are good. He said he is optimistic that the needed broodstock will be obtained. Wahls also clarified that the target collection number will cover all programs, including the CCT. He said, for example, if the CCT can collect 48 broodstock in the Okanogan, then that represents 48 fewer fish that the entire effort requires. He said that all broodstock need to be obtained by mid-to-late April 2014.

Wahls noted that one female's progeny was euthanized due to testing positive for infectious hematopoietic necrosis virus (IHNV), which he said was unusual. He said that the fish was collected by hook and line in the Methow, and all progeny (eggs) from each female were kept isolated from other females' eggs so no other fish had to be euthanized.

C. Wells Modernization Update (Greg Mackey)

Greg Mackey reminded the Hatchery Committees that Kristi Geris sent them an email on January 20, 2014, notifying them that the draft Wells Hatchery Modernization 30% Design Drawings and draft Wells Hatchery Preliminary Design Report were available for a 60-day review period, with comments due to him no later than Friday, March 21, 2014. Comments and/or approval of the revised draft February 19, 2014 Wells Modernization Workshop minutes are due to Geris no later than Friday, April 4, 2014, as discussed during the review of last month's meeting minutes.

III. Chelan PUD

A. 2014 Rocky Reach Trap Pilot Proposal (Alene Underwood and Catherine Willard)

Alene Underwood distributed an updated 2014 Rocky Reach Trap Pilot Proposal; she indicated that the proposal was basically the same as the previous draft with changes recommended by Hatchery Committees members during the February 19, 2014, meeting. Catherine Willard reviewed these revisions, as follows:

- Three different color visual signals associated with the three PIT-tag arrays were added to the notification signal for the trap operator to differentiate between detection locations, as recommended by the YN.
- Historical fish passage data at Rocky Reach Dam were reviewed to determine detection probability for the proposed trapping period, as recommended by WDFW. Based on data from 2006 to present, the start time of trap operation was revised from 9:00 a.m. to 7:00 a.m., which increased the daily run coverage from 46% to 70% with operations running until 3:00 p.m.
- A table summarizing age at return based on PIT-tagged smolts was added (Table 2 of Attachment B), as recommended by the CCT.
- A collection decision diagram was added (Figure 2 of Attachment B), as recommended by the CCT.

Underwood noted that tangle netting was still included in the updated proposal even though the option was not preferred by the YN. She said that Bill Gale indicated (in a previous conversation) that if natural-origin recruits (NORs) are available, he would prefer obtaining those for a conservation program over hatchery-origin recruits (HORs). Keely Murdoch said that the YN spoke with Gale, as well, and that they are supportive of including the tangle netting option contingent on the addition of sideboard language that outlines the extent that tangle netting will be used. Mike Tonseth suggested adding language such as: 1) the total time that tangle netting can be used; 2) the geographic area where tangle netting can be used; and 3) total number of fish targeted, regardless of origin. Murdoch said that if broodstock cannot be obtained via tangle netting within the specified sideboards, a back-up plan would be needed. Underwood noted that the proposal indicates that HORs will also be collected at the Rocky reach Trap in case they are needed to fill the program. Mike Schiewe asked what would be done with excess HORs, and Tonseth said they could possibly go to a safety net program or Winthrop NFH. Tonseth added that Chelan PUD and WDFW do not have Endangered Species Act permits to sacrifice HORs. He also added that there is an over-collection allowance to manage for bacterial kidney disease.

Lynn Hatcher asked if Chelan PUD is still discussing with Douglas PUD the option of obtaining broodstock at Wells Dam. Underwood said that discussions are ongoing between Chelan PUD and Douglas PUD. Hatcher asked if Douglas PUD would accept excess fish if Chelan PUD obtained them at the Rocky Reach Trap. Greg Mackey said that Douglas PUD would not need HORs, and Tonseth noted that Chelan PUD needs 38 NORs and the likelihood of Chelan PUD obtaining more than that is extremely low.

Mackey asked if the timeframe outlined for tangle netting will apply to hours in the water, or also to time spent searching for a spot to deploy the tangle nets. Tonseth said that spawning ground data that were collected by Charlie Snow will be reviewed to help inform where to start looking. Mackey said the effort should be calculated as the time nets spend in the water and not include the amount of time it may take to locate an area to deploy the nets. Tonseth said that a fallback option to the Rocky Reach Trap and tangle netting could be to make up the difference with HORs from Winthrop NFH. He said that, ultimately, only 19 females are needed.

Hatcher asked why Wells Dam was not included in the collection decision diagram (Figure 2 of Attachment B). Underwood explained that while discussions are ongoing between Chelan PUD and Douglas PUD, Wells Dam was not included in the proposal because it is not currently a viable option. She added, however, that Chelan PUD will include a note on Figure 2 indicating that discussions are ongoing between Chelan PUD and Douglas PUD regarding broodstock collection options at Wells Dam. *(Note: this has been added to the revised proposal in Attachment B.)*

Hatcher asked if the HCP Coordinating Committees had reviewed this proposal, and Underwood said that the fish passage aspect of the proposal will be presented for review at the HCP Coordinating Committees' meeting on March 25, 2014.

Recognizing that the proposed trapping study is scheduled to begin in late-April 2014, Underwood requested Hatchery Committees final review and an email vote on an expedited schedule. Tonseth added that WDFW also needs to include the approved broodstock collection strategy for Chelan PUD's program in the draft 2014 Broodstock Protocols, which are due April 15, 2014. Murdoch requested that sideboard language regarding tangle netting is added to the final draft for review, which Underwood indicated would be done. *(Note: the requested language has been added to the revised draft proposal for review [Attachment B].)*

Kristi Geris sent an email to the Hatchery Committees on March 19, 2014, notifying them that the revised draft Rocky Reach Trap/Methow Spring Chinook Broodstock Collection Proposal is available for review and that an email vote is due to Chelan PUD (with a copy to Geris) no later than Friday, April 4, 2014.

B. 2014 Chiwawa Spring Chinook Broodstock Collection (Alene Underwood)

Alene Underwood said she recently learned that a draft Statement of Agreement (SOA) for Grant PUD's Nason Creek spring Chinook broodstock collection will be discussed at tomorrow's Priest Rapids Coordinating Committee's Hatchery Subcommittee (PRCC HSC) meeting. Underwood said, however, that there are aspects of the SOA that she feels should also be discussed by the Hatchery Committees. Keely Murdoch added that the SOA is specific to Nason Creek; however, implementation of the SOA could affect Chelan PUD's Chiwawa spring Chinook program. Underwood explained that there is a caveat statement included in the SOA that states if approval of the SOA is delayed, Grant PUD's brood year 2014 spring Chinook obligation will be backfilled in the Chiwawa River, pending agreement with Chelan PUD (i.e., the "back-up plan"). Underwood said this concerns Chelan PUD because under their current permit, they are only authorized to release 205,000 from Chiwawa. Mike Tonseth said that Grant PUD has a Nason Creek permit to release fish from Chiwawa, so their permit would cover their fish. Underwood said the other concern is regarding stray management, noting that Chelan PUD has relief in their current permit until 2017. However, after 2017, Chelan PUD is held to a 10% in-basin and 5% out-of-basin stray rate limit. She said a large concern has existed regarding the number of strays from the Chiwawa program and with current program reductions, strays should be reduced; and it seems this SOA could hamper that effort. Tonseth said this concern has been discussed by the Joint Fisheries Parties, and that they are optimistic that the numbers of strays can be reduced by adult management. He said, for example, that because the preponderance of strays in this program are 3-year-old males, WDFW could prioritize removing age 3 returning males. He said that hatchery females could also be prioritized to meet escapement levels. He said these strategies, along with other adult management actions, would likely reduce stray rates in the program. Murdoch suggested marking the fish differently and developing an agreement on stray issues. Underwood said that Chelan PUD and Grant PUD currently do not have an agreement on any of the approaches contained in the draft SOA; Tonseth noted that the expectation is that Grant PUD will contact Chelan PUD.

Murdoch suggested that if agreement is reached on the SOA, but there is a delay in implementation this year because of the permitting issues that Amilee Wilson (NMFS) anticipated, as a stop-gap measure Grant PUD could put production at Chiwawa for 1 year while permitting issues are resolved. Lynn Hatcher said that Wilson was clear about the need to reinitiate consultation. He said there is a lot of interest by NMFS in the compositing approach, but a lot of details need to be worked out. He said as a result, this year, NMFS will be pushing for what was implemented last year. Murdoch said that this is different than what was previously discussed, and Hatcher explained that the issue is that NMFS did not consider the potential long-term effects of compositing during consultation. Murdoch recalled that NMFS had previously indicated that they were discussing ways to implement the SOA this year while working through issues, and then the back-up plan was added to the SOA to address possible delays due to permitting issues.

Underwood asked what will be included in the 2014 Broodstock Protocols. Tonseth said that he discussed this with NMFS, but they have not yet officially stated their position. He said regarding the composite concept and permit coverage, he understood that although the compositing approach was considered, the long-term effects were not, which is why NMFS would need to re-consult on it. He said that NMFS will not be able to complete the consultation in time for implementation this year, so they likely will not want to deviate from what was implemented last year. He said that if this is the case, this year's protocols will not be much different from last year. Tonseth suggested that instead of using the genetic approach similar to last year, that they consider using a parental-based tagging (PBT) approach using data obtained through the Wenatchee Spring Chinook RSS. Underwood noted that PBT has not worked in the past, and Tonseth said that it did not work for White River fish—not Nason and Chiwawa fish. He added that this year, only Wenatchee basin fish would be used. Underwood asked how PBT will be permitted, and Tonseth said that it is already authorized to be used, but this has not yet been discussed. Underwood asked when it will be discussed, and added that Chelan PUD needs to collect fish, but cannot because decisions have not been made. Murdoch said that if the SOA is approved, discussions need to continue with NMFS about possible implementation this year and next. She added that there are a lot of decisions that need to fall into place before actions can be taken.

Hatcher reiterated that because certain impacts were not evaluated in the Biological Opinion (BiOp), there is no coverage for the compositing approach. He said that this year, as Tonseth noted, NMFS will likely move in the direction of PBT. Tonseth added that another difference from last year is how fish would be assigned. He suggested using the same sideboards as last year to avoid over-impacting fish. He said that last year, the target was 172 adults, which would also be the limit this year. He said that what he does not want to see happen is having a small program one year, and then skip a year—it just delays the program.

Hatcher noted that it is important to NMFS to meet mitigation requirements this year; Tonseth added that meeting mitigation is the easy part, but how it is met that can be challenging. Underwood said that Chelan PUD needs these discussions to continue in the Hatchery Committees in parallel with any discussions in the PRCC HSC. Tonseth said that he plans to develop a draft document summarizing what he discussed today (with regards to the PBT approach) for discussion within the PRCC HSC. Murdoch suggested separating the back-up plan from the SOA, and Tonseth agreed, noting that the SOA has been moving in multiple directions.

Hatcher said that once the last permits are in place, discussions need to start about how to reinitiate consultation and what needs to be completed for next year. Mike Schiewe asked if there is time sensitivity to this in terms of bringing it back to the Hatchery Committees. Tonseth said that if there is clear direction from the PRCC HSC, the next discussion will likely occur during discussion of the draft 2014 Broodstock Protocols, which will include this year's plan for the Nason Creek Program. Tonseth said he plans to distribute the draft 2014 Broodstock Protocols to the Hatchery Committees for review on March 25, 2014, with comments due to WDFW on April 10, 2014. Tonseth said that he will incorporate comments into a revised draft and flag outstanding issues for discussion during the Hatchery Committees meeting on April 16, 2014.

Greg Mackey said he would be interested in reading a written technical document explaining the reasoning behind the compositing strategy. Murdoch said that there is not a clear genetic difference between Nason and Chiwawa fish, and she noted how similar their life histories and habitats are. Mackey said that failure to observe genetic differences does not necessarily mean there are not evolutionary differences between the populations because population genetics studies are based on neutral markers, which by definition, are not under selection and may not reveal adaptive differences. Mackey indicated that he believes a risk-averse approach, where an irreversible measure is not taken, is preferable to an action like compositing that cannot be reversed. Hatcher said that rough model runs conducted by Craig Busack indicated that a fish trapped at Tumwater Dam and identified using genetic analysis as Nason has about a 30% chance of actually being a Chiwawa fish, and vice versa. This suggests that if broodstock is collected at Tumwater Dam for the Chiwawa and Nason programs, 30% of the wrong fish will be incorporated into each program. If this is repeated, after about 3 generations, there will not be a difference; so a fish classified as one origin is just as likely to be the other. Schiewe noted that this argument will need to be made in the context of a BiOp, and Hatcher agreed.

C. Wanapum Update (Alene Underwood)

Alene Underwood said that fish passage is open at all Rock Island Dam fish ladders. She said that Chelan PUD requested a minimum of 45,000 cubic feet per second (kcfs) at Rock Island Dam, and they are currently receiving about 100 kcfs. She said on March 10, 2014, one PIT-tagged steelhead was detected passing the dam. She said that Chelan PUD anticipates that normal fish passage will be maintained at Rock Island Dam through July 2014, and when flows are lower, fish passage will be maintained via modified entrances at the left and right bank ladders. She said that modifications include Denil structures at three of five entrances. Keely Murdoch asked if these structures will be permanent, and Underwood said they are only interim measures while the Wanapum Pool is drawn down. Lynn Hatcher asked what modifications are being implemented at Wanapum Dam. Mike Schiewe said that Grant PUD is installing auxiliary pumps to keep water in the fish ladders at Wanapum Dam, and Underwood added that they are also installing a slide at the upstream exits. Schiewe said that both PUDs are in emergency consultation through the Federal Energy Regulatory Commission (FERC), with NMFS and USFWS, which includes approvals of an accelerated schedule to complete several actions for maintaining fish passage at the dams. Underwood said, for example, that Chelan PUD received HCP Coordinating Committees approval of an Interim Fish Passage Plan on Monday, March 17, 2014, in order to file the plan with FERC, and begin fabrication by Friday, March 21, 2014. Mike Tonseth noted that neither dam can afford to not have fish passage. He added that if fish passage is not available when the runs start, this could mean truck and transport of up to 27,000 salmon per day.

IV. WDFW

A. Draft 2014 Broodstock Collection Protocols (Mike Tonseth)

Mike Tonseth said that WDFW will distribute the draft 2014 Broodstock Protocols to the Hatchery Committees for review on March 25, 2014. Comments on the draft protocols will be due to WDFW on April 10, 2014, and discussions on the revised draft protocols will continue during the Hatchery Committees meeting on April 16, 2014. Lynn Hatcher said that he will inquire internally about requiring Hatchery Committees approval of the annual Broodstock Protocols prior to submission to NMFS. Tonseth noted that this year's protocols are largely the same as last year's with slight shifts in numbers.

B. Gonadal Mass Methodology (Mike Tonseth)

Mike Tonseth said that a memorandum clarifying standardized methods for Hatchery M&E Plan Objective 8.3, Fecundity at Size (Attachment C), was distributed to the Hatchery Committees by Kristi Geris on February 24, 2014. Tonseth recalled that when this topic was first discussed during the Hatchery Committees meeting on January 15, 2014, the Hatchery Committees came to conclusions regarding how to calculate and measure fecundity at size, and wanted to formalize these conclusions in a document to be added to the Hatchery M&E Plan. He noted, however, that additional discussion is still needed regarding sample sizes.

Tonseth said that one comment was received regarding Table 1 of Attachment C, suggesting avoiding conducting 100% sampling on some of the programs. He asked what would be realistic sample sizes, for example, for the Wells and Chelan Falls summer Chinook programs. Greg Mackey asked if age at the time of sampling is known, and Tonseth said age can be estimated based on size. Mackey suggested sampling by size class, and added that 30 is a typical sample size for a population, and over the years, this would build a large dataset. He suggested that sampling 30 fish per size class in the large programs would provide a reasonable sample size. Tonseth also suggested that as these data are collected, it may be determined that sample sizes need to be increased or modified. He said that this M&E objective is meant to compare HORs and NORs for conservation and safety net components, but some programs are not so straightforward. He said that some programs are NOR-driven, so the hatchery component is not available for comparison. He said that program composition may also influence sample size. Tonseth suggested holding another discussion about sample size for each program, and noted that data are available to base decisions on.

Tonseth said that WDFW is not requesting a decision on this document at this time; however, he requested that Hatchery Committees representatives submit comments to him on the sample size section in this memorandum. The methodology will be approved by the Hatchery Committees at a later date once comments are submitted. He said that coded-wire-tag data can be incorporated into the memorandum once they are received, and then he recommended, at some point, appending this memorandum to the Hatchery M&E Plan. He noted that all programs are currently being measured as outlined in this memorandum, and that Chris Moran, Charlie Snow, and Steve Richards also provided guidance on this standardized approach.

C. 2014 Wenatchee Juvenile Steelhead Release Proposal (Mike Tonseth)

Mike Tonseth said that the 2014 Wenatchee Basin Steelhead Release Proposal (Attachment D) was distributed to the Hatchery Committees by Kristi Geris on March 17, 2014. Tonseth recalled that last year, an evaluation of forced versus volitional releases from the Chiwawa Ponds indicated that there was no significant difference in the performance of the fish released from either group. He said that this year, WDFW is proposing only volitional releases for two reasons: 1) volitional release seems to follow a more natural behavior pattern (opposed to pushing the fish out all at once); and 2) volitional release contributes to management of potential residualism. Tonseth noted that although residualism has not been definitely identified as a problem, a condition in the current permit requires management of residualism.

Tonseth said that, as described in Attachment D, volitional releases will be conducted through the second week in May 2014 (beginning after the end of the spring Chinook release), and volitionally migrating fish will be truck-planted in multiple locations in Nason Creek, the Chiwawa River, and the upper Wenatchee River. Tonseth said that he plans to add a table to Attachment D that summarizes release numbers, origins, number of PIT-tags, etc., and redistribute a revised draft to the Hatchery Committees. He requested that Hatchery Committees representatives provide comments to him no later than Friday, March 28, 2014. No comments received will be considered an approval. Tonseth said that following the end of the volitional period, fish remaining at the Chiwawa Ponds will be transferred to Blackbird Pond where fish will be allowed additional acclimation and migration opportunities. He said that termination of the volitional release will be based upon PIT-tag detections from the pond (typically around mid-late June); at which time, stop logs will be installed at the pond outlet, and any remaining fish will be available for juvenile fishing opportunities in Blackbird Pond as part of Trout Unlimited's activities. Tonseth noted that this is consistent with previous years, only the migration period will be extended.

Keely Murdoch asked approximately how many fish will be taken to Blackbird Pond. Tonseth said that last year, after the forced and volitional releases, about 33,000 were taken to the Lower Wenatchee River below Blackbird Pond (out of 243,000 total). He added that in previous years, as many as 50,000 were acclimated in Blackbird Pond. Alene Underwood said that fish were hauled to Blackbird in the past to offer them additional spring acclimation time and migration opportunities. Tonseth noted that several of the non-migrants that were transferred to Blackbird last year following volitional releases at Chiwawa were detected at McNary Dam.

Mike Schiewe recalled that last year, the data suggested that as fish migrated later in the year, predation increased. Underwood noted that those data were based on smaller release groups (smaller groups of fish).

Lynn Hatcher asked about how the number of fish leaving Blackbird Pond will be estimated. Tonseth said that a proportion of the fish are PIT-tagged and a PIT-tag array is located at the exit of the pond.

V. NMFS

A. HGMP Update (Lynn Hatcher)

Lynn Hatcher said that the ongoing Coordination Meetings with NMFS and USFWS have been helpful, and Mike Tonseth added that the meetings are a good venue for clarification. Hatcher said the next meeting is scheduled for May 2014, when the BiOp template that Amilee Wilson has been developing will be discussed. He noted that the Mid-Columbia Coho BiOp has made it through quality check, and will be distributed soon.

VI. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees' meetings are on April 16, 2013 (Chelan PUD); May 21, 2014 (Douglas PUD); and June 18, 2014 (Chelan PUD).

List of Attachments

Attachment A	List of Attendees
Attachment B	Revised 2014 Rocky Reach Trap Pilot Proposal
Attachment C	Memorandum Clarifying Standardized Methods for Hatchery M&E Plan Objective 8.3 Fecundity at Size
Attachment D	2014 Wenatchee Basin Steelhead Release Proposal

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Alene Underwood*	Chelan PUD
Catherine Willard	Chelan PUD
Greg Mackey*	Douglas PUD
Tom Kahler*	Douglas PUD
Lynn Hatcher*	National Marine Fisheries Service
Keely Murdoch*	Yakama Nation
Mike Tonseth*	Washington Department of Fish and Wildlife
Jayson Wahls	Washington Department of Fish and Wildlife

Notes:

* Denotes Hatchery Committees member or alternate

DRAFT Proposal to Trap Spring-Run Chinook Salmon at Rocky Reach Trap and Tributary Based Broodstock Collection, 2014

Purpose: To collect Methow spring-run Chinook salmon broodstock (n=38) in 2014 to meet Chelan PUD's production obligation of 60,516 smolts.

Chelan PUD is proposing a two-step approach to collect Methow spring-run Chinook salmon in 2014. The first step consists of testing newly installed sorting technology the Rocky Reach trap (RRT) to determine if appropriate broodstock could be collected to meet program needs. The second step will consist of a tributary based approach utilizing tangle nets to collect broodstock in the Chewuch River. The following is a description of the two proposed methods.

<u>Rocky Reach Trap</u>

The RRT was used historically to capture listed steelhead and bull trout (in 2002 and 2005-2007, respectively), as part of studies required for implementation of the Rocky Reach License. Based on these previous efforts with steelhead and bull trout, it was determined that select individual fish can be effectively removed at the RRT, without delaying unmarked fish or non-target species. Additionally, based on a 2013 pilot study, externally marked spring Chinook were successfully removed at the RRT, on an individual basis without delaying non-targeted spring Chinook.

In response to results and observations made from conducting the 2013 spring Chinook pilot study, several trap modifications were identified and have been made in early 2014 in an effort to improve operation of the trap and increase the success of each trapping event:

- Replace the solid trap door with a rectangular 1" diameter vertical bar screen with 1" gaps to reduce the changes in water velocity observed by a solid door, which appeared to deter fish moving into the trap;
- Install underwater lighting and an underwater camera that can capture the view of the trap entrance to enable better viewing of the fish as they move into the trap;
- Install an electrical control pendant for the technician located above the trapping area to allow additional control of the trap door;
- Paint the floor in the viewing window white to create contrast.
- Installation of separation-by-code technology.

2014 will represent a second pilot year to evaluate all of the trap modifications/improvements and to test the efficacy of using separation-by-code technology to target PIT tagged natural origin (NOR) adults for broodstock (and hatchery origin [HOR] adults to the extent needed, to meet the production target).

Separation-by-Code Technology

The RRT trap is operated by use of a manually operated pneumatic gate that directs individual fish to a collection area and a trapping vessel. The trap design mimics a basket; it is lowered into the fish ladder and can remove one fish at a time. To identify broodstock for collection, the fish ladder directly in front of the counting room will be outfitted with a PIT tag detection array. This will provide a total of three PIT tag detection arrays located downstream of the trap in the fish ladder (baffle four, baffle six, and the entrance into the counting room/trap location). The separation-by-code software will rely on a pre-loaded library of PIT tag codes (Tables 1 and 2), that when detected by one of the three PIT tag arrays, will send a visual and auditory signal to the trap operator indicating a target fish has been detected. As an identified target fish moves through the baffles of the ladder and subsequent PIT tag arrays (a total distance of roughly 125 feet), three sequential notifications will occur indicating the fish is approaching the trap chamber (Figure 1). A different colored light will be associated with each PIT tag array. Once the last notification occurs, the operator in the counting room will be able to visually observe the target fish, manually open the trap door, and trap the fish. The operator located above the trap will raise the trap and confirm the intended fish was trapped by use of a hand held PIT tag detector loaded with the same library of PIT tag codes.

Upon confirmation that the trapped fish is the intended target fish, the fish will be transferred to a holding tank supplied with recirculating water, directly adjacent to the trap. Eastbank Hatchery staff will be notified that a target fish has been captured and they will transport the fish to the Eastbank hatchery, directly adjacent to Rocky Reach Dam, via truck mounted holding tank supplied with Eastbank Aquifer water and oxygen.

Trapping will occur up to five days per week (Monday through Friday), and up to eight hours per day (from 7:00 a.m. to 3:00 p.m.), with unrestricted passage during non-trapping periods; based on PIT tag detection between 2006 and 2013, 70% of the PIT-tagged adults move through the Rocky Reach fishway between 7:00 a.m. and 3:00 p.m. Unless the trap operator is attempting to actively trap a target fish, the ladder will be open to passage. Trapping will begin in late April and will continue through about the third week in June (based on the average distribution of the most recent 10 years of data [DART] the first 5 percent of the spring Chinook run passes Rocky Reach by April 18, and the 95 percent passage date is June 17; therefore, 90 percent of the run passes during an approximately 60-day period).

The following PIT-tag codes will be targeted at the RRT in 2014:
- Chewuch River smolt trap and mark/recapture evaluations (natural spring Chinook)
- Mark/recapture evaluations above the mouth of the Twisp River (natural spring Chinook)
- Methow River smolt trap (natural spring Chinook)
- Methow Hatchery MetComp smolts (brood year 2009 and 2010)

Genetic sampling/assessment will be utilized to differentiate Twisp River and non-Twisp River natural-origin spring Chinook adults that were PIT tagged as juveniles at the Methow smolt trap, once transported to Eastbank Hatchery from the RRT. Any adults that are determined to be of Twisp origin could be provided to Douglas PUD for their Twisp spring Chinook conservation program in exchange for a MetComp NOR trapped at Wells Dam (contingent upon agreement with Douglas PUD). All NORs trapped at the RRT and subsequently held at Eastbank Hatchery for genetic sampling will be retained for broodstock. Additionally, up to 45 HOR adults (no age-3 returns would be retained) from the Methow Hatchery MetComp smolt releases will be trapped at the RRT and held at Eastbank Hatchery as contingency broodstock in the event the total number of NORs needed for CPUDs Methow Subbasin conservation program are not available. If it is determined that these HOR adults are not needed to meet Chelan PUD's Methow spring Chinook obligation, the following options are available (the JFP will be responsible for determining the priority and ultimate disposition of these fish): 1) they will be offered to Grant and/or Douglas PUDs if a shortfall exists in their program; 2) they will be offered to the USFWS Winthrop NFH for utilization in their safety net program; and 3) they will be released above Wells Dam or in the Methow River to offset any delays caused by retaining these fish (Figure 2).

Chiwawa Spring Chinook Stray Management

In an effort to control potential strays from the Chiwawa spring Chinook hatchery program, PIT tag codes from hatchery releases will also be included in the separation-by-code library. If encountered in the Rocky Reach arrays, these fish will be trapped and the disposition of them determined by the JFP.

Tributary Based Broodstock Collection

If insufficient broodstock are retained from the RRT, measures to collect natural-origin broodstock utilizing tangle netting in the Chewuch will be attempted (provided authorizations and approvals are received). Known or suspected spring Chinook spawning locations will be targeted for tangle netting.

Tangle Netting Methodology

Limitations and details of the tangle netting methodology will be determined by the HCP-HC prior to implementation. Primary wild spring Chinook spawning areas will be identified using historical NOR spawning data. Only those areas (pools) of the river immediately above and below the spawning areas will be targeted for netting versus a randomized approach. Personnel that have experience capturing salmon using tangle nets will conduct the tangle netting. Any spring Chinook captured will be assessed for CWT. Any Chinook that are captured and not retained will be released in the vicinity of where it was captured. Fish tubes filled with water will be utilized to provide transfer from the river to the holding truck. Fish transportation equipment will ensure safe transportation of collected broodstock and will include equipment that is mechanically reliable and that can be disinfected, equipment to monitor dissolved oxygen levels, and salt will be made available if it is needed as a stress reduction measure.

Based on redd survey data the majority of bull trout spawning occurs in the upper Chewuch River above River Mile (RM) 34 and in Lake Creek (RM 4 and RM 7) and limited spawning occurs in Eightmile Creek around RM 1.6. Water temperatures in the Chewuch River below RM 34 exceed the upper range of bull trout spawning temperatures; bull trout utilize the Chewuch River below RM 34 for foraging and overwintering (USFS personal communication 2014). Radio-telemetry data documented bull trout entering spawning areas in the Chewuch subwatershed in early to mid-July (USFWS 2007). This data indicates that the majority of bull trout will likely have moved through areas that will be targeted for tangle netting for Chinook salmon, and increases the likelihood of being able to avoid the capture of bull trout. To further limit capturing bull trout, targeted pools will be snorkeled to determine what, if any level of bull trout presence exists; if bull trout are not observed or if they are located in an area that can be avoided by the netting while targeting Chinook then the crews will proceed. Personnel will be employed for this activity that have experience tangle netting for salmon, while avoiding bull trout in the process. Nets will be deployed in configurations that will minimize the likelihood of capturing bull trout if bull trout are associated with aggregations of spring Chinook. Nets will be monitored continuously for bull trout. Any bull trout that is incidentally caught will be immediately removed from the net and released to the nearest upstream pool that is not targeted for netting. If more bull trout are encountered than is reasonable and prudent (or anticipated to be in excess of permit/authorization limitations), all netting activities will cease.

Table 1. Source of PIT tagged juveniles for Methow spring Chinook broodstock collection in 2014.

Source of PIT Tagged Juveniles	Brood Year		
	2009	**2010**	**2011**
Chewuch River smolt trap (NOR spring Chinook)	1,375	992	1,595
Chewuch River mark/recapture evaluations (NOR spring Chinook)	12	516	774
Methow River Mark/recapture evaluations above the confluence with the Twisp River (NOR spring Chinook)	38	399	880
Methow River smolt trap (natural spring Chinook)[a]	502	657	937
Total	1,927	2,564	4,186
Range of expected tagged adults migrating past Rocky Reach based on historic SAR's of tagged wild spring Chinook returned to Wells (SAR = .0015-.0122)	**3-25**	**4-31**	**5-50**
Methow Hatchery MetComp smolts[b]	15,998	18,570	
Range of expected tagged adults migrating past Rocky Reach based on historic SAR's of tagged hatchery spring Chinook returned to Wells (SAR = .0008-.0025)	**13-40**	**15-46**	

[a]Genetic sampling/assessment will be utilized to differentiate Twisp River and non-Twisp River natural-origin spring Chinook adults trapped at the RRT which were PIT tagged as juveniles at the Methow smolt trap; any adults that are determined to be of Twisp origin could be provided to Douglas PUD for their Twisp spring Chinook conservation program in exchange for a MetComp NOR trapped at Wells Dam (contingent upon agreement with Douglas PUD). All NORs trapped at the RRT and subsequently held at Eastbank Hatchery for genetic sampling will be retained for broodstock.

[b]Up to 45 HOR adults (age-3 returns would not be retained) from the Methow Hatchery MetComp smolt releases will be trapped at the RRT and held at Eastbank Hatchery as contingency broodstock in the event the total number of NORs needed for CPUDs Methow Subbasin conservation program are not available. If it is determined that these HOR adults are not needed to meet Chelan PUD's Methow spring Chinook obligation, the following options (in order of priority) are available: 1) they will be offered to Grant and/or Douglas PUDs if a shortfall exists in their program; 2) they will be offered to the USFWS Winthrop NFH for utilization in their safety net program; and 3) they will be released above Wells or in the Methow River to offset any delays caused by retaining these fish.

Table 2. Age class-at-return projection for PIT-tagged Methow Subbasin natural origin (NOR) and hatchery origin (HOR) spring Chinook to Rocky Reach, 2014.

Age-at-Return										
			Natural Origin				**Hatchery Origin**			
	NOR	HOR	**Age-3**	**Age-4**	**Age-5**	**Total**	**Age-3**	**Age-4**	**Age-5**	**Total**
2009	3-25	13-40	*0-1*	*10-19*	**1-6**	*11-25*	*0-1*	*10-30*	**3-9**	*13-40*
2010	4-31	15-46	*0-1*	**3-23**	*1-23*	*4-47*	*0-1*	**10-34**	*10-34*	*21-69*
2011	5-50	NA	**0-1**	*0-37*	*4-11*	*4-49*	NA	NA	NA	NA
2014 Estimated PIT-Tagged Adult Returns			**0-1**	**3-23**	**1-6**	**4-30**	**NA**	**10-34**	**3-9**	**13-43**

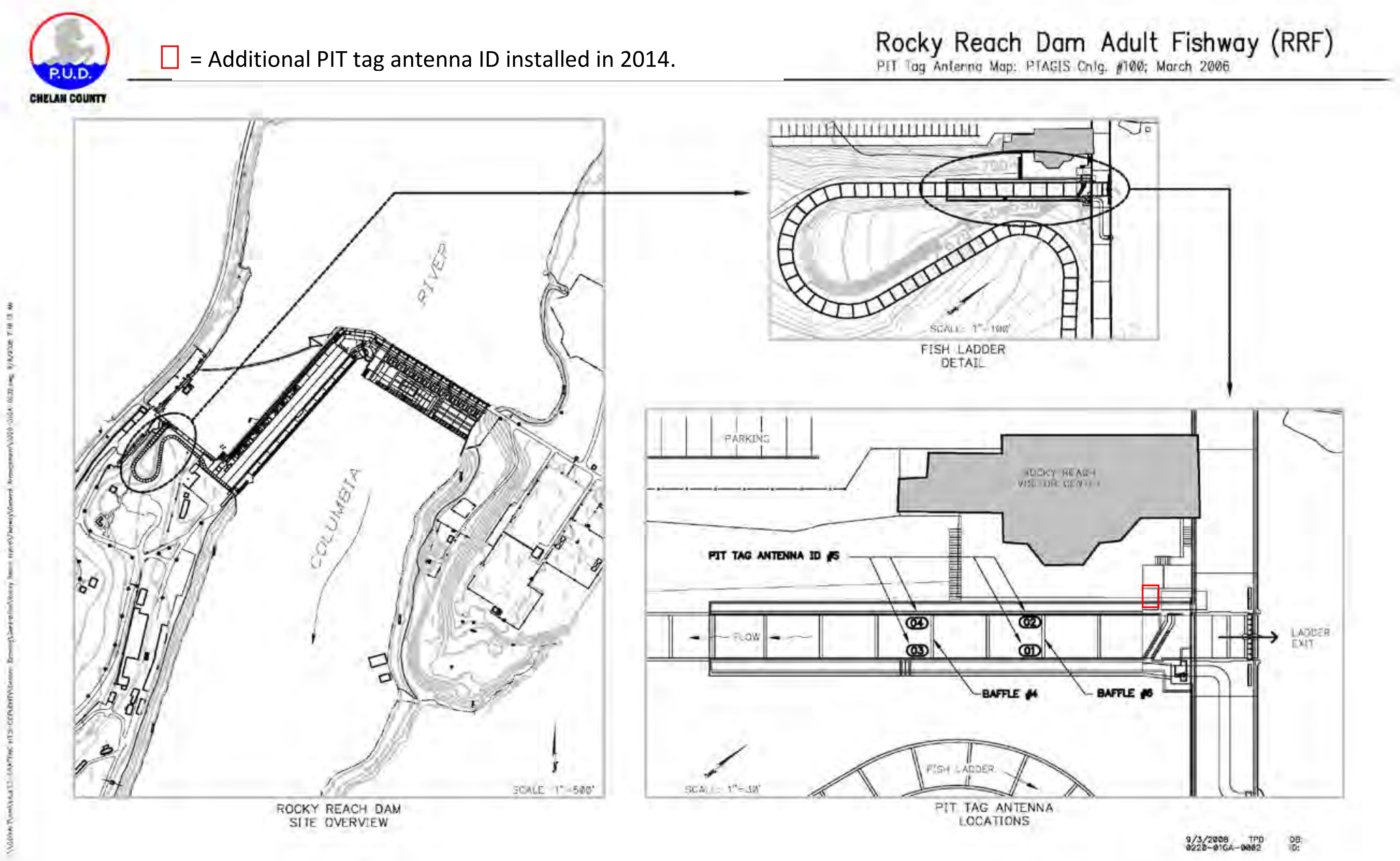


Figure 1. Rocky Reach adult fishway.

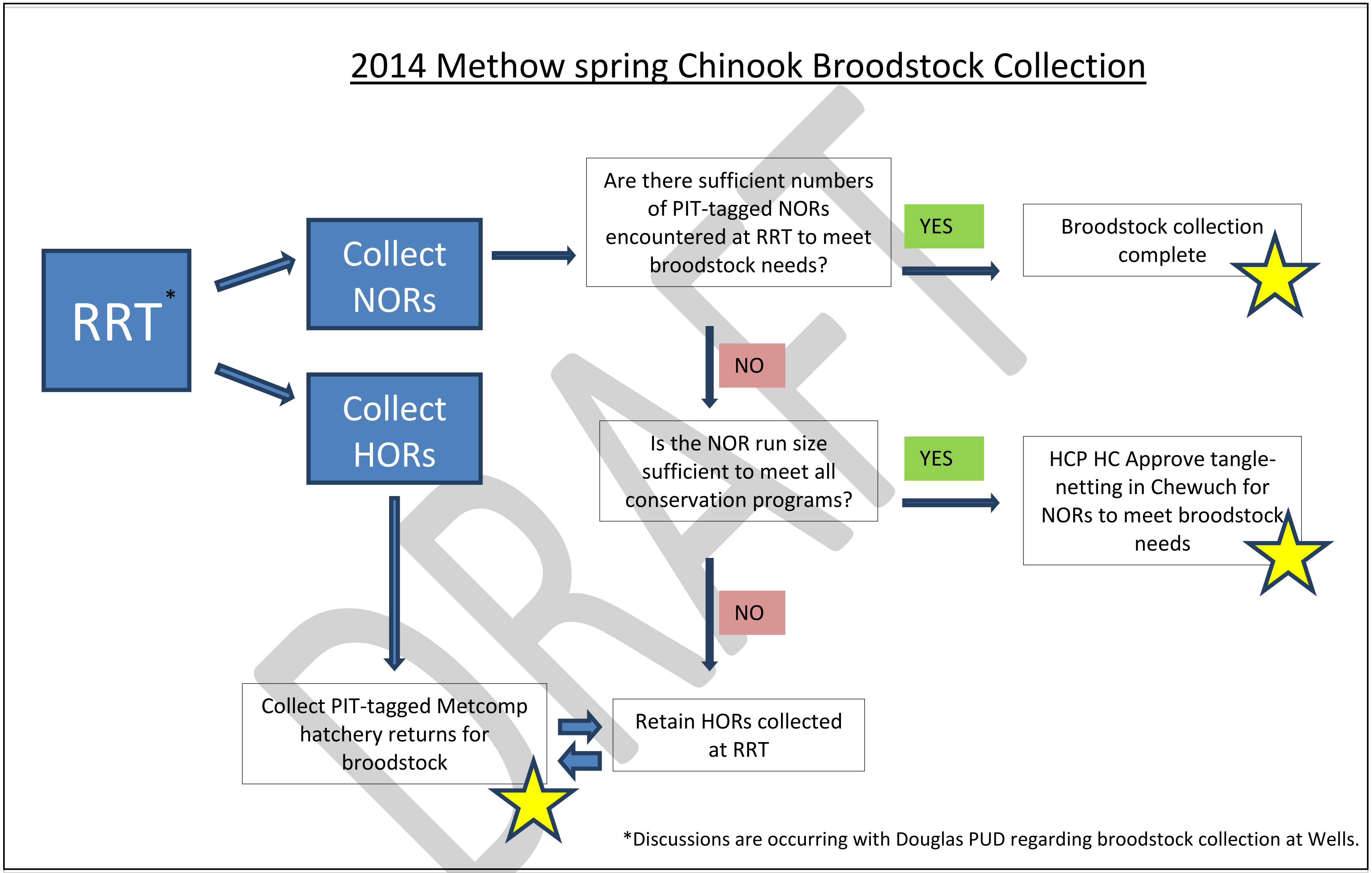


Figure 2. Methow spring Chinook 2014 broodstock collection decision diagram.

STATE OF WASHINGTON
DEPARTMENT OF FISH AND WILDLIFE
FISH PROGRAM – SCIENCE DIVISION
SUPPLEMENTATION RESEARCH TEAM

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February 24, 2014

To: HCP Hatchery Committees and HSC Hatchery Sub Committee

From: WDFW

Subject: Clarification of standardized methods for Objective 8.3 Fecundity at Size.

The intent if this memo is to clarify the methodology used for hatchery programs required to monitor Objective 8 in the Monitoring and Evaluation Plan for PUD Hatchery Programs 2013 Update (Hillman et al. 2013). Specifically, Objective 8.3, Fecundity at Size, contains the following two monitoring questions:

> **Q8.3.1**: Is the fecundity vs. size relationship of hatchery and naturally produced fish similar?
> **Q8.3.2**: Is the gonadal mass vs. size relationship of hatchery and naturally produced fish similar?

From these questions, two Measured Variables are required:

- Length, weight, and age (covariate) of hatchery and natural-origin broodstock after eggs have been removed.
- Number and weight of eggs.

These questions and variables were not part of the original M&E plan framework (Peven et al. 2005), nor are specific methods stated within the 2013 Update. Due to the lack of standardized methodologies for collecting gonadal mass, and the new need to collect this data for all hatchery programs, preliminary discussions have been aimed at determining a standardized method that maintains fish health and efficiently provides accurate and comparable data. The agreed upon methods will be incorporated into the current 5-year M&E plan appendices.

At the January 15, 2014 HCP committee meeting, parties agreed that gonadal weight was to be measured at the green egg stage. Given this, fish health concerns arise whenever green eggs are handled due to their delicate nature at this stage. Two sampling approaches are currently being used in mid and upper Columbia hatcheries for weighing green eggs. At the Cle Elum Supplementation Research Facility (CESRF), ovarian fluid is drained off and the entire mass of green eggs is measured for Yakima River spring Chinook.   In the Wenatchee Basin, green egg weights have been collected for the past ten years as part of the Chiwawa spring Chinook relative reproductive success study (RRS). For the RRS study, a subsample of ~100 eggs is collected and weighed and the resulting average weight per egg is extrapolated over the total fecundity of each fish.

Given the various approaches available, committee members were agreeable that the RRS methods meet the desire to minimize impacts to green eggs while at the same time providing the data set needed. Below is a brief description of the methods based on the assumption that each female's eggs are held separately.

Methods:

Sample females after fish have been bled and eggs have been stripped.

1) Weigh each carcass.
2) Before eggs are fertilized, weigh a subsample of green eggs in a sampling container to the nearest 0.01 g.
    a. Sampling should be done indoors away from sunlight.
    b. Tare the weight of the sampling container.
    c. Subsample should be a minimum of 100 eggs (ovarian fluid drained).
        i. Use a slotted spoon or other device to separate fluids in subsample.
    d. After weighing subsample, count eggs back into egg bag to calculate average egg weight.
    e. Sanitize and dry equipment (i.e., spoons, egg pickers, etc.) before sampling and between females.
3) After fecundity is determined (at eye up) calculate total gonadal mass for each female by multiplying average egg weight by total fecundity.

Expectations are that for nearly all hatchery programs, and in particular integrated hatchery programs (Priest Rapids fall Chinook being the notable exception, 100% of the females spawned will be sampled (unless a female is deemed non-viable prior to fertilization or is considered a partial spawn). For the Wells segregated harvest program and the Priest Rapids integrated fall Chinook program (due to its size), we recommend subsampling a representative group of spawned females and request further clarification by the HCP HC/HSC of acceptable sampling rates that would be suitable for meeting the monitoring needs of Objective 8.3. A sub-sample rate is proposed for discussion (Table 1). Additional consideration and agreement by HSC members will be needed in order to address facility and or logistical constraints at Priest Rapids Hatchery given their current infrastructure, program size, spawning methods, and marking regime.

It should be noted that while the methods are straightforward and relatively simple to achieve, additional time and effort will be needed and will potentially delay fertilization of gametes on spawn days which could affect hatchery staff time.

Table 1. Sampling rate of spawned females to meet Objective 8.3 of the monitoring and evaluation plans for upper Columbia River hatchery programs.

Program	Program Type	Sample Rate (*N*)[1]
Methow Spring Chinook[2]	Integrated Recovery	100% (*N*=56)
Methow Summer Chinook	Integrated Supplementation/Harvest	100% (N=51)
Twisp Summer Steelhead	Integrated Recovery	100% N=12)
Wells Summer Steelhead	Segregated Harvest	100% (N=107)
Wells Summer Chinook	Segregated Harvest	Sub-sample[3]
Chelan Falls Summer Chinook	Segregated Harvest	100% (N=159)[4]
Wenatchee Summer Chinook	Integrated Supplementation/Harvest	100% (N=128)
Wenatchee Summer Steelhead	Integrated Recovery	100% (N=65)
Chiwawa Spring Chinook	Integrated Recovery	100% (N=37)
Nason Creek Spring Chinook	Integrated Recovery	100% (N=65)
Priest Rapids Fall Chinook	Integrated Harvest	Sub-sample [5]

[1] Females only.
[2] Includes conservation components for all three PUD production obligations.
[3] The total number of females collected to product the Wells yearling and sub-yearling programs is about 272 fish. The proposed sampling rate/number is an equivalent number of HO as the number of NO fish collected for broodstock through the Wells volunteer channel.
[4] Will provide the hatchery origin comparison for the Wenatchee and Methow summer Chinook programs.
[5] The total number of females estimated to meet the adult demands of program collecting broodstock at PRH and associated facilities is about 3,524 fish. An evaluation of the minimum number of NO fish to be sampled will be the primary driver for the total number of females evaluated.

References

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Murdoch, A., and C. Peven, 2005. Conceptual Approach to Monitoring and Evaluating the Chelan Count Public Utility District Hatchery Programs Final Report. Chelan PUD Habitat Conservation Plan Hatchery Committee.

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March 17, 2014

To: HCP Hatchery Committee

From: Chris Moran, Mike Tonseth, WDFW

Subject: 2014 Wenatchee Basin Steelhead Release Proposal

In early 2013 the HCP-HC approved an evaluation of post-release performance of summer steelhead comparing forced and volitional releases to determine which strategy could maximize survival and to screen for non-migratory juveniles. The evaluation was in response to program changes (e.g. overwinter acclimation and reduced production levels) and lower survival of 2012 releases which were comprised entirely of progeny from WxW parentage.

Preliminary results of the 2013 release evaluations suggest there is little difference in survival performance between forced and volitionally released fish. Mean survival estimates, generated using PIT tag detections to McNary Dam and based on the Cormack-Jolly-Seber (CJS) model (http://www.cbr.washington.edu/dart/query/pit_sum_tagfiles), were 57.5% and 58.9% for volitional and forced releases, respectively (Table 1). However, there was more variability in the survival of volitionally released fish (36.3%-67.8%) than for the forced group(40.0%-58.9%). In addition, since 2009, Blackbird Pond has been used to short term acclimate a portion (up to 50K) of the steelhead smolts annually, to aid in improving homing fidelity of adults back to the Wenatchee River in the absence of overwinter acclimation availability (which first became available for the full program in 2011). In the five years Blackbird Pond has been used to acclimate fish beginning in March, detections of fish leaving the pond during high flows have been less than ideal for determining what proportion (number) had emigrated from the pond. This potentially biases estimates of smolt-to-adult survival which could potentially affect the NNI mitigation component in the future.

Overwinter acclimation has been available for the full Wenatchee steelhead program since 2011 including conducting volitional and forced releases. For volitional releases, fish remaining in the ponds at the end of the volitional period, were trucked planted into the Wenatchee River adjacent to the town of Leavenworth (immediately downstream and right of Blackbird Pond). This was to minimize the potential for non-migrant (residual) interactions with juvenile wild ESA listed spring Chinook and steelhead.

Based upon the release results from 2013, for 2014, WDFW proposes to conduct volitional releases from rearing structures at Chiwawa Ponds (raceway and circulars) consistent with volitional releases in 2013 and truck plant to various locations in Nason Creek, the Chiwawa River, and the upper Wenatchee River throughout the volitional period. At the end of the volitional period at Chiwawa Ponds, the remaining "non-migrants" will be transferred to Blackbird Pond for continued acclimation and volitional release opportunity through approximately mid-late June, after which stop logs will be installed, effectively halting emigration. This methodology allows the District and WDFW to manage for potential residualism consistent with the terms and conditions of Section 10 (a)(1)(A) permit 1395.

Specific details for 2014 are as follows:

- Volitional releases at Chiwawa Ponds (both circulars and raceway) will begin approximately April 16 following the end of the spring Chinook release.

- All volitionally migrating fish (a combination of HxH and WxW) will be truck planted in multiple locations in Nason Creek, the Chiwawa River, and the upper Wenatchee River.

- Fish remaining at Chiwawa Ponds (estimated at about 30K based upon 2013 data), following the end of the volitional period, will be transferred to Blackbird Pond where fish will be allowed additional acclimation and migration opportunities through mid-late June. Actual termination of the volitional release will be based upon PIT detections from the pond.

- Beginning July 1, fish that did not migrate are assumed to be residuals, or likely to residualize; stop logs will be installed at the pond outlet, and any remaining fish will be available for juvenile fishing opportunities in Blackbird Pond as part of Trout Unlimited's activities.

Table 1: 2013 Wenatchee steelhead release dates, apparent survival to McNary Dam, and release number.

Release Location	Release Type	Volitional Start Date	Release Date	Survival to McNary	SE	Release number
U. Wenatchee R.	F	--	24-Apr, 1- May	0.5887	0.1370	39,280
U. Wenatchee R.	V	24-Apr	29-Apr, 1-May	0.5748	0.1393	37,467
Nason Cr.	F[1]		29-April, 13-May	0.4002	0.0745	59,649
Nason Cr.	V	24-Apr	26, 29-April, 6-May	0.3627	0.0482	11,617
Chiwawa R.[2]	V	5/1	1, 6, & 14-May	0.6777	0.3408	47,263
Nason Cr.	NM[3]	22-Apr	6-May	0.1803	0.0894	762
L. Wenatchee R.	NM	24-Apr	15-May	0.1304	0.0768	27,442
All Volitional Releases (pooled)		--	--	0.4037	0.0364	96,347
All Forced Releases (pooled)		--	--	0.4514	0.0645	98,929

[1]Survival estimates for this group were from two releases from Circular 3 and Pond 3 released on April 29th and May 13th respectively.

[2]Survival estimated for this release group were released from Pond 1 and represents 3 release groups. The first two groups were released at the Chiwawa River bridge on May 1st, and 6th; the last group was released at Meadow Creek on May 14th.

[3]NM= Non-Migrant group (i.e. fish remaining after volitional releases have ceased).

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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	June 18, 2014
From:	Mike Schiewe, Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the April 16, 2014 HCP Hatchery Committees Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees' meeting was held at Chelan PUD headquarters in Wenatchee, Washington, on Wednesday, April 16, 2014, from 9:30 am to 1:00 pm. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- Alene Underwood will review the status of pending water recirculation pilot studies at Eastbank Fish Hatchery and Chiwawa Fish Acclimation Facility, and will report back to the Hatchery Committees at the May 21, 2014 meeting (Item I).
- Chelan PUD will provide video from the Rocky Reach Trap 2013 Pilot Study to Kristi Geris to post on the HCP Hatchery Committees Extranet Site (Item I).
- The Yakama Nation (YN) will coordinate with Chelan PUD to develop a list of questions for Karl Halupka (U.S. Fish and Wildlife Service [USFWS]) regarding how the USFWS assigns incidental take, for discussion at the next National Marine Fisheries Service (NMFS)/USFWS Biological Opinion Coordination Meeting tentatively scheduled for early May 2014 (Item I).
- Hatchery Committees representatives will submit comments on the sample size section in the memo clarifying standardized methods for Hatchery Monitoring and Evaluation (M&E) Plan Objective 8.3 Fecundity at Size to Mike Tonseth (Item I).
- The Washington Department of Fish and Wildlife (WDFW) will add a revised summary table to the draft 2014 Wenatchee Basin Steelhead Release Proposal, and will redistribute the final revised draft to the Hatchery Committees (Item I).
- WDFW will incorporate outstanding edits and comments into the draft 2014 Broodstock Protocols, including USFWS's edits, sideboard language for tangle-netting

in the Chewuch to obtain Chelan PUD Methow spring Chinook broodstock, and other edits discussed during today's Hatchery Committee meeting; and he will redistribute the revised draft to Kristi Geris for distribution to the Hatchery Committees (Item III-A).

DECISION SUMMARY

- The Hatchery Committees representatives approved via email the revised draft Rocky Reach Trap/Methow Spring Chinook Broodstock Collection Proposal for implementation in 2014, as follows: NMFS approved on April 4, 2014; WDFW approved on April 7, 2014; the Colville Confederated Tribes (CCT) and the YN approved on April 8, 2014; and USFWS approved on April 11, 2014.
- The Hatchery Committees representatives approved the Wells Modernization February 19, 2014 Workshop minutes via email on Friday, April 4, 2014 (Item I).

AGREEMENTS

- There were no agreements discussed during today's meeting.

REVIEW ITEMS

- Kristi Geris distributed a memo to the Hatchery Committees on February 24, 2014, that clarified standardized methods for Hatchery M&E Plan Objective 8.3 Fecundity at Size. Comments on this memo, with regards to sample size, are due to Mike Tonseth (Item I).
- Kristi Geris sent an email to the Hatchery Committees on April 16, 2014, notifying them that the draft Non-Target Taxa of Concern (NTTOC) Modeling Report is out for a 60-day review period, with comments due to Greg Mackey no later than Monday, June 16, 2013 (Item II-A).
- Kristi Geris sent an email to the Hatchery Committees on April 17, 2014, notifying them that the draft 2013 Hatchery M&E Report is out for review with comments due to Tracy Hillman no later than Friday, May 16, 2013.

FINALIZED DOCUMENTS

- The Final 2013 Rocky Reach and Rock Island HCP Annual Reports were distributed to the Hatchery Committees by Kristi Geris on April 8, 2014.

I. Welcome, Agenda Review, Meeting Minutes, and Action Items

Mike Schiewe welcomed the Hatchery Committees and asked for any additions or other changes to the agenda. The following revisions were requested:

- Greg Mackey added an update on Methow Hatchery spring Chinook early maturation sampling.
- Bill Gale added a brief update on Winthrop National Fish Hatchery (NFH) steelhead broodstock and research to Douglas PUD's Wells Hatchery steelhead broodstock update.
- Catherine Willard added a brief update on Rock Island Dam fish ladder modifications.

Following a review period that was extended to allow more time for the Hatchery Committees to review the revised draft February 19, 2014 Wells Modernization Workshop minutes, the Hatchery Committees representatives approved the revised minutes via email on Friday, April 4, 2014.

The Hatchery Committees reviewed the revised draft March 19, 2014 meeting minutes. Two revisions were discussed as follows:

- Regarding Chelan PUD's Wanapum update, Mike Tonseth clarified that if fish passage at Wanapum Dam is not available when the runs start, this could require trap and transport by truck of up to 27,000 salmon per day (not specific to sockeye salmon as previously reported).
- Regarding WDFW's 2014 Wenatchee Juvenile Steelhead Release Proposal, Tonseth clarified that several of the non-migrants that were transferred to Blackbird last year after the volitional release period at Chiwawa were detected at McNary Dam.

Kristi Geris said that all other comments and revisions received from members of the Committees were incorporated in the revised minutes. The Hatchery Committees members present approved the draft March 19, 2014 meeting minutes, as revised. Geris will finalize the meeting minutes and distribute them to the Committees.

Action items from the last Hatchery Committees meeting on March 19, 2014, and follow-up discussions were as follows: *(Note: italicized item numbers below correspond to agenda items from the March 19, 2014 meeting.)*

- *Hatchery Committees representatives will submit comments and/or their approval of the revised draft February 19, 2014, Wells Modernization Workshop minutes to Kristi Geris no later than Friday, April 4, 2014. No comments received will be considered an approval (Item I).*
  Geris indicated that no additional comments were received on the draft minutes, and the final minutes were distributed to the Hatchery Committees on April 4, 2014.
- *Alene Underwood will review the status of pending water recirculation pilot studies at Eastbank Fish Hatchery and Chiwawa Fish Acclimation Facility, and will report back to the Hatchery Committees at the April 16, 2014 meeting (Item I).*
  Catherine Willard requested that this action item be carried forward.
- *Chelan PUD will provide video from the Rocky Reach Trap 2013 Pilot Study to Kristi Geris to post on the HCP Hatchery Committees Extranet Site (Item I).*
  Catherine Willard requested that this action item be carried forward.
- *The Hatchery Evaluation Technical Team (HETT) will provide the draft NTTOC Report for a 60-day review to Kristi Geris for distribution to the Hatchery Committee prior to the April 16, 2014, meeting (Item I).*
  Geris sent an email to the Hatchery Committees on April 16, 2014, notifying them that the draft NTTOC Modeling Report is out for a 60-day review period, with comments due to Greg Mackey no later than Monday, June 16, 2013.
- *Chelan PUD will develop for review a list of questions for Karl Halupka (USFWS) regarding how incidental take is assigned (Item I).*
  The YN will coordinate with Chelan PUD to develop a list of questions for Halupka regarding how the USFWS assigns incidental take, for discussion at the next NMFS/USFWS Biological Opinion Coordination Meeting tentatively scheduled for early May 2014.

- *Hatchery Committees representatives will submit an email vote on the revised draft Rocky Reach Trap/Methow Spring Chinook Broodstock Collection Proposal to Chelan PUD (with a copy to Kristi Geris) no later than Friday, April 4, 2014 (Item III-A).*

  All votes were received by April 11, 2014, and the Rocky Reach Trap/Methow Spring Chinook Broodstock Collection Proposal was approved by the Hatchery Committees.
- *WDFW will distribute the draft 2014 Broodstock Protocols to the Hatchery Committees for review on March 25, 2014. Initial comments on the draft protocols will be due to WDFW on April 10, 2014, and discussions on the revised draft protocols will continue during the Hatchery Committees meeting on April 16, 2014 (Item III-B).*

  This item will be discussed during today's meeting.
- *Lynn Hatcher will inquire internally about requiring Hatchery Committees approval of the annual Broodstock Protocols (Item IV-A).*

  This item will be discussed during today's meeting.
- *Hatchery Committees representatives will submit comments on the sample size section in the memorandum clarifying standardized methods for Hatchery M&E Plan Objective 8.3, Fecundity at Size, to Mike Tonseth (Item IV-B).*

  Tonseth said that comments were received from Douglas PUD, and also that additional data were recently compiled. He requested that this item remain open for review.
- *WDFW will add a summary table to the draft 2014 Wenatchee Basin Steelhead Release Proposal, and will redistribute the revised draft to the Hatchery Committees. Hatchery Committees representatives will provide comments to Tonseth no later than Friday, March 28, 2014. No comments received will be considered an approval (Item IV-C).*

  Tonseth said that he will add a revised summary table to the draft 2014 Wenatchee Basin Steelhead Release Proposal, and will redistribute the final revised draft to the Hatchery Committees.

II. Douglas PUD

A. HETT NTTOC Report Update (Greg Mackey)

Greg Mackey said that the draft NTTOC Modeling Report was uploaded to the HCP Hatchery Committees Extranet site on April 16, 2014, prior to the meeting. Kristi Geris sent an email to the Hatchery Committees following the meeting on April 16, 2014, notifying them that the draft report is out for a 60-day review period, with comments due to Mackey no later than Monday, June 16, 2014. Mackey said that the draft report has already been distributed to the HETT for review, and comments were received from Todd Pearsons (Grant PUD) and Matt Cooper (USFWS). Mackey said that he also made additional edits to the draft for review. Bill Gale said that he will involve Matt Cooper in the review, and Mike Tonseth said that he will also involve Andrew Murdoch (WDFW) in the review.

B. Wells Hatchery Steelhead Broodstock Update (Greg Mackey)

Greg Mackey said that all steelhead broodstock have been collected to replace those lost at Wells Hatchery on November 17, 2013. He added that he does not have the specific numbers by broodstock source; however, he acknowledged Ringold Hatchery for providing broodstock for the Columbia Safety-Net Program and Winthrop NFH for their collection of natural-origin recruits (NORs) in their volunteer channel and by hook-and-line angling. He said that Douglas PUD also obtained broodstock in the Wells fish ladder and in the Wells Hatchery volunteer channel; and he added that Jayson Wahls indicated that additional females are still being collected as backup. Kirk Truscott said that the CCT collected the full 58 steelhead for the Okanogan program from Omak Creek, including 16 NORs. He added that Wild Horse Springs was dry and therefore unfishable. Lynn Hatcher asked what will happen with unneeded backup fish. Mackey said that excess hatchery-origin recruits (HORs) will go to the Ringold program; however, excess Okanogan-collected fish would go to Douglas PUD's Columbia River-release program. He added that NORs are still being collected for the Twisp program, and that the last he heard, 7 had been collected so far and about 19 additional broodstock are needed. He said that no NORs are needed for other Wells Project programs—only Omak Creek and Twisp.

Mackey said that during hook-and-line angling efforts, adipose (ad)-present (presumed natural origin) fish outnumbered ad-clipped fish that were encountered during hook-and-line collections. He said, however, that past percent hatchery-origin spawner (pHOS) data suggest 80% or more HORs in the system. He said that perhaps HORs are not entering the system as believed, may not be as susceptible to angling, or may enter the Methow later as most of the hook-and-line collection efforts occurred in late winter. He said that Winthrop NFH also encountered more NORs earlier in the year, but observed a higher incidence of HORs later in the year.

Winthrop Steelhead Broodstock and Research (Bill Gale)

Bill Gale said that this year, angling by Winthrop NFH staff started earlier than ever before, mainly to help obtain steelhead broodstock for Wells Hatchery, and also because a Biologist and technician are now stationed at Winthrop NFH, which makes logistics easier. Gale said that angling started on February 20, 2014, and ended about one week ago. A total of 100 fish were collected, including 85 Winthrop, 9 Twisp, and 6 lower Methow fish. Also, 8 HORs volunteered to Winthrop NFH. He said that the ladder is still open; however, there are not many fish entering. He said that a total of 35 NOR pairs were retained for the Winthrop program, which will equal about 150,000 smolts; and about 12 HORs were also retained. He added that a total of 20 HORs were transferred to Wells Hatchery. He said that 15 females and 8 males were live-spawned, and 10 males were also lethal-spawned. He said that among the females live-spawned, two did not survive; and all other live-spawned fish were transferred to the YN for recovery and reconditioning.

Gale said that a pilot study was underway using an artificially constructed spawning channel at Winthrop NFH. He said that the channel has been stocked with 4 HOR pairs, which will be used to monitor the reproductive success of returning Winthrop NFH brood. Gale said that this year, the goal is to determine if the spawning channel will work; and if so, then the channel will be in full operation next year. He said that the spawning channel is part of a Bonneville Power Administration (BPA) project to evaluate the reproductive success of returning HOR from different smolt rearing regimes. This project will target the inclusion of only HOR adults (no wild adults), and therefore, Winthrop NFH will need more HORs than in the past to populate the study. He said the goal is to obtain enough crosses to evaluate differences between the two smolt-age release groups (1 and 2 year) and returning salt years.

C. Methow Hatchery Spring Chinook Early Maturation Sampling (Greg Mackey)

Greg Mackey recalled that at the Hatchery Committees meeting on January 15, 2014, the Committees approved sacrificing 300 Methow Hatchery spring Chinook juveniles for an evaluation of early maturation. Mackey said that the sampling has been completed, and preliminary observations included a relatively high proportion of early-maturing males; this finding was surprising because returning adults show a skewed sex ratio of 60:40 males to females when the opposite may have been expected (i.e., females representing the higher proportion because of the loss of male returns due to early maturation). Bill Gale suggested that this may indicate higher ocean survival of males. Catherine Willard asked what proportion of the males were showing signs of early maturation, and Mackey said he did not have a final estimate yet, but that it was quite substantial. He added that the testes were also weighed (testes of early-maturing males were about 10 times heavier than normally maturing); so these early observations are based both on visual and quantitative data. Kirk Truscott asked what the fish sizes were. Mackey said that fish lengths ranged from about 120 millimeters (mm) to about 170 mm, and Tom Kahler indicated that fish weights ranged from about 19 grams (g) up to about 40 to 50 g. A complete report will be prepared, but will require consultation with several experts on early maturation before it can proceed.

III. WDFW

A. Draft 2014 Broodstock Collection Protocols (Mike Tonseth)

Mike Tonseth said that the revised draft 2014 Broodstock Collection Protocols was distributed to the Hatchery Committees by Kristi Geris yesterday, April 15, 2014. He said that almost all edits received were incorporated into the revised draft. He added, however, that sideboard language for tangle netting and a Wenatchee spring Chinook broodstock collection strategy still needed to be discussed. The Hatchery Committees reviewed and edited portions of the revised draft 2014 Broodstock Collection Protocols, as depicted in Attachment B and as described in the following sections.

Notable in This Year's Protocols

Coded-wire-tag Interrogation and Winthrop NFH (first bullet, page 2)

Bill Gale requested removing mention of Winthrop NFH from this bullet because there has been no need for Winthrop NFH to participate in this activity in the past. Tonseth noted that USFWS' comments were not yet incorporated into the revised draft protocols, and Gale said that he would resend USFWS' edits to Tonseth for incorporation.

Wells Hatchery Steelhead (eighth bullet, page 2)

Greg Mackey requested deleting this bullet (adjustment to the 2013 Broodstock Protocol regarding the loss of Wells steelhead broodstock) because the loss of Wells steelhead broodstock has since been recovered.

Table 1

Smolt-to-adult Ratio (SAR; page 5)

Tonseth noted that, as shown in Table 1, the total SAR increased from 0.0066% to 0.0085%, and that the total target HORs increased as well (compared to the first draft). He also noted that in terms of the collection objective to limit extraction to no greater than 33%, only the percentage of age 4 and 5 returns were considered, as opposed to considering the total NOR return. He said that he could include 3–year-olds if the Hatchery Committees prefer, but the Committees agreed with Tonseth's approach.

Table 3

Methow Spring Chinook (page 6)

Tonseth said that the Methow spring Chinook numbers were updated by Charlie Snow (WDFW), which changed the overall numbers, as shown in Table 3.

Transferring HORs to Winthrop NFH from Methow Fish Hatchery (FH)

Gale asked if any discussion has taken place about the potential transfer of HORs to Winthrop NFH from Methow FH, and Tonseth said that there had been no discussion. Tonseth added that he believes the intent is to incorporate Methow HORs; however, this has not been included in the protocols in the past. He said that any excess HORs collected at Methow FH should be prioritized for Winthrop NFH to reduce the incidence of Carson ancestry fish in Winthrop fish and to improve the Winthrop program as a safety-net for the Methow program. He also noted that the protocols are specific to PUD programs, and this is somewhat of a gray area.

Douglas PUD and Grant PUD Activities (page 6)

Tonseth said that scoping of activities for Douglas PUD and Grant PUD are largely the same as last year.

Chelan PUD Activities

Tonseth said that the big differences this year are with Chelan PUD programs.

Rocky Reach Trap (RRT; page 7)

Tonseth said that the use of the RRT is well defined. He said that a total of 42 fish will be targeted, including 5 HORs and 37 NORs; and how many of those can be collected at the RRT will define how many fish need to be targeted via tangle netting in the Chewuch. Lynn Hatcher asked if few fish are collected at the RRT and a major effort is needed in the Chewuch, whether this effort would first be discussed with the Hatchery Committees. Tonseth explained that this question is what the sideboard language is intended to address.

Tributary-based Broodstock Collection (tangle netting; page 9)

Tonseth said that sideboard language needs to be established that defines such things as when tangle netting will start, how long it will last, and what the fallback options are if not enough fish are collected (e.g., Winthrop NFH). Keely Murdoch noted that the YN does not want to shift to HORs as an immediate fallback position. Tonseth suggested that passive integrated transponder (PIT)-tagged HORs need to be targeted at the RRT in case not enough NORs can be collected. He added that collecting HORs may also help limit the duration of tangle netting. The Hatchery Committees established five sideboards for tangle netting efforts, as described below.

Sideboard 1: Tangle netting activities not to exceed 10 days

Keely Murdoch said that the YN does not support the use of tangle netting in the Chewuch for long periods of time. She said that tangle netting in Nason Creek was completed over a 2-week period, and the YN would be supportive of a similar time frame. She added that the language needs to specify number of days, rather than weeks. She also suggested that the days do not need to be consecutive; in cases where there are not a lot of fish in the system, tangle netting efforts could then stop and restart when more fish are present. Tonseth suggested that tangle netting activities should not exceed 10 days, regardless of when those days are used. He added that this will involve monitoring of PIT-tagged detections at in-stream arrays to optimize timing.

Sideboard 2: Start and end dates to allow tangle netting activities to be determined based on existing data

Keely Murdoch suggested establishing a sideboard for how late in the season tangle netting activities can occur. She added that activities should not be occurring when fish are staging to spawn. Kirk Truscott suggested reviewing historical PIT-tag data to determine the best time to sample, and Hatcher also suggested coupling those data with up-to-date observations. Tonseth added that historical spawning data can also be used to determine an end date.

Sideboard 3: Location of tangle netting activities to be determined based on historical data

Tonseth suggested that, in terms of location, rather than sampling the entire river, areas where fish tend to spawn should be identified because fish typically tend to stage in areas upstream and downstream of those areas. Truscott also suggested targeting areas with a higher proportion of NORs. Hatcher asked if snorkeling efforts are planned. Tonseth said that, initially, spawning ground data will be used to target an area, and then before deploying the nets, snorkeling crews will confirm that fish are present. Catherine Willard asked if snorkeling efforts would count towards the 10 days allotted for tangle netting, and Keely Murdoch replied that they should not.

Sideboard 4: Retain fish collected

Tonseth said that ad-present fish will be targeted, but that the number of HORs and NORs collected still needs to be tracked because one-third extraction cannot be exceeded. He added that all fish collected will be retained (no catch and release).

Sideboard 5: Overcollection to be used for the Winthrop NFH program

Truscott asked if the target amount of fish is obtained, but most of them are HORs, whether tangle netting efforts would continue with the excess HORs being used for the Winthrop NFH program. Tonseth agreed that this should happen and noted that as the number of HORs retained for the program increases, the overall brood needed to account for 15% cull for bacterial kidney disease management also increases. He also added that if tangle netting efforts continue to increase the number of NORs, HORs would not be transferred until the total number of NORs is known. Gale noted that from a fish health perspective, USFWS may not support the transfer of fish that are held at Eastbank FH to Winthrop NFH.

Tonseth recalled that on Nason Creek, two tangle netting crews operated each day. Gale said that he discussed the overall RRT proposal with Karl Halupka (USFWS), and he appeared to be supportive of the direction in which it was heading, as well as of the bull trout aversion measures that have been discussed. Gale added that Halupka may have questions once dates are established. Tonseth said that, in terms of bull trout, a letter will be developed that is similar to last year's. Willard noted that historical data indicate that bull trout move up in May and are at spawning grounds by mid-July, which are located higher in the system than where spring Chinook spawn.

Mackey suggested that language should be considered that allows some flexibility in the amount of time allowed for tangle netting activities if, for example, the impact is low and more fish need to be collected. Tonseth said that language has already been added that provides latitude to potentially extend activities with concurrence from the Committees.

Keely Murdoch requested that tangle netting efforts be coordinated with the HCP parties so that staff have the opportunity to participate. She added that the YN is interested in sending someone out during these activities, and Willard said that Chelan PUD is also interested in participating. Tonseth said that once the details are worked out, he will send an email to Geris for distribution to the Hatchery Committees that outlines dates, times, and locations. Keely Murdoch requested that the email be sent with ample time to coordinate schedules, as needed.

Winthrop NFH (page 10)

Gale requested adding "and/or gametes" to what will be used from Winthrop NFH to help Chelan PUD meet their spring Chinook obligation in the event that the RRT and tangle netting fail to yield the needed broodstock. He also clarified that this option "may" be utilized (not "will").

Table 5

Methow Safety-Net Steelhead and Winthrop NFH (page 12)

Gale said that given the efficiency of Winthrop NFH, he was uncertain how realistic it was to report that Winthrop NFH will be able to transfer "up to 62 HORs" steelhead for the Methow Safety-Net Program. Tonseth said that 62 HORs will also be collected at Wells Dam to make up any shortfall at Winthrop NFH; and he added that he will insert a footnote indicating that collection methods may vary.

Table 6

USFWS (page 13)

Gale said that Winthrop NFH no longer requires steelhead broodstock progeny from Wells Dam, and requested removing their respective smolt and green egg values from the table.

Summer/Fall Chinook

Wells Volunteer Channel (page 15)

Tonseth noted reference to the HCP Hatchery Committees Statement of Agreement (SOA) dated June 20, 2012, which stated that summer Chinook collection at the Wells volunteer channel may be used to support the Entiat NFH summer Chinook program. Though, Gale noted that USFWS is not anticipating needing assistance in 2014 and is planning to collect broodstock using on-station returns.

Chelan Falls Program (page 16)

Willard requested removal of the statement indicating that surplus summer Chinook from the Wells volunteer channel will be used as backup for the Chelan Falls program. She said that Chelan PUD is confident that any backup fish will be obtained from Eastbank FH. Further, Mackey added that no agreement is in place for obtaining fish from Wells Hatchery, and including this statement sets an expectation. Schiewe suggested replacing the statement with "the Hatchery Committees will discuss options."

Wenatchee Spring Chinook

Table 10 and Table 11 (pages 17-18)

Tonseth reviewed both tables. He said that Andrew Murdoch has been running additional models, which have produced higher confidence. He said that only 4- and 5-year-olds are being modeled because when 3-year-olds are added, model precision is greatly reduced.

Draft 2014 Nason/Chiwawa Program Implementation Options (page 18)

The Hatchery Committees discussed the three options, described as follows:

Option 1: Parental Based Tagging (PBT) Approach

Tonseth noted the red text on page 19, and explained that this option depends on how quickly samples can be processed and results made available. He explained that Mike Ford (NMFS Northwest Fisheries Science Center) has developed a new single nucleotide polymorphic loci (SNPs) approach that produces a higher assignment rate than the SNP panel used by the WDFW genetics lab, but Ford has not indicated if the NMFS lab is available to run these samples in a timely fashion. Tonseth said that Ford was able to analyze 1,400 progeny and assign 99.3% to a single parent and almost 80% to both parents, which is an exceptionally high assignment rate. He said that the limiting factor is the probability of determining where any given parent spawned. In addition, he said that Mike Hughes (WDFW) looked into this for Nason Creek, and he was able to determine that Nason Creek was the spawning location for 77% of the adults estimated to have spawned in Nason Creek. Keely Murdoch asked what data this estimate was based on, and Tonseth replied that it is based on spawning ground data, direct PIT-tag detections, both arrays in Nason Creek, and carcass recoveries. He added that these data will be collected for the Wenatchee Relative Reproductive Success Study through 2022; however, from 2018 to 2022, there will no longer be PIT-tagging of adults at Tumwater Dam, so numbers may drop slightly. He said to boost sample size, rafts may be outfitted with PIT-tag antennas to pick up detections of shed tags from post spawn adults throughout the river.

Option 2: Produce the Nason and Chiwawa mitigation programs using returning hatchery adults and release from the Chiwawa Ponds facility

Tonseth said that this option involves producing all hatchery-by-hatchery (Chiwawa hatchery returns) from brood collected at Tumwater Dam and producing the combined Grant PUD and Chelan PUD mitigation at Chiwawa. Willard said that Chelan PUD does not support this option because: 1) Chelan PUD's Chiwawa program is a conservation program and not a safety-net program; and 2) this option would limit proportionate natural influence (PNI) for one year, which would also impact Chelan PUD's ability to meet PNI goals for the program.

Option 3: Tributary-based efforts to collect NORs for both Nason and Chiwawa programs
Tonseth noted that with this option, there was uncertainty regarding use of the Chiwawa Weir because of permitting for bull trout. He said that the tangle netting portion for both Nason and Chewuch would be addressed in the same manner that tangle netting in Nason Creek was handled in the past. Gale noted that bull trout can be avoided with tangle netting in Nason Creek; however, numerous bull trout are encountered at the Chiwawa Weir each year. Tonseth said that sideboard language can be established that limits the days of trapping at the weir, or limits the number of bull trout that can be encountered. Gale said that USFWS's concern is the compounded effects of operating the Chiwawa Weir and Tumwater Dam. He added that USFWS's preference is to avoid using the weir. Willard asked how the Chiwawa conservation program's production target can be met if USFWS does not want the Chiwawa weir operated to collect broodstock and NMFS does not want tangle netting utilized to collect broodstock—there is no other tributary-based option. Truscott added that if hatchery programs are going to be utilized to aid in recovery of listed fish populations, that handling of the fish is a necessary component of a hatchery program.

Hatcher suggested implementing a combination of options 1 and 3, similar to last year. Hatcher asked if WDFW can run the PBT samples, so this option will not be contingent on NMFS' ability to run them. Tonseth explained that Ford ran all of the parent data and WDFW does not have the same SNPs panel. Willard asked if WDFW could use NMFS' panel. Tonseth said that he can ask; however, he was not sure if borrowing NMFS' panel would be possible. He added that if this is the case, and if Ford cannot process the data rapidly, option 1 will not be viable.

Gale noted that the Tumwater Dam Operating Plan will eventually need to be submitted to NMFS and USFWS, and he asked how development of this plan aligns with settling the details of the draft protocols. Tonseth said that the Tumwater Dam Operating Plan is being developed now along with site-based operating plans for all collection locations, and they will all be appended to the protocols. Gale noted the potential conflict with WDFW submitting something that is not permitted. Tonseth said that WDFW will consult with USFWS, as needed. Gale recommended not including unpermitted activities in the Tumwater Dam Operating Plan because approving the plan would imply permit coverage for those activities.

Schiewe asked what the process should be to reach agreement on this, and Keely Murdoch acknowledged that approval needs to be obtained from both the Hatchery Committees and the Priest Rapids Coordinating Committee Hatchery Sub-Committee (PRCC HSC). She added that how Grant PUD will meet the Nason Creek Conservation component production target has not yet been decided. She recalled that Chelan PUD has not been requested by Grant PUD to have Grant PUD's fish on station (additional Chiwawa fish to make up for Nason production shortfalls), and Grant PUD expressed initial reservations about raising fish at Chiwawa. She said that one possible option would be to raise the extra Chiwawa fish at Nason Creek; and Gale indicated that he was uncertain about this idea. Willard said that Grant PUD has not yet contacted Chelan PUD regarding this matter. Tonseth noted that the capacity exists, and it is more a matter of willingness to contract. Gale asked, regarding Chelan PUD's concern about additional strays, if Grant PUD would assume some of the responsibility. Tonseth agreed and said that he believes Grant PUD would have a proportional share of the impact.

Tonseth said that the draft protocols and today's comments will also be discussed during tomorrow's PRCC HSC meeting. Hatcher said that NMFS and WDFW will discuss Endangered Species Act (ESA) compliance concerns regarding the broodstock protocols, and he will also contact Ford regarding the PBT approach.

Tonseth said that he will incorporate outstanding edits and comments into the draft 2014 Broodstock Protocols, including USFWS's edits, sideboard language for tangle netting in the Chewuch to obtain Chelan PUD Methow spring Chinook broodstock, and other edits discussed during today's Hatchery Committee meeting; and he will redistribute the revised draft to Geris for distribution to the Hatchery Committees.

IV. NMFS

A. Hatchery Committees Approval of Annual Broodstock Protocols—SOA (Lynn Hatcher)

Lynn Hatcher said that after internal NMFS discussions about the approval process for the annual broodstock protocols, it was decided to maintain the current process and leave development in the hands of the State of Washington. He said that NMFS wants to avoid a situation where the process is delayed because agreement cannot be reached on a particular program. He added that maintaining the current procedures for developing the protocols in coordination with committees will still give managers authority over details included in the protocols. Mike Schiewe noted that this is not just about ESA permitting—it is about HCP production. He said that when the HCPs were signed, agreement was reached that the Hatchery Committees would be the deciding body for HCP production; and it was written in the individual permits that the broodstock protocols would be prepared annually in consultation with the Hatchery Committees. He said that NMFS would need to remove that language from the permits because the Hatchery Committees are not in a position to overwrite the permit. He added that a SOA is not necessarily required; Hatchery Committees approval of the annual protocols can simply be memorialized in the meeting minutes. Hatcher said that NMFS' concern is obtaining approval from both the Hatchery Committees and the Joint Fisheries Parties. He added that at times, the two groups are not working together. Schiewe agreed that the two groups do not always work together, but that they should and that was the purpose of forming the Hatchery Committees. He added that this discussion is about both groups approving the protocols and about finalizing the protocols by a certain date so that a schedule can be established for review and approval by the Committees. He said that in order to accomplish this approval, NMFS may need to change the language in the permit.

Greg Mackey suggested rethinking the entire approach. He acknowledged that this year, with several programs new or in flux, is an exception; however, he said for most years, this process should be the same: broodstock collections goals should be very similar each year, and each program can operate within specific sideboards. He said that NMFS really needs to know basic information about broodstock collection, such as the number, stock, origin, and location(s) where the broodstock are proposed to be collected—this will allow NMFS to confirm that the annual proposed collections are consistent with the terms of the permits.

All the other details that the Hatchery Committees need to work out likely do not need to be included in the protocols, and can instead be developed for management of specific programs separately from the Broodstock Protocol document. Mike Tonseth agreed and added that because NMFS participates in the development of the protocols, issues are raised before the final version is drafted. Mackey also said that the Douglas PUD is the permit holder, along with WDFW, and that the Hatchery Committee is the venue under ESA where management of the PUD programs occurs; therefore, it is appropriate that the Hatchery Committee is responsible for development and approval of the broodstock protocols that are sent to NMFS. Bill Gale noted that USFWS also reviews and approves the annual broodstock protocols, so when developing a schedule for approving the annual protocols, USFWS review needs to be considered as well.

Hatcher said that he will take this feedback back to NMFS and continue this discussion at the Hatchery Committees meeting on May 21, 2014. Schiewe noted that NMFS is about to issue new permits, so this is a good time to figure this out. Tonseth also suggested that the different committees start thinking about what is important to include in the protocols, and what can be left out. Hatcher agreed and suggested discussing this at the next NMFS/USFWS Biological Opinion Coordination Meeting.

B. Chelan PUD 2014 RRT/Methow Spring Chinook Broodstock Collection Proposal (Lynn Hatcher)

Lynn Hatcher said that although NMFS agreed to this proposal this year, he wanted to emphasize that NMFS' preferred option is collection at Wells Dam. He said that collection at Wells Dam would eliminate tangle netting in the Methow Basin, and would also prevent potential problems that may occur at the RRT (i.e., inadequate numbers of PIT-tagged NORs). He said that NMFS has reservations about authorizing PIT-tagging additional NORs for future trapping needs at the RRT; and suggested thinking about how to use the RRT without needing to tag additional NORs in the Methow Basin. Bill Gale said that if there is no additional tagging, then there is reliance on collecting untagged NORs returning upstream of Rocky Reach Dam, which will potentially impact the natural origin population of spring Chinook stock bound for the Entiat. Kirk Truscott noted that the permits allow handling up to 20% of the population for juveniles, and currently, efforts are nowhere near that threshold. Gale also noted that adults have a separate take level. Truscott said that handling more fish is inevitable when reforming programs. Gale asked if Chelan PUD and the U.S. Geological Survey (USGS) have had any discussions about trapping. Catherine Willard said that Chelan PUD has been discussing options for their M&E component in the Methow; however, at this point, those options do not involve USGS.

C. Hatchery and Genetic Management Plan (HGMP) Update (Lynn Hatcher)

Lynn Hatcher said that the next NMFS/USFWS Biological Opinion Coordination Meeting will likely be held in early May 2014. He then reviewed HGMP updates, as described in the following sections.

Mid-Columbia Coho

Hatcher said that permitting should be completed by end of May.

Okanogan Spring Chinook and Methow Spring Chinook

Hatcher said that the draft Biological Opinion (BiOp) should be complete by mid-May 2014, and the Section 10 permit should be complete by mid-summer 2014. He also noted that the Section 10(j) Environmental Assessment (EA) is complete except for Washington D.C. review and approval.

Wenatchee Steelhead

Hatcher said that permitting will be complete by spring 2014, and he noted that the YN's concerns with the Wenatchee basin steelhead management plan have been addressed. NMFS now has to conduct an analysis of the fishery affects to complete the BiOp.

Methow Steelhead

Hatcher said that USFWS comments on the draft Methow Steelhead supplemental EA are due back this week.

Wells Hatchery Steelhead

Hatcher said that permitting will be complete by early fall 2014.

Okanogan Steelhead

Hatcher said that the HGMP sufficiency letter was distributed in February 2014, and public comment for the HGMP and draft EA will hopefully be in June 2014. He said that a letter indicating ESA coverage was sent to Grant PUD, and permitting will be complete by early fall 2014.

Leavenworth Spring Chinook

Hatcher said that the Leavenworth Spring Chinook BiOp will be completed as soon as USFWS and NMFS discuss final revisions.

Summer Chinook

Hatcher said that permitting will be complete by early fall 2014.

Kirk Truscott asked if the Fishery Management Plan for the Methow Basin is required for the Methow Steelhead BiOp, and Greg Mackey said that Amilee Wilson (NMFS) indicated that it is required. Hatcher asked if adult management will be performed on steelhead at Methow Hatchery. Tonseth said that there is not a plan currently in place to do so, but that the existing permit allows this activity. Tonseth also added that the Joint Fisheries Parties had not yet developed a Fishery Plan for the Methow basin, and he thought the BiOp would be reopened just for the fishery piece, if needed.

V. Chelan PUD

A. Rock Island Dam Update (Catherine Willard)

Catherine Willard said that three fish ladder extensions are being installed at Rock Island Dam. She said the two extensions at the two entrances of the right bank fish ladder are already in place, and are intended to help facilitate fish passage during low flow conditions. She said that fish have already been detected passing Rock Island Dam.

Mike Tonseth said that fish passage opened at Wanapum Dam on April 15, 2014. Bill Gale asked what monitoring is in place for juveniles, and Mike Schiewe replied that he understands that Grant PUD is planning acoustic releases for juvenile monitoring. Kirk Truscott added that some fish will also be double-tagged (acoustic and PIT) in the Rock Island and Wanapum tailraces. He said that there will also be the opportunity to monitor

PIT-tagged fish released above Rock Island Dam to evaluate survival probability to McNary Dam. Regarding adult passage, he said that a short video clip of a spring Chinook passing through the flume system at Wanapum Dam showed the fish passing through the system nose first. He added that preliminary testing was also conducted using hatchery steelhead, which went as planned. Schiewe said that the cause of the fracture is still unknown, and it needs to be determined prior to moving forward with a fix. Truscott noted that only 6 of 26 investigative holes have been drilled so far because of high winds inhibiting progress. Tonseth added that a platform has been constructed to help with the drilling effort. Truscott also added that a layer of neoprene is now covering the fracture to reduce the amount of water entering the crack.

VI. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees' meetings are on May 21, 2014 (Douglas PUD); June 18, 2014 (Chelan PUD); and July 16, 2014 (Douglas PUD).

List of Attachments

Attachment A	List of Attendees
Attachment B	Revised Draft 2014 Broodstock Collection Protocols (edited)

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Catherine Willard	Chelan PUD
Greg Mackey*	Douglas PUD
Tom Kahler*	Douglas PUD
Lynn Hatcher*	National Marine Fisheries Service
Bill Gale*	U.S. Fish and Wildlife Service
Keely Murdoch*	Yakama Nation
Kirk Truscott*	Colville Confederated Tribes
Mike Tonseth*	Washington Department of Fish and Wildlife

Notes:

* Denotes Hatchery Committees member or alternate

STATE OF WASHINGTON
DEPARTMENT OF FISH AND WILDLIFE
Wenatchee Research Office
3515 Chelan Hwy 97-A Wenatchee, WA 98801 (509) 664-1227 FAX (509) 662-6606

April 15, 2014

To: Craig Busack

From: Mike Tonseth, WDFW

Subject: **DRAFT 2014 UPPER COLUMBIA RIVER SALMON AND STEELHEAD BROODSTOCK OBJECTIVES AND SITE-BASED BROODSTOCK COLLECTION PROTOCOLS**

The attached protocol was developed for hatchery programs rearing spring Chinook salmon, summer Chinook salmon and summer steelhead associated with the mid-Columbia HCPs, spring Chinook salmon and steelhead programs associated with the 2008 Biological Opinion for the Priest Rapids Hydroelectric Project (FERC No. 2114) and fall Chinook consistent with Grant County Public Utility District and Federal mitigation obligations associated with Priest Rapids and John Day dams (ACOE funded), respectively. These programs are funded by Chelan, Douglas, and Grant County Public Utility Districts (PUDs) and are operated by the Washington Department of Fish and Wildlife (WDFW).

This protocol is intended to be a guide for 2014 collection of salmon and steelhead broodstocks in the Methow, Okanogan, Wenatchee, and Columbia River basins. It is consistent with previously defined program objectives such as program operational intent (i.e., conservation and/or harvest augmentation), mitigation production levels (HCPs, Priest Rapids Salmon and Steelhead Settlement Agreement), changes to programs as approved by the HCP-HC and PRCC-HSC, and to comply with ESA permit provisions.

Notable in this year's protocols are:

- Continuing for 2014, no age-3 males will be incorporated into spring or summer Chinook programs.

- Implementation of the draft Production Management Plan (Appendix B), for all programs where possible, to ensure mitigation production levels are met and that the permitted production ceiling is not exceeded at release.

- Chelan PUD's 2014 Methow spring Chinook obligation of 60,516 smolts will be met through a combination of a second year pilot of operating the Rocky Reach Trap (RRT) using sort-by-code technology and tangle netting in the Chewuch River. Should the RRT and tangle netting not meet all of the adult requirements, hatchery origin adults from WNFH will be used to meet the production obligation.

- Utilization of genetic sampling/assessment to differentiate Twisp River and Methow Basin natural-origin spring Chinook adults collected at Wells Dam, and CWT interrogation during spawning of hatchery spring Chinook collected at the Twisp Weir, and Methow FH to differentiate Twisp and Methow Composite hatchery fish for discrete management of Twisp and Methow Composite production components for the GPUD and DPUD program.

Deleted: and Winthrop NFH

- Collection of only hatchery adult steelhead at Wells Dam/hatchery for Lower Methow safety-net (WFH/MFH), Winthrop NFH conservation, and Wells Hatchery Okanogan and mainstem Columbia safety-net programs.

- Placeholder for Nason Cr. and Chiwawa program broodstocking.

- Targeted collection of 100% of the Wenatchee summer Chinook and Wenatchee hatchery origin steelhead broodstock at Dryden Dam to reduce the number of activities that may contribute to delays in fish passage at Tumwater Dam (some adult collections at Tumwater may be necessary if sufficient adults cannot be acquired at Dryden Dam).

- Targeted collection of 100% of the natural origin steelhead broodstock at Tumwater Dam.

- Collection of summer Chinook broodstock from the Eastbank outfall, sufficient to meet a 576K yearling juvenile Chelan Falls program.

- Collection of surplus hatchery origin steelhead from the Twisp Weir (up to 25% of the required broodstock) to produce the 100K Methow safety-net on-station-released smolts (up to 14 adults). The remainder of the broodstock (37) will be WNFH returns collected at WNFH and/or Methow Hatchery and surplus to the WNFH program needs. Collection of Wells stock may be used if WNFH and Twisp returns are insufficient. The collection of adults will occur in spring of 2015.

Deleted: <#>Adjustment to the 2013 Broodstock Protocol: Due to a steelhead broodstock mortality event at Wells Hatchery in 2013, surplus hatchery origin steelhead from the Twisp Weir may be used for broodstock for the Lower Methow Safety net in excess of 25% of the broodstock target for that program.¶

- Summer Chinook collections at Wells Dam to support the CJH program may occur if CCT broodstock collection efforts fail to achieve broodstock collection objectives.

- Collection from the Wells Hatchery volunteer channel of Wells summer Chinook to support the YN, Yakima River summer Chinook program.

- Targeted collection of 1,000 adipose present, non-coded wire tagged fall Chinook from the PRD OLAFT.

- Targeted collection of 400-500 adipose present, non-coded wire tagged fall Chinook using hook and line efforts in the Hanford Reach.

These protocols may be adjusted in-season, based on actual run monitoring at mainstem dams and/or other sampling locations. Additional adaptive management actions as they relate to broodstock objectives may be implemented as determined by the HCP-HC or PRCC-HSC and within the boundaries of applicable permits.

Above Wells Dam

Spring Chinook

Inclusion of natural-origin fish in the broodstock will be a priority, with natural-origin fish specifically being targeted. Collections of natural-origin fish will not exceed 33% of the Methow Composite (i.e., non-Twisp, including the Methow Program [DPUD and GPUD] and the Chewuch Program [CPUD]) and Twisp natural-origin run escapement consistent with take provisions in Section 10 (a)(1)(A) Permit 1196.

To facilitate BKD management, comply with ESA Section 10 permit take provisions, and to meet programmed production, hatchery-origin spring Chinook will be collected in numbers excess to program production requirements. Based on historical Methow FH spring Chinook ELISA levels above 0.12, the hatchery origin spring Chinook broodstock collection will include hatchery origin spring Chinook in excess to broodstock requirements by approximately 15.7% (based upon the most recent 5-year mean ELISA results for the Methow/Chewuch program; 8% for the Twisp program). For purposes of BKD management and to comply with maximum production levels and other take provisions specified in ESA Section 10 permit 1196, culling will include the destruction of eggs from hatchery-origin females with ELISA levels greater than 0.12 and/or that number of hatchery origin eggs required to maintain production at 163,249 Methow Hatchery, and 60,516 Chelan yearling smolts (223,765 total conservation production). Culling of eggs from natural-origin females will not occur unless their ELISA levels are determined by WDFW Fish Health to be a substantial risk to the program. Progeny of natural-origin females, with ELISA levels greater than 0.12, may be differentially tagged for evaluation purposes. Annual monitoring and evaluation of the prevalence and level of BKD and the efficacy of culling in returning hatchery- and natural-origin spring Chinook will continue and will be reported in the annual monitoring and evaluation report for this program.

WDFW genetic assessment of natural-origin Methow spring Chinook (Small et al. 2007) indicated that Twisp natural-origin spring Chinook can be distinguished, via genetic analysis, from non-Twisp spring Chinook with a high degree of certainty. The Wells HCP Hatchery Committee accepted that Twisp-origin fish could be genetically assigned with sufficient confidence that natural origin collections can occur at Wells Dam. Scale samples and non-lethal tissue samples (fin clips) for genetic analysis will be obtained from adipose-present, non-CWT, non-ventral-clipped spring Chinook (suspected natural-origin spring Chinook) collected at Wells Dam, and origins assigned based on that analysis. Natural-origin fish retained for broodstock will be PIT tagged (pelvic girdle) for cross-referencing tissue samples/genetic analyses. Tissue samples will be preserved and sent to the WDFW genetics lab in Olympia Washington for genetic/stock analysis. Spring Chinook from Wells will be retained at Methow Hatchery and spawned for each program depending on results of DNA analysis.

The number of natural-origin Twisp and Methow Composite (non-Twisp) spring Chinook retained will be dependent upon the number of natural-origin adults returning and the collection objective limiting extraction to no greater than 33% of the natural-origin spring Chinook return to the Methow Basin. Natural origin fish not assigning to the Twisp or Methow Composite (combined, these make up the entire Methow Basin spring Chinook population) will be released back into the Columbia River. Based on the broodstock-collection schedule at Wells Dam (3-day/week, 16 hours/day), extraction of natural-origin spring Chinook is expected to be approximately 33% or less.

Weekly estimates of the passage of Wells Dam by natural-origin spring Chinook will be provided through stock-assessment and broodstock-collection activities. This information will facilitate in-season adjustments to collection composition so that extraction of natural-origin spring Chinook remains less than 33%. Trapping at the Winthrop NFH will be included if needed because of broodstock shortfalls.

Pre-season run-escapement of Methow-origin spring Chinook above Wells Dam during 2014 is estimated at 2,923 spring Chinook, including 2,575 hatchery and 449 natural origin spring Chinook (Table 1 and Table 2). In-season estimates of natural-origin spring Chinook will be adjusted proportional to the estimated returns to Wells Dam at weekly intervals and may result in adjustments to the broodstock collection targets presented in this document.

The following broodstock collection protocol was developed based on BKD management strategies, projected return for BY 2014 Methow Basin spring Chinook at Wells Dam (Table 1 and Table 2), and assumptions listed in Table 3.

The 2014 aggregate Methow spring Chinook broodstock collection will target up to 156 adult spring Chinook (22 Twisp, 134 Methow). Based on the pre-season run forecast, Twisp fish are expected to represent 5% of the adipose present, CWT tagged hatchery adults and 15% of the natural origin spring Chinook passing above Wells Dam (Tables 1 and 2). Based on this proportional contribution and a collection objective to limit extraction to no greater than 33% of the age-4 and age-5 natural-origin spawning escapement to the Twisp, the 2014 Twisp origin broodstock collection will total 19 wild fish, representing 79% of the broodstock necessary to meet Twisp program production of 30,000 smolts. Methow Composite fish are expected to represent 54% of the adipose present CWT tagged hatchery adults and 85% of the natural origin spring Chinook passing above Wells Dam (Tables 1 and 2). Based on this proportional contribution and a collection objective to limit extraction to no greater than 33% of the age-4 and age-5 natural-origin recruits, the 2014 aggregate Methow broodstock collection will total 162 spring Chinook (138 wild and 24 Hatchery). Broodstock collected for the aggregate Methow program represents 100% of the broodstock necessary to meet the Methow FH program production of 133,249 smolts and Chelan PUD's program production of 60,516 smolts. The Twisp River releases will be limited to releasing progeny of broodstock identified as wild Twisp and or known Twisp hatchery origin fish, per ESA Permit 1196. The Grant/Douglas and Chelan PUD releases will include progeny of broodstock identified as wild non-Twisp origin and known Methow Composite hatchery origin fish. Age-3 males ("jacks") will not be collected for broodstock.

Table 1. Brood year 2009-2011 age class-at-return projection for wild spring Chinook above Wells Dam, 2014.

Brood year	Smolt Estimate		Age-at-return: Twisp Basin				Age-at-return: Methow Basin				
	Twisp[1/]	Methow Basin[2/]	Age-3	Age-4	Age-5	Total	Age-3	Age-4	Age-5	Total	SAR[3/]
2009	5,124	31,212	5	26	**13**	44	15	183	**67**	265	0.0085
2010	8,927	50,165	9	**45**	22	76	24	**295**	107	426	0.0085
2011	10,047	36,344	**11**	50	24	85	**18**	214	77	309	0.0085
Estimated 2014 Return			**11**	**45**	**13**	**69**	**18**	**295**	**67**	**380**	

[1/]-Smolt estimate is based on sub-yearling and yearling emigration (Alex Repp, personal communication).
[2/]-Estimated Methow Basin smolt emigration based on Twisp Basin smolt emigration, proportional redd deposition in the Twisp River and Twisp Basin smolt production estimate.
[3/]- Mean Twisp NOR spring Chinook SAR to Wells Dam estimated using natural origin PIT tag returns (BY 2006-2008; Charlie Snow, personal communication).

Table 2. Brood year 2009-2011 age class and origin run escapement projection for UCR spring Chinook at Wells Dam, 2014.

Stock	Projected Escapement – Origin: Hatchery				Origin: Wild				Total: Methow Basin			
	Age-3	Age-4	Age-5	Total	Age-3	Age-4	Age-5	Total	Age-3	Age-4	Age-5	Total
MetComp	41	1,145	213	**1,399**	18	295	67	**380**	59	1,440	280	**1,779**
%Total				54%				85%				58%
Twisp	18	91	30	**139**	11	45	13	**69**	29	136	43	**208**
%Total				5%				15%				7%
Winthrop (MetComp)	130	833	74	**1,037**					130	833	74	**1,037**
%Total				41%								35%
Total	189	2,069	317	**2,575**	29	340	80	**449**	218	2,409	397	**3,024**

Table 3. Assumptions and calculations to determine the number of broodstock needed for BY 2014 production of 223,765 smolts.

Program Assumptions	Twisp standard	Twisp program	Methow standard	Methow FH program	Chelan program	Total program
Smolt Release		30,000		133,249	60,516	**223,765**
Fertilization-to-release survival	*84.4%*[1]		*83.7%*[1]			
Total egg take target		35,545		159,198	72,301	**267,044**
Egg take (production)						
Cull allowance[2/]	*8.0%*	40,299	*15.7%*	175,453	74,630	282,247
Fecundity[3/]	*3,504H/3,699W*		*3,556H/3,751W*			
Female Target						
Female to male ratio	*1:1*		*1:1*			
Broodstock target						
Pre-spawn survival	*95.9%*		*97.9%*			
Total broodstock collection		**19W** **5H**		**82W** **14H**	**37W** **5H**	**138W** **24H**

[1/] - Mean values.
[2/]-Hatchery origin MetComp. component only, and is based on the projected natural origin collection and assumption that all Twisp (hatchery and wild) and wild MetComp. fish will be retained for production.
[3/]-Based on historical age-4 fecundities and expected 2014 return age structure (Table 1).

Douglas/Grant PUD Activities:

Trapping at Wells Dam will occur at the East and West ladder traps beginning on 01 May, or at such time as the first spring Chinook are observed passing Wells Dam, and continue through 20 June 2014. Broodstock collection and stock assessment sampling activities authorized through the 2014 Douglas PUD Hatchery M&E Implementation Plan will occur simultaneously up to 3-days/week, up to 16 hours/day. Natural origin spring Chinook will be retained from the run, consistent with spring Chinook run timing at Wells Dam (weekly collection quota). Collection goals will be developed by Wells M&E staff to identify the most appropriate spatial and temporal approach to achieving the overall brood target. All natural origin spring Chinook collected at Wells Dam for broodstock will be held at the Methow FH.

To meet Methow FH broodstock collection for hatchery origin Methow Composite and Twisp River stocks, adipose-present coded-wire tagged hatchery fish will be collected at Methow FH, Winthrop NFH, and the Twisp Weir beginning 01 May or at such time as spring Chinook are observed passing Wells Dam and continuing through 20 June (Wells Dam) or 22 August 2014 for the Twisp Weir. Natural origin spring Chinook will be retained at the Twisp Weir as necessary to bolster the Twisp program production so long as the aggregate collection at Wells Dam and Twisp River weir does not exceed 33% of the estimated Twisp River natural origin spawners to maximize pNOS in the Twisp. All hatchery and natural origin fish collected for broodstock at Methow FH, Twisp Weir and Winthrop NFH for the Douglas and Grant County PUD conservation program will be held at the Methow FH. A total of 120 adults (101 wild and 19 hatchery origin) will be targeted to meet the Methow FH production obligation.

Chelan PUD Activities:

To meet Chelan PUD's Methow spring Chinook broodstock obligation (42 total adults; 37 wild and 5 hatchery), Chelan PUD is proposing a two-step approach to collect Methow spring-run Chinook salmon in 2014. The first step consists of testing newly installed sorting technology at the Rocky Reach trap (RRT) to determine if appropriate broodstock could be collected to meet program needs. The second step will consist of a tributary based approach utilizing tangle nets to collect broodstock in the Chewuch River. The following is a description of the two proposed methods.

Rocky Reach Trap

The RRT was used historically to capture listed steelhead and bull trout (in 2002 and 2005-2007, respectively), as part of studies required for implementation of the Rocky Reach License. Based on these previous efforts with steelhead and bull trout, it was determined that select individual fish can be effectively removed at the RRT, without delaying unmarked fish or non-target species. Additionally, based on a 2013 pilot study, externally marked spring Chinook were successfully removed at the RRT, on an individual basis without delaying non-targeted spring Chinook.

In response to results and observations made from conducting the 2013 spring Chinook pilot study, several trap modifications were identified and have been made in early 2014 in an effort to improve operation of the trap and increase the success of each trapping event:

- Replace the solid trap door with a rectangular 1" diameter vertical bar screen with 1" gaps to reduce the changes in water velocity produced by the movement of the solid door, which appeared to deter fish moving into the trap;
- Install underwater lighting and an underwater camera that can capture the view of the trap entrance to enable better viewing of the fish as they move into the trap;
- Install an electrical control pendant for the technician located above the trapping area to allow additional control of the trap door;
- Paint the floor in the viewing window white to create contrast.
- Installation of separation-by-code technology.

2014 will represent a second pilot year to evaluate all of the trap modifications/improvements and to test the efficacy of using separation-by-code technology to target PIT tagged natural origin (NOR) adults for broodstock (and hatchery origin [HOR] adults to the extent needed, to meet the production target).

Separation-by-Code Technology

The RRT trap is operated by use of a manually operated pneumatic gate that directs individual fish to a collection area and a trapping vessel. The trap design mimics a basket; it is lowered into the fish ladder and can remove one fish at a time. To identify broodstock for collection, the fish ladder directly in front of the counting room will be outfitted with a PIT tag detection array. This will provide a total of three PIT tag detection arrays located downstream of the trap in the fish ladder (baffle four, baffle six, and the entrance into the counting room/trap location). The separation-by-code software will rely on a pre-loaded library of PIT tag codes, that when detected by one of the three PIT tag arrays, will send a visual and auditory signal to the trap operator indicating a target fish has been detected. As an identified target fish moves through the baffles of the ladder and subsequent PIT tag arrays (a total distance of roughly 125 feet), three sequential notifications will occur indicating the fish is approaching the trap chamber . A different colored light will be associated with each PIT tag array. Once the last notification occurs, the operator in the counting room will be able to visually observe the target fish, manually open the trap door, and trap the fish. The operator located above the trap will raise the trap and confirm the intended fish was trapped by use of a hand held PIT tag detector loaded with the same library of PIT tag codes.

Upon confirmation that the trapped fish is the intended target fish, the fish will be transferred to a holding tank supplied with recirculating water, directly adjacent to the trap. Eastbank Hatchery staff will be notified that a target fish has been captured and they will transport the fish to the Eastbank Hatchery, directly adjacent to Rocky Reach Dam, via truck mounted holding tank supplied with Eastbank Aquifer water and oxygen.

Trapping will occur up to five days per week (Monday through Friday), and up to eight hours per day (from 7:00 a.m. to 3:00 p.m.), with unrestricted passage during non-trapping periods; based on PIT tag detection between 2006 and 2013, 70% of the PIT-tagged adults move through the Rocky Reach fishway between 7:00 a.m. and 3:00 p.m. Unless the trap operator is attempting to actively trap a target fish, the ladder will be open to passage. Trapping will begin in late April and will continue through about the third week in June (based on the average distribution of the most recent 10 years of data [DART] the first 5 percent of the spring Chinook run passes Rocky Reach by April 18, and the 95 percent passage date is June 17; therefore, 90 percent of the run passes during an approximately 60-day period).

The following PIT-tag codes will be targeted at the RRT in 2014:

- Chewuch River smolt trap, WDFW remote PIT tagging, and USGS PIT array evaluations (natural spring Chinook)
- Mark/recapture evaluations above the mouth of the Twisp River (natural spring Chinook)
- Methow River smolt trap (natural spring Chinook)
- Methow Hatchery MetComp smolts (brood year 2009 and 2010)

Genetic sampling/assessment will be utilized to differentiate Twisp River and non-Twisp River natural-origin spring Chinook adults that were PIT tagged as juveniles at the Methow smolt trap, once transported to Eastbank Hatchery from the RRT. Any adults that are determined to be of Twisp origin could be provided to Douglas PUD for their Twisp spring Chinook conservation program in exchange for a MetComp NOR trapped at Wells Dam (contingent upon agreement with Douglas PUD). All NORs trapped at the RRT and subsequently held at Eastbank Hatchery for genetic sampling will be retained for broodstock. Additionally, up to 45 HOR adults (no age-3 returns would be retained) from the Methow Hatchery MetComp smolt releases will be trapped at the RRT and held at Eastbank Hatchery as contingency broodstock in the event the total number of NORs needed for CPUDs Methow Subbasin conservation program are not available. If it is determined that these HOR adults are not needed to meet Chelan PUD’s Methow spring Chinook obligation, the following options are available (the JFP will be responsible for determining the priority and ultimate disposition of these fish): 1) they will be offered to Grant and/or Douglas PUDs if a shortfall exists in their program; 2) they will be offered to the USFWS Winthrop NFH for utilization in their safety net program; or 3) they will be released above Wells Dam or in the Methow River to offset any delays caused by retaining these fish.

Tributary Based Broodstock Collection

If insufficient broodstock are retained from the RRT, measures to collect natural-origin broodstock utilizing tangle netting in the Chewuch will be attempted (provided authorizations and approvals are received). Known or suspected spring Chinook spawning locations will be targeted for tangle netting.

Tangle Netting Methodology

Limitations , scope of effort, and details of the tangle netting methodology will be determined by the HCP-HC prior to implementation. Primary wild spring Chinook spawning areas will be identified using historical NOR spawning data. Only those areas (pools) of the river immediately above and below the spawning areas will be targeted for netting versus a randomized approach. Personnel that have experience capturing salmon using tangle nets will conduct the tangle netting. Any spring Chinook captured will be assessed for CWT. All captured Chinook will be retained regardless of mark or origin. Fish tubes filled with water will be utilized to provide transfer from the river to the holding truck. Fish transportation equipment will ensure safe transportation of collected broodstock and will include equipment that is mechanically reliable and that can be disinfected, equipment to monitor dissolved oxygen levels, and salt will be made available if it is needed as a stress reduction measure.

Based on redd survey data the majority of bull trout spawning occurs in the upper Chewuch River above River Mile (RM) 34 and in Lake Creek (RM 4 and RM 7) and limited spawning occurs in Eightmile Creek around RM 1.6. Water temperatures in the Chewuch River below RM 34 exceed the upper range of bull trout spawning temperatures; bull trout utilize the Chewuch River below RM 34 for foraging and overwintering (USFS personal communication 2014). Radio-telemetry data documented bull trout entering spawning areas in the Chewuch subwatershed in early to mid-July (USFWS 2007). This data indicates that the majority of bull trout will likely have moved through areas that will be targeted for tangle netting for Chinook salmon, and increases the likelihood of being able to avoid the capture of bull trout. To further limit capturing bull trout, targeted pools will be snorkeled to determine what, if any level of bull trout presence exists; if bull trout are not observed or if they are located in an area that can be avoided by the netting while targeting Chinook then the crews will proceed. Personnel will be employed for this activity that have experience tangle netting for salmon, while avoiding bull trout in the process. Nets will be deployed in configurations that will minimize the likelihood of capturing bull trout if bull trout are associated with aggregations of spring Chinook. Nets will be monitored continuously for bull trout. Any bull trout that is incidentally caught will be immediately removed from the net and released to the nearest upstream pool that is not targeted for netting. If more bull trout are encountered than is reasonable and prudent (or anticipated to be in excess of permit/authorization limitations), all netting activities will cease.

-Placeholder for sideboards for implementation of tangle netting activities.

Winthrop National Fish Hatchery

If efforts undertaken through the Rocky Reach trap and tributary based tangle netting fails to yield the full complement of adults needed to meet Chelan's 60,516 spring Chinook obligation, MetComp adults and/or gametes collected at the WNFH outfall may be utilized.

Deleted: will

Steelhead

Steelhead programs located upstream of Wells Dam and at Wells Hatchery are presented in Table 4.

Table 4. 2015 brood year Steelhead Programs at Wells Hatchery and Upstream of Wells Dam

Program	Hatchery	Owner	Release Location	Release Target	Broodstock Collection Location
Twisp Conservation	Methow Hatchery (incubation); Wells Hatchery (rearing)	Douglas PUD	Twisp Acclimation Pond	48,000	Twisp WxW
Methow Safety-Net	Wells Hatchery	Douglas PUD	Methow Hatchery	100,000	HxH: Twisp Hatchery (25%) + WNFH Hatchery (75%) or WNFH to make up balance
Mainstem Columbia Safety-Net	Wells Hatchery	Douglas PUD	Wells Hatchery	160,000	HxH: Methow Hatchery returns (1st option); Wells Hatchery/Dam (Wells

					Stock) (2nd option)
WNFH Conservation Program	WNFH	USFWS	WNFH	100,000	Up to 25 collected at Wells Dam/Hatchery HO only); remaining 25 collected by USFWS
Omak Creek	Wells Hatchery	Grant PUD	Omak Creek	Up to 20,000[1]	Okanogan Basin/Omak Creek (up to 16 wild or hatchery)
Okanogan	Wells Hatchery	Grant PUD	Okanogan Basin	Up to 100,000[1]	Wells Stock collected at Wells Dam/Hatchery or at tributary locations in the Okanogan Basin operated by the CCT

1/ The Grant PUD programs will total 100,000 smolts, +-10% (58 broodstock).. , Broodstock collection number, origin, and location, and smolt numbers will be consistent with those detailed in National Marine Fisheries Service (NMFS) letter to Randall Friedlander (CCT) and Jeff Grizzel (GPUD) dated February 27, 2014 and detailed in Table 4 and Table 5 herein.

Steelhead mitigation programs above Wells Dam (including the USFWS steelhead program at Winthrop NFH) utilize adult broodstock collections at Wells Dam, Twisp Weir, Methow Hatchery volunteer trap, WNFH volunteer trap, and the Omak Creek weir (Table 5) and incubation/rearing at Wells Fish Hatchery (FH) and incubation at Methow Hatchery (Twisp program). The Wells steelhead Program has provided eggs for UCR steelhead reared at Ringold FH, not as a mitigation requirement, but rather an opportunity to reduce the prevalence of early spawn hatchery steelhead in the mitigation component above Wells Dam. However, the Methow steelhead program is shifting to locally collected Twisp wild broodstock (Twisp conservation program), and hatchery origin broodstock representative of the Twisp and WNFH conservation programs (Methow safety-net program). Therefore, surplus broodstock will not be collected for the Methow steelhead programs to address the spawn-timing issue of the Wells stock. The Wells Hatchery Columbia River releases will use returns to the Methow Hatchery volunteer trap to the extent possible, and will be augmented with Wells stock as required to fulfill the program. However, the local collections of broodstock in the Methow Basin will occur in the spring of 2015. To ensure the safety-net programs have broodstock, some broodstock will be collected at Wells Dam in the autumn of 2014, and held at Wells Hatchery. These autumn-collected Wells stock fish will be considered surplus to the spring-collected Methow and Okanogan broodstock, and eggs from these surplus broodstock may be transferred to Ringold Hatchery. In addition, Wells Hatchery may be used for adult management and steelhead removed for adult management may be retained for the Ringold program (Table 5).

Table 5. Broodstock collection locations, number, and origin by program.

Program	**Wells Dam or Hatchery**		**Twisp Weir**		**WNFH**		**Methow Hatchery**		**Omak Creek/Okanogan Basin**	
	H	W	H	W	H	W	H	W	H	W
Twisp Conservation			0	28						

Methow Safety-Net	Up to 62 (backup)		14	0	Up to 62	0				
Mainstem Columbia Safety-Net	94 (backup)	0					94	0		
WNFH Conservation Program	25					96[1]				
Omak Creek										Up to 16[2]
Okanogan									42	
Okanogan	Up to 58 [4]	0								
Ringold[3]	0	0								
Total	214	0	14	28	62	96	94	0	42	16[2]

1/- Wild origin fish for WNFH program will be collected through USFWS hook and line angling efforts in the Methow in the spring of 2015. The 96 NOR's represents full production (200K) for the 2015 release. Actual number of NORs collected will be dependent upon actual NO returns.
2/- Wild origin preferred, but hatchery origin broodstock will also be collected to meet target.
3/- Broodstock derived from adult management at Wells Hatchery and surplus brood collected as backup for Methow and Okanogan programs.
4/- Back-up collection to assure 100,000 smolt production for the Okanogan Basin due to unknown collection efficacy in the Okanogan River Basin.

The following broodstock collection protocol was developed based on mitigation program production objectives (Table 6), program assumptions (Table 7), and the probability that sufficient adult steelhead will return in 2014/2015 to meet production objectives absent a preseason forecast at the present time.

Trapping at Wells Dam and/or Wells FH will selectively retain up to 177 hatchery origin steelhead (west [and east, as necessary]ladder collection). Ringold FH production will be based on the availability of surplus eggs/fish resultant from managing any production overruns in DC and GCPUD production. No adults for the Ringold program will be specifically targeted at Wells. In the spring of 2015, 28 wild steelhead will be targeted at the Twisp Weir and transferred to the Methow Hatchery for spawning, incubation, and early rearing (up to 60-d post ponding to facilitate viral testing of progeny resulting from live spawning females for the YN reconditioning program), after which they will be moved to Wells Hatchery for the balance of rearing. In addition, up to 14 surplus hatchery-origin Twisp-stock steelhead (to meet to meet up to 25% of the 100K Methow Safety-Net release) will be targeted at the Twisp Weir and/or Methow Hatchery and either spawned/incubated at Methow FH or moved to Wells Hatchery for spawning. Surplus WNFH hatchery returns will be used to augment the Twisp/Methow hatchery-origin collection if needed. Should there be inadequate surplus steelhead from these two sources, hatchery steelhead (presumed Methow Safety-Net origin) captured at the Methow Hatchery volunteer trap will be used to fulfill the program. Wells stock held at the Wells Hatchery will be used as a final option if broodstock collection at the Twisp Weir, and WNFH and MH traps are unsuccessful. Fifty-eight (58) adult steelhead will be targeted in the Okanogan Basin, including up to 16 natural-origin adults. Additionally, up to 58 adult steelhead will be targeted at Wells Dam/Hatchery as a back-up collection contingency due to unknown broodstock collection efficiencies in the Okanogan River Basin. Omak Creek for a 20K endemic program operated by the CCT and funded by GCPUD as part of their 100K UCR steelhead mitigation obligation. Overall collection for the programs will be 566 fish (a combination of program

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specific and back-up adults) and limited to no more than 33% of the entire run or 33% of the natural origin return (NOR composition in the broodstock, is estimated at 17% for Douglas and Grant PUD programs only; 40% if the WNFH program is included). Hatchery and natural origin collections will be consistent with run-timing of hatchery and natural origin steelhead at Wells Dam. Trapping at the Wells Dam ladders will occur between 01 August and 31 October, three days per week, up to 16 hours per day, as required to meet broodstock objectives. Trapping will be concurrent with summer Chinook broodstocking efforts through 15 September on the west ladder. Adult return composition including number, origin, age structure, and sex ratio will be assessed in-season at Priest Rapids and Wells dams. Broodstock collection adjustments may be made based on in-season monitoring and evaluation. If collection of adults from the east ladder trap is necessary, access will be coordinated with staff at Wells Dam due to the rotor rewind project.

Table 6. Adult steelhead collection objectives for programs supported through 2014 return year adult steelhead broodstock collected at Wells Dam, Twisp Weir, WNFH, and Okanogan Basin..

Program	# Smolts	# Green eggs	% Wild	# Wild	# Hatchery	Total Adults
DCPUD[1/]	160,000	230,548			94	94
DCPUD[2/]	100,000	144,092			76	76
DCPUD Twisp	48,000	69,164	100%	28		28
GCPUD Okan.[3/]	80,000	115,274			42	42
GCPUD Omak [3/]	20,000	40,000	100%	16		16[4/]
USFWS			100%	96		96
Sub-total	**458,000**	**671,124**	40%	**140**	**212**	**352**
Ringold[5/]	180,000	285,714			214	214
Sub-total	**180,000**	**285,714**			**426**	**566**
Grand Total[6/]	**638,000**	**956,838**	**25%**	**140**	**426**	**566**

Deleted: 50,000

Deleted: 72,046

[1/-] *Mainstem Columbia releases at Wells Dam. Target HxH parental adults as the hatchery component.*
[2/-] *Methow hatchery release of HxH fish produced from either adults returning from the Winthrop conservation program, adults trapped at MFH, and/or surplus hatchery adults from the Twisp weir.*
[3/-] *Okanogan Basin releases as part of GCPUD's 100K summer steelhead obligation*
[4/-] *Broodstock targeted is 16 total (8 male/8 female) of mixed origin composition based upon what is trapped.*
[5/-] *Eggs/juveniles will be provided to the Ringold program consistent with management of program surpluses up to 180,000 smolts. Adults for the Ringold program will not be specifically targeted at Wells Dam/Hatchery in 2014.*
[6/-] *Based on steelhead production consistent with Mid-Columbia HCP's, GCPUD BiOp and Section 10 permit 1395.*

Table 7. Program assumptions used to determine the number of adults required to meet steelhead production objectives for programs above Wells Dam.

	Standard	
Program assumptions	**Hatchery**	**Wild**
Pre-spawn survival	94.9%	94.9%
Female : Male ratio	1.0:1.0	1.0:1.0
Fecundity	5,050 1-salt/6,623 2-salt[1]	4,755 1-salt/6,290 2-salt[2]
Fertilization-to-yearling release	69.4%	69.4%

[1]/-The most recent 5-year mean of age at return for hatchery steelhead is 49.8% 1-salt and 50.2% for 2-salt.
[2]/-The most recent 5-year mean of age at return for wild steelhead is 52.0% 1-salt and 48.0% for 2-salt.

Summer/fall Chinook

The summer/fall Chinook mitigation program in the Methow River utilizes adult broodstock collections at Wells Dam and incubation/rearing at Eastbank Fish Hatchery. The total production level target is 200,000 summer/fall Chinook smolts for acclimation at Carlton Pond.

The TAC 2014 Columbia River UCR summer Chinook return projection to the Columbia River (Appendix A) and BY 2009, 2010, and 2011 spawn escapement to tributaries above Wells Dam indicate sufficient summer Chinook will return past Wells Dam to achieve full broodstock collection for supplementation programs above Wells Dam. The following broodstock collection protocol was developed based on initial run expectations of summer Chinook to the Columbia River, program objectives, and program assumptions (Table 8).

For 2014, WDFW will retain up to 100 natural-origin summer/fall Chinook at Wells Dam west (and east, if necessary) ladder(s), including 50 females for the Methow summer Chinook program. Collection will be proportional to return timing between 01 July and 15 September. Trapping may occur up to 3-days/week, 16 hours/day. Age-3 males (“jacks”) will not be collected for broodstock.

Additionally, in 2014 brood stock collection for Okanogan based summer Chinook programs will fall under the responsibility of the Colville Tribes as part of their overall summer Chinook program. Broodstock collection will be prioritized through purse seine operations, ladder returns to the Chief Joe Hatchery, tangle netting, and the Okanogan weir. Should use of Wells Dam be needed to meet any shortfalls in broodstock, the CCT will notify the HCP-HC and coordinate with Douglas PUD, Grant PUD, and WDFW to facilitate additional effort. Summer Chinook broodstock collection efforts at Wells Dam, should they be required to meet CJH program objectives, will be conducted concurrent with broodstock collection efforts for the Methow summer Chinook program and or steelhead collection efforts for steelhead programs above Wells Dam.

To better assure achieving the appropriate number of females for program production, the collection will utilize ultrasonography to determine the sex of each fish retained for broodstock. If the probability of achieving the broodstock goal is reduced based on passage at the west ladder or actual natural-origin escapement levels, broodstock collections may be expanded to the east ladder trap and/or origin composition will be adjusted to meet the broodstock collection objective. If collection of adults from the east ladder trap is necessary, access will be coordinated with staff at Wells Dam due to the rotor rewind project.

Table 8. Assumptions and calculations to determine the number of broodstock needed for 2014 brood summer/fall Chinook production goals in the Methow River basin and CCT summer programs as needed based upon success of planned broodstocking methods.

Program Assumptions	Metrics	Carlton Pond	CCT/Okanogan
Smolt release		**200,000**	
Fertilization-to-release survival	85.8%		
Eggtake target		**233,100**	
Fecundity	4,982		
Female target		**47**	
Female:male ratio	1:1		
Broodstock target		**94**	
Pre-spawn survival	95.0%		
Total collection target		**100**	**TBD**

Columbia River Mainstem below Wells Dam

Summer/fall Chinook

Summer/fall Chinook mitigation programs that release juveniles directly into the Columbia River between Wells and Rocky Reach dams have traditionally been supported through adult broodstock collections at the Wells Hatchery volunteer channel. For 2014, the broodstock requirement for the Chelan Falls summer Chinook program will be prioritized through broodstock collection of marked summer Chinook in the Eastbank Outfall (EBO). The total production level supported by this collection is up to 576,000 yearlings for the Chelan Falls program.

Collection at the Wells FH volunteer channel will be used to collect the broodstock necessary for the Wells FH yearling (320,000) and sub-yearling (484,000) programs.

Because of CCT concerns about sufficient natural origin fish reaching spawning grounds and to ensure sufficient NOR's being available to meet the CCT summer Chinook program, incorporation of natural origin fish for the Wells program or programs with broodstock originating from the Wells volunteer channel, will be limited to fish collected in the Wells volunteer channel. The following broodstock collection protocol was developed based on mitigation objectives and program assumptions (Table 9).

WDFW will target 544 run-at-large summer Chinook from the volunteer ladder trap at Wells Fish Hatchery outfall for the Wells sub-yearling and yearling programs and up to 160 for the YN 250K-350K egg request for the Yakima summer Chinook program. Additionally, per an HCP HC SOA dated June 20 2012, summer Chinook collection at the Wells volunteer channel may be used to support the Entiat NFH summer Chinook program. Due to fish health concerns associated with the volunteer collection site (warming Columbia River water during late August), the volunteer collection will begin 11 July and terminate by 31 August. Age-3 males ("jacks") will not be collected for broodstock.

Again for 2014, broodstock collection for the Chelan Falls summer Chinook program will be prioritized at the Eastbank Outfall (EBO) using in-channel seining/netting beginning July 1 (or earlier if summer Chinook are detected in the outfall) through September 15. Collection efforts in the EBO in 2013 were sufficient to meet the adult requirements for the Chelan Falls program. If shortfalls in adult needs are expected and the number of females needed to meet program has not been reached by August 15th , the HC will discuss options. The 2014 broodstock target for the Chelan Falls program is 322 adults. Age-3 males will not be incorporated into the broodstock. Confirmation of gender will be made at the time of collection using established ultrasonography techniques.

Deleted: broodstock collection may default to surplus summer Chinook from the Wells Volunteer channel to make up the difference

Table 9. Assumptions and calculations to determine the number of broodstock needed for summer/fall Chinook production goals for programs released at or below Wells Dam relying on adult collection at Wells Dam or Wells Hatchery in 2014.

Program Assumptions	**Standard**		**Wells FH**		**Chelan Falls FH[1/]**	**Yakama Nation**	
	Sub-yearling	**Yearling**	**Sub-yearling**	**Yearling**	**Yearling**	**Green eggs**	**Total**
Smolt release			**484,000**	**320,000**	**576,000**		**NA**
Green egg-to-release survival	76.1%	82.7%					NA
Eggtake target			**636,005**	**386,941**	**696,493**	**350,000[4/]**	**2,069,439**
Fecundity	4,475	4,475					
Female target			**142**	**86**	**156**	**78**	**462**
Female:Male ratio	1:1	1:1					
Broodstock target			**284**	**242[3/]**	**312**	**156**	**994**
Pre-spawn survival	97.1%	97.1%					
Total collection target			**294**	**268**	**322**	**160**	**1,026**

[1/]-The Well volunteer trap will only be a fallback broodstock source should efforts to acquire broodstock in the Eastbank outfall not provide sufficient females to meet production objectives.
[2/]-Adults for USFWS summer Chinook program in the Entiat River Basin.
[3/]- Includes 70 adults collected for the Lake Chelan triploid Chinook program.
[4/]- The YN request is for between 250K and 350K eggs.

Wenatchee River Basin

Spring Chinook

In 2014 the Eastbank Fish Hatchery (FH) is expecting to rear spring Chinook salmon for the Chiwawa River and Nason Creek acclimation facilities located on the Chiwawa River and Nason Creek. The program production level target for the Chiwawa program (Chelan PUD obligation) in 2014 is 144,026 smolts, requiring a total broodstock collection of 74 natural origin spring Chinook (Table 10).

The spring Chinook production obligation for Grant PUD in the Wenatchee Basin is 223,670 smolts (Table 10). Grant PUD's production was originally scripted to be met through a combination of 74,556 smolts in the White River and 149,114 smolts at Nason Creek. Consistent with agreements in the PRCC-PC SOA 2013-01, the White River production will be met through progeny produced at Nason Creek through 2026. Because the last brood year of White River captive brood adults were heavily diseased (BKD) and dying at a rate that would have likely not had any viable females remaining at the time of spawning, on February 5, 2014, NMFS issued a letter concurring with fish health recommendations to terminate the last of the adult side of the White River captive brood program. Consequently, the PRCC SOA identified credit of 75,000 smolts from the captive brood program toward meeting the 223K production obligation in 2014 is no longer applicable.

Table 10. Assumptions and calculations to determine the number of broodstock needed for a combined Nason/Chiwawa spring Chinook production goal of 367,696 smolts. For 2014, the Nason Creek production will be met through a combination of smolts produced through the Nason Creek conservation program and backfilling remaining production using HxH Chiwawa progeny at Chiwawa Ponds (contingent upon agreement between Chelan and Grant PUD's).

		Chiwawa	Nason Creek[1/]		
Program Assumptions	**Standard**	**Conservation**	**Conservation**	**Safety net**	**Wenatchee Basin Total**
Smolt Release		**144,026**	**125,000**	**98,670**	**367,696**
Fertilization-to-release survival	*85.0%*				
Total egg take target		169,442	147,059	116,082	**432,583**
Egg take (production)					
Cull allowance	*14.9%*			17,296	**449,879**
Fecundity	*4,684 W* *4,145 H*				
Female Target		36	31	32	**99**
Female to male ratio	*1:1*				
Broodstock target		72W	62W	64H	**198**
Pre-spawn survival	*97.7%W/97.7H*				
Total broodstock collection		**74W**	**64W**	**66H**	**204 (138W;66H)**

[1/] *Because Nason Creek is in its second year, hatchery performance values from the Chiwawa program were used as a surrogate to estimate the adult requirements for Nason Creek.*

Inclusion of natural origin fish into the broodstock will be a priority, with natural origin fish specifically being targeted. Consistent with ESA Section 10 Permit 18118 and 18121, natural origin fish collections will not exceed 33 percent of the expected return to the respective tributaries.

Pre-season estimates for age-4 and age-5 adults project a total of 3,263 (931 natural origin (28.5%) and 2,332 hatchery origin [71.5%]) spring Chinook back to Tumwater Dam in the Wenatchee Basin. Approximately 2,947 spring Chinook are destined for the Chiwawa River, of which 615 (20.9%) and 2,332 fish (79.1%) are expected to be natural and hatchery origin spring Chinook, respectively and approximately 233 natural origin spring Chinook are expected back to Nason Creek (Table 11). In-season assessment of the magnitude and origin composition of the spring Chinook return above Tumwater Dam will be used to provide in-season adjustments to hatchery/wild composition and total broodstock collection, consistent with ESA Section 10 Permit 18118 and 18121.

Table 11. Age-4 and age-5 class return projection for wild and hatchery spring Chinook to Tumwater Dam during 2014. Estimates were generated by a recently developed model (WDFW unpublished data).

	Chiwawa Basin			Nason Cr. Basin			Wenatchee Basin to Tumwater Dam		
	Age-4	Age-5	Total	Age-4	Age-5	Total	Age-4	Age-5	Total
Estimated wild return	466	149	**615**	177	56	**233**	706	225	**931**
Estimated hatchery return	1,623	12	**1,635**				2,166	166	**2,332**
Total	2,089	161	**2,250**	177	56	**233**	**2,872**	**391**	**3,263**

DRAFT 2014 Nason/Chiwawa Program Implementation Options:

1) As a temporary (one year) solution to broodstock collection, parental based (PBT) genetic assignment of adults collected at Tumwater Dam back to at least one adult reasonably considered to have spawned in Nason Creek and the Chiwawa River (based upon last know detection at either an in-stream array, live hit, or carcass recovery).

   - Of the sampled fish arriving at TWD we estimate greater than 90% assignment success to at least one parent using a single nucleotide polymorphisms (SNPs) panel (Michael Ford [NMFS], RPA Rollup Annual Report. 2013). Based on the 2010 spawners (parents) and 2012 smolts (progeny), assignments based on data from the SNP panel provided equivalent or better resolution of parentage than we obtained for prior broods based on microsatellite loci. Of 1,432 progeny analyzed, 1,167 assigned to two parents (81.5%), 208 to a female parent only (14.5%), 47 to a male parent only(3.3%), and 10 to no parent (0.7%; Ford, 2013).
   - Through a combination of existing remote PIT tag detection antenna arrays within Nason Creek and the Chiwawa River and detections of individual spawners during spawning ground surveys (live hits and carcasses), we estimate that about 77.0%,

62.6%, 75.9% of the parental generation can be identified to Nason Creek, the Chiwawa River, and other locations (e.g. White River, Little Wenatchee River, and Chiwaukum Creek, repsectively.

- Based on these rates, we anticipate that spawning tributary can be identified for up to67.3%- of the total run of NOR adult progeny returning to Tumwater Dam. Unidentified NORs will be released above Tumwater Canyon.

The safetynet component of the Nason Creek program will be met through collection of 66 hatchery orign adults from the Chiwawa program, collected at Tumwater Dam. The progeny will be acclimated and released from the Chiwawa acclimation facility. (contingent upon Agreement between Chelan and Grant PUDs). Additionally, while increasing the number of juveniles released from the Chiwawa facility will increase the number of HO adults returning from this brood year, implementation of adult management at Tumwater Dam will limit the total number of HO's above Tumwater Dam. -Placeholder for how many NO adults would need to be collected at TWD to achieve the 64 and 74 wild adults for the Nason and Chiwawa conservation programs, respectively. Additional language needs to be inserted here describing uncertainties and limitations of this methodology as well as process for review and approval.

Trapping

Because broodstock collection will initially run concurrent with the Reproductive Success Studies (RSS) already taking place at Tumwater Dam, we will initially target brood collection on a Monday – Friday time frame to more closely fit with Hatchery staff scheduling.

Trapping at Tumwater Dam will be consistent with operational protocols approved by the respective Committees and pending NMFS and USFWS concurrence. If broodstock collection occurs outside of activities under the RSS, trapping will default to Section 10 Permits 18118 and 18121 conditions of no more than 3-days per week up to 16 hours per day (48 cumulative hours per week). Broodstock collection will begin the first week of May.

On each day of trapping, at least one hatchery personnel will be on site with a transport vehicle complete with recirculation ability and oxygen/stones. As RSS personnel work up a wild fish, gender ID will be made using a Honda 110V portable ultrasound machine, DNA (fin clips) will be collected and each fish will receive a PIT tag in the pelvic girdle. To facilitate the timely processing of fish through the Tumwater facility, hatchery personnel will take fish identified for broodstock from RSS staff and place it into the transport truck. At no time will broodstock be placed into or held in temporary tanks on the deck. When an appropriate number of fish have been loaded onto the transport truck (this number will depend upon the size and type of vehicle) or if the weekly broodstock quota has been met, fish will be transported to Eastbank FH (EBFH) for holding. All fish transfers will occur water to water.

Adult Holding/Sorting

Up to four adult raceways are expected to be utilized for holding and sorting spring Chinook collected for broodstock. As the first week of collection is completed, (and placed into a single raceway) genetic samples will be submitted to the genetics lab for processing. Preliminarily we anticipate approximately one to two weeks for the samples to be run and results available (still awaiting a reply back from Mike Ford regarding timelines to run samples and provide results. WDFW could run the samples however Kens SNP panel is not the same as Mikes and won't speak to his data cleanly). During holding, fish will only receive formalin treatments to prevent external fungus. Antibiotics and other treatments will only be used on broodstock retained for the programs.

When assignments have been provided, hatchery and M&E staff will sort by PIT tag. Fish to be retained for broodstock will be placed into their respective vessels (i.e., Chiwawa in one pond and Nason in another). All remaining fish will be placed onto transport trucks and released at the Swift Water campground (RKM yet to be determined), well above Tumwater Dam.

Using PIT tags (and possible carcass recoveries), fish not retained for broodstock and released, will be evaluated for post release behavior, survival and spawning success when possible. The 2013 results from the 95 NO fish collected trapped at Tumwater Dam, transferred to and held at EB and returned to the Wenatchee River had a 71.6% post release survival to a tributary (compared to about 38% for fish trapped and released at Tumwater Dam).

2) Produce 100% of the Nason and Chiwawa mitigation programs using hatchery adults returning and release them from the Chiwawa Ponds facility. All progeny would be adipose clipped and coded wire tagged to facilitate meeting PNI objectives in the future.

   - A total of 248 hatchery origin adults from the Chiwawa program will be collected at Tumwater Dam to meet the aggregated 367,696 spring Chinook production obligation in the Wenatchee Basin. Fish will be acclimated and released from the Chiwawa Ponds acclimation facility. If hatchery broodstock are to be collected during a window outside when the RSS is ongoing, operation of Tumwater Dam will follow a not to exceed 3-days per week, 16 hours per day to minimize potential delay.

   - Additional language needs to be inserted here describing uncertainties and limitations of this methodology as well as process for review and approval.

3) Collect natural origin fish for the Nason and Chiwawa conservation programs in the tributaries (via the Chiwawa Weir and tangle netting in Nason Creek). Potential shortfalls in meeting the respective conservation programs will be secured by retaining sufficient HO adults at Tumwater Dam. Additional language needs to be inserted here describing uncertainties and limitations of this methodology as well as process for review and approval.

   - *Chiwawa Weir:*

      - Collection of natural origin spring Chinook for the Chiwawa conservation program at the Chiwawa Weir will be based on weekly quotas, consistent with average run timing at Tumwater Dam. If the weekly quota is attained prior to the end of the week, retention of spring Chinook for broodstock will cease. If the weekly quota is not attained, the shortfall will carry forward to the next week. The number of hatchery origin fish retained for broodstock will be adjusted in-season, based on estimated Chiwawa River natural-origin returns provided through extrapolation of returns past Tumwater Dam. If hatchery origin Chinook are retained in excess to that required to maintain a minimum 33% natural origin composition in the broodstock, excess fish will be sampled, culled and either used for nutrient enhancement or disposed of in a landfill depending upon fish health staff recommendations.

- Broodstock collection at the Chiwawa Weir will begin 01 June and terminate no later than 11 September. Spring Chinook trapping at the Chiwawa Weir will follow a 4-days up and 3-days down schedule, consistent with weekly broodstock collection quotas that approximate the historical run timing and a maximum 33 percent retention of the projected natural-origin escapement to the Chiwawa River. If the weekly quota is attained prior to the end of the 4-day trapping period, trapping will cease. If the weekly quota cannot be accomplished with a 4-days up and 3-days down schedule, a 7-day per week schedule may be implemented to facilitate reaching the collection objectives. Under the 7-day per week schedule, no more than 33% (1 in 3) of the fish collected will be retained for broodstock. If the weekly quota is not attained within the trapping period, the shortfall will carry forward to the next week.

- All spring Chinook in excess of broodstock needs and all bull trout trapped at the Chiwawa weir will be transported by tank truck and released into a resting/recovery pool at least 16.0 km upstream from the Chiwawa River Weir.

- Any shortfall in expected natural origin broodstock for the Chiwawa conservation program will be offset with collection of hatchery origin adults at Tumwater Dam during adult management activities and only surplussed if a shortfall is not realized. Age-3 males ("jacks") will not be collected for broodstock (age-3 natural origin males may be considered if needed to maintain effective population size).

- Use of the Chiwawa Weir will be contingent upon authorization by the USFWS and operations will be scaled to minimize the threat to the conservation and recovery of bull trout.

- *Tangle Netting*

  - Conduct tangle netting for NO broodstock in Nason Creek over a two week period (not to exceed 10 total days (beginning around the week of July 28 and terminating August 8 – the actual dates will be based upon evaluation of PIT tag array data in Nason Creek which indicates sufficient fish have entered to begin the collection effort). Cessation of tangle net activities will be directed by; 1) When the targeted number of adults have been acquired, 2) The method proves ineffective, 3) water temperatures are in excess of 21ºC (or if fish, as they are collected, exhibit excessive handling stress), or 4) encounters of bull trout are in excess of what would be considered reasonable and prudent for this type of activity or poses a significant threat to the conservation and recovery of bull trout.

- Tangle netting activities beyond the two week period will require re-engagement of the HSC and regulatory parties to determine if there is support to do so.

- A number of measures will be implemented to ensure minimal negative interaction with bull trout (we can't reasonably expect that no bull trout will be encountered). Those measures are:

  - Primary wild spring Chinook spawning areas will be identified using historical NOR spawning data collected through the Wenatchee Spring Chinook Relative Reproductive Success study.

  - Only those areas (pools) of the river immediately above and below the spawning areas will be targeted for netting rather than a randomized approach which could increase bull trout encounters.,

  - Targeted pools will be snorkeled to determine what, if any level of bull trout presence exists. If bull trout are not observed or if they are located in an area that can be avoided by the netting while targeting Chinook then the crews will proceed.,

  - If a bull trout is incidentally caught in the net, it will be immediately removed and released, preferably in an area that it isn't likely to be re-encountered.,

  - If more bull trout are encountered than is reasonable and prudent, all netting activities will cease.

- To ensure the full Nason Creek mitigation is achieved, up to 152 hatchery origin adults will be collected at Tumwater Dam and retained at EB until the size of the Nason Creek conservation program can be determined. Progeny will be adipose clipped and coded wire tagged and reared/released at Chiwawa Ponds contingent upon agreement between Grant and Chelan PUD's

Broodstock collection will start at Tumwater Dam on or about the week beginning May 1 depending upon run timing. Weekly broodstock goals were developed based upon targeting the middle 90% of the spring Chinook return (Table 12). Due to variability in run timing between years, adjustments may be made in-season using passage of spring Chinook at Rock Island Dam, the lower Wenatchee PIT tag array, and passage of spring Chinook over Tumwater Dam. If the weekly quota is attained prior to the end of the trapping period, broodstock trapping will cease. If the weekly quota is not attained within the trapping period, the shortfall will carry forward to the next week.

Table 12. Weekly target of natural origin adult spring Chinook for Nason Creek and Chiwawa River conservation programs in 2014. –To be developed.

	Week Beginning	Total
	Natural Origin	
Females		
Males		
	Hatchery Origin	
Female		
Male		
Total		

Steelhead

The steelhead mitigation program in the Wenatchee Basin use broodstock collected at Dryden and Tumwater dams located on the Wenatchee River. Per ESA section 10 Permit 1395 provisions, broodstock collection will target adults necessary to meet a 50% natural origin – conservation oriented program and a 50% hatchery origin – safety net program, not to exceed 33% of the natural origin steelhead return to the Wenatchee Basin. Based on these limitations and the assumptions listed below (Table 13), the following broodstock collection protocol was developed.

WDFW will retain a total of 130 mixed origin steelhead for broodstock for a smolt release objective of 247,300 smolts (Table 13). The 66 hatchery origin adults will be targeted at Dryden Dam and if necessary Tumwater dam. The 64 natural origin adults will be targeted for collection at Tumwater Dam. Collection will be proportional to return timing between 01 July and 14 November. Collection may also occur between 15 November and 5 December at both traps, concurrent with the Yakama Nation coho broodstock collection activities. Hatchery x wild and hatchery x hatchery parental cross and unknown hatchery parental cross adults will be excluded from the broodstock collection. Hatchery steelhead parental origins will be determined through evaluation of VIE tags, adipose/CWT presence/absence, and PIT tag interrogation during collection. Adult return composition including number, origin, age structure, and sex ratio will be assessed in-season at Priest Rapids and at Dryden Dam. In-season broodstock collection adjustments may be made based on this monitoring and evaluation. To better assure achieving the appropriate females equivalents for program production, the collection will implement the draft Production Management Plan, including ultrasonography to determine the sex of each fish retained for broodstock.

In the event steelhead collections fall substantially behind schedule, WDFW may initiate/coordinated adult steelhead collection in the mainstem Wenatchee River by hook and line. In addition to trapping and hook and line collection efforts, Tumwater and Dryden dams may be operated between February and early April the subsequent spring to supplement broodstock numbers if the fall trapping effort provides fewer than the required number of adults.

Table 13. Assumptions and calculations to determine the number and origin of 2015 brood Wenatchee summer steelhead broodstock needed for Wenatchee Basin program release of 247,300 smolts.

Program Assumptions	Standard	Conservation	Safety Net	Full Program
Smolt Release		**123,650**	**123,650**	**247,300**
Fertilization-to-release survival	*70.2%*			
Egg take target		176,140	176,140	**352,280**
Fecundity	*5,930 H* *5,787 W*			
Female Target		**31**	**30**	**30 H** **31 W**
Female to male ratio	*1:1*			
Broodstock target		**62**	**60**	**122**
Pre-spawn survival	*90.7%H/97.1%W*			
Total broodstock collection		**64**	**66**	**130**

Summer/fall Chinook

Summer/fall Chinook mitigation programs in the Wenatchee River Basin utilize adult broodstock collections at Dryden and Tumwater dams, incubation/rearing at Eastbank Fish Hatchery (FH) and acclimation/release from the Dryden Acclimation Pond. The total production level target for BY 2014 is 500,001 smolts (181,816 GCPUD mitigation and 318,185 CCPUD mitigation).

The TAC 2014 Columbia River UCR summer Chinook return projection to the Columbia River (Appendix A) and BY 2009, 2010 and 2011 spawn escapement to the Wenatchee River indicate sufficient summer Chinook will return to the Wenatchee River to achieve full broodstock collection for the Wenatchee River summer Chinook supplementation program. Review of recent summer/fall Chinook run-timing past Dryden and Tumwater dam indicates that previous broodstock collection activities have omitted the early returning summer/fall Chinook, primarily due to limitations imposed by ESA Section 10 Permit 1347 to minimize impacts to listed spring Chinook. In an effort to incorporate broodstock that better represent the summer/fall Chinook run timing in the Wenatchee Basin, the broodstock collection will front-load the collection to account for the disproportionate collection timing. Approximately 43% of the summer/fall Chinook destined for the upper Basin (above Tumwater Dam) occurs prior to the end of the first week of July; therefore, the collection will provide 43% of the objective by the end of the first week of July. Weekly collection after the first week of July will be consistent with run timing of summer/fall Chinook during the remainder of the trapping period. With concurrence from NMFS, summer Chinook collections at Dryden Dam may begin up to one week earlier. Collections will be limited to a 33% extraction of the estimated natural-origin escapement to the Wenatchee Basin. Based on these limitations and the assumptions listed below (Table 14), the following broodstock collection protocol was developed.

WDFW will retain up to 278 natural-origin, summer Chinook at Dryden and/or Tumwater dams, including 139 females. To better assure achieving the appropriate females for program production, the collection will implement the draft Production Management Plan, including ultrasonography to determine the sex of each fish retained for broodstock. Trapping at Dryden Dam may begin 01 July and terminate no later than 15 September and operate up to 7-days/week, 24-hours/day. Trapping at Tumwater Dam if needed may begin 15 July and terminate no later than 15 September and operate up to 48 hours per week for broodstock related activities.

Table 14. Assumptions and calculations to determine the number of 2014 brood Wenatchee summer Chinook salmon broodstock needed for Wenatchee Basin program release of 500,001 smolts.

Program Assumptions	Standard	Grant PUD	Chelan PUD	Total Wenatchee Program
Smolt Release		**181,816**	**318,185**	**500,001**
Fertilization-to-release survival	*77.8%*			
Egg take target		**233,697**	**408,978**	**642,675**
Fecundity	*5,099*			
Female Target		**46**	**80**	**126**
Female to male ratio	*1:1*			
Broodstock target		**92**	**160**	**252**
Pre-spawn survival	*90.5%*			
Total broodstock collection		**102**	**176**	**278**

Priest Rapids Fall Chinook

Collection of fall Chinook broodstock at Priest Rapids Hatchery will generally begin in early September and continue through about mid-November. Juvenile release objectives specific to Grant PUD (5,599,504 sub-yearlings), Federal (1,700,000 sub-yearlings + 3,500,000 eggs – collection of broodstock for the federal programs are conditional upon having contracts in place with the ACOE and concurrence that Section 10 permit coverage exists for the ACOE programs), mitigation commitments. Biological assumptions are detailed in Table 15. Smolt release objectives for Ringold Springs occur as green eggs collected at Priest Rapids FH and incubated at Bonneville prior to eyed-egg transfers to Ringold Springs.

For 2014, up to 1,000 adipose present, non-coded wire tagged (presumed wild) fall Chinook adults will be targeted at the OLAFT (as approved by the PRCC-HSC). Additional NOR adults targeted as a continued pilot evaluation through hook-and-line angling efforts in the Hanford Reach to increase the proportion of natural origin adults in the broodstock to meet integration of the hatchery program will also be incorporated into the program. Close coordination between broodstock collections at the volunteer channel, the OLAFT and through hook-and-line efforts in the Hanford Reach will need to occur so over collection is minimized. Presumed NOR's collected and spawned from either hook-and-line caught broodstock or OLAFT collections will be prioritized for PRH programs (i.e. OLAFT and Hanford Reach fish will be held in a separate raceways from volunteer collected fish, spawned first each week, and to the extent possible segregated and reserved for the GPUD program).

Grant PUD staff will work closely with WDFW hatchery and M&E staff to maintain separation of gametes/progeny of OLAFT and angling collected adults at spawning and through incubation/early rearing.

Based upon the biological assumptions in Table 15, an estimated 3,524 females will need to be spawned to meet the 12,413,223 eggs required to meet the current three up-river bright (URB) programs which rely on adults collected at the Priest Rapids Hatchery volunteer channel trap, hook-and-line efforts on the Hanford Reach, and/or the Priest Rapids Dam off ladder trap (OLAFT).

To increase the probability of incorporating a higher percentage of NOR's from the volunteer channel, adipose present, non-CWT males and females will be prioritized for retention.

<u>Implementation Assumptions</u>

1) Broodstock may be collected at any or all of the following locations/means: the PRD off ladder trap (OLAFT – operated 4-days per week/8 hrs/day to collect up to 1,000 presumed NOR's), hook-and-line angling in the Hanford Reach (actual numbers collected are uncertain but will contribute to the overall brood program and pNOB), and the Priest Rapids Hatchery volunteer channel trap.

2) Assumptions used to determine egg/adult needs is based upon current program performance metrics.

3) Broodstock retained from the volunteer channel will exclude age-2 and 3 males (using length at age; i.e. retain males ≥ 75 cm) to address genetic risks/concerns of younger age-at-maturity males producing offspring which return at a younger age (decreased age-at-maturity) and also decrease the probability of using hatchery origin fish in the broodstock that are skewed towards earlier ages at maturity.

4) Only adipose present, non-CWT males and females will be retained for broodstock from volunteer channel collected broodstock unless a shortage is expected.

5) Only progeny of adipose present, non-wired fish encountered through hook-and-line angling and at the OLAFT will be prioritized for retention into the program.

6) Broodstock collected from the OLAFT and by hook-and-line will exclude age-2 and to the degree possible age-3 fish (<75 cm) to minimize genetic risks/concerns of younger age-at-maturity males producing offspring which return at a younger age (decreased age-at-maturity) and to ensure the highest proportion of NOR's in the collection (e.g. collection of 1 in 5 age-3 fish for broodstock from the OLAFT).

7) All gametes of fish spawned from hook-and-line broodstocking efforts and/or OLAFT collections will be incorporated into the GCPUD program.

8) Should the PRCC-HSC reach consensus, presumptive NO males may be spawned with more than 2 females and estimates of pNOB may be adjusted based upon how many HO females a NO male is crossed (i.e. spawned) with (effective pNOB). Prior to agreement by the HSC, the HSC will consult with geneticists to balance competing genetic risks. -.

Table 15. Assumptions and calculations to determine the number of fall Chinook salmon broodstock needed for a non-actively integrated Priest Rapids program release of 7,299,504 sub-yearling fall Chinook and 3,500,000 eggs for Ringold, in 2014.

Program Assumptions	Standard		Program objective
Juvenile Production Level			
Grant PUD Mitigation-PUD Funded			**5,325,543 smolts** **273,961 smolts[3/-]**
John Day Mitigation-Federally Funded			**1,700,000 smolts**
John Day Mitigation [1]-Ringold Springs-ACOE funding.			**3,500,000 eggs**
Total Program Objectives			**10,799,504 eggs/ smolts**
Fertilization-to-release survival	*87%*		
Egg take target			**12,413,223**
Fecundity Age-4+(~56%)	*4,300*		1,617
Age-3 (~44%)	*3,680*		1,484
Female Target			**3,101**
Female to male ratio	*2:1*		
Pre-spawn survival	*88%*		
Broodstock target	**Total**	**Volunteer Trap**	**OLAFT**
Females	***3,524***	**2,611**	**670[4/-]**
Males	***1,762***	**1,311**	**330[4/-]**
Total broodstock collection	**5,286**	**3,922**	**1,000**
Estimated NOR's from OLAFT	**540[2/-]**		
Estimated 2014 minimum pNOB	**0.102[5/-]**		

[1/-] As of brood year 2009, Priest Rapids Hatchery is taking 3,500,000 eggs for release at Ringold-Meseberg Hatchery funded by the ACOE – incubation of this program occurs at Bonneville. Section 10 permit coverage is still uncertain at this time which may complicate implementation of the 3.5M Ringold program.

[2/-]Estimated NOR's assumes a minimum of 178 wild males using them in the 2:1 F:M ratio and no more than 362 wild females. If the number of wild males is increased (the number of NOR females would decrease).
[3/-]The PRCC-HSC agreed upon smolt production by conversion of the 1M fry obligation.
[4/-]Estimated number of fall Chinook females and males acquired from the OLAFT in 2014.
[5/-]Trap and transport activities at the OLAFT, should they be required during the fall migration period as a result of the Wanapum pool drawdown, could disrupt fall Chinook broodstocking at the OLAFT. If this occurs, pNOB will likely be well below the estimated level. However success of the hook and line effort to collect NOR's may help to offset the loss of NORs from the OLAFT.

Columbia River Mouth Fish Returns Actual and Forecasts**

			2013 Forecast	2013 Return	2014 Forecast
Spring Chinook	**Total Spring Chinook**		**225,000**	**195,200**	**308,000**
	Willamette		59,800	47,300	58,700
	Sandy		6,100	5,700	5,500
	Cowlitz*		5,500	9,500	7,800
	Kalama*		700	1,000	500
	Lewis*		1,600	1,600	1,100
	Select Areas		9,900	7,000	7,400
	Lower River total		**83,600**	**72,100**	**81,000**
	Wind*		3,000	3,600	8,500
	Drano Lake*		4,900	7,300	13,100
	Klickitat*		2,200	1,800	2,500
	Yakima*		7,300	7,100	9,100
	Upper Columbia	Total	14,300	18,000	24,100
	Upper Columbia	*Wild*	*1,600*	*3,600*	*3,700*
	Snake River Spring/Summer	Total	58,200	67,300	125,000
	Snake River	*Wild*	*18,900*	*21,900*	*42,200*
	Upriver Total		**141,400**	**123,100**	**227,000**
Summer Chinook	**Upper Columbia**	**Total**	**73,500**	**67,600**	**67,500**
Sockeye	Wenatchee		44,600	36,000	63,400
	Okanogan		134,500	149,000	282,500
	Snake River	*Wild*	*1,250*	*1,100*	*1,200*
	Total Sockeye		**180,500**	**186,100**	**347,100**
Steelhead					
Winter	Wild winter steelhead	Wild	15,700	15,600	16,100
Upriver Summer (to Bonneville Dam)	Upriver Skamania Index	**Total**	**16,600**	**5,800**	**8,600**
		Wild	*5,300*	*1,700*	*2,300*
	Group A-run Index	**Total**	**291,000**	**214,100**	**241,400**
	Wild		*83,500*	*90,500*	*82,400*
	Group B-run Index	**Total**	**31,600**	**11,500**	**31,000**
		Wild	*7,900*	*2,900*	*6,500*
	Total Upriver Steelhead	**Total**	**339,200**	**231,400**	**281,000**
		Wild	*96,700*	*95,100*	*91,200*

*Return to tributary mouth **Totals may not sum due to rounding 26-Feb-14

Appendix B

DRAFT

Hatchery Production Management Plan

The following management plan is intended to provide life-stage-appropriate management options for Upper Columbia River (UCR) PUD salmon and steelhead mitigation programs. Consistent, significant over-production or under-production risks the PUD's not meeting the production objectives required by FERC and overages in excess of 110% of program release goals violates the terms and conditions set forth for the implementation of programs under ESA and poses potentially significant ecological risks to natural origin salmon communities.
Under RCW 77.95.210 (Appendix A) as established by House Bill 1286, the Washington Department of Fish and Wildlife has limited latitude in disposing of salmon and steelhead eggs/fry/fish. While this RCW speaks more specifically to the sale of fish and/or eggs WDFW takes a broader application of this statute to include any surplus fish and/or eggs irrespective of being sold or transferred.
We propose implementing specific measures during the different life-history stages to both improve the accuracy of production levels and make adjustments if over-production occurs. These measures include (1) Improved Fecundity Estimates, (2) Adult Collection Adjustments, (3) Within-Hatchery Program Adjustments, and (4) Culling.

<u>Improved Fecundity Estimates</u>

A) Develop broodstock collection protocols based upon the most recent 5-year mean in-hatchery performance values for female to spawn, fecundity, green egg to eye, and green egg to release.

B) Use portable ultrasound units to confirm gender of broodstock collected (broodstock collection protocols assume a 1:1 male-to-female ratio). Ultrsonography, when used by properly trained staff will ensure the 1:1 assumption is met (or that the female equivalents needed to meet production objective are collected). Spawning matrices can be developed such that if broodstock for any given program are male limited sufficient gametes are available to spawn with the females.

<u>Adult Collection Adjustments</u>

C) Make in-season adjustments to adult collections based upon a fecundity-at-length regression model for each population/program and origin composition needs (hatchery/wild). This method is intended to make in-season allowances for the age structure of the return (i.e. age-5 fish are larger and therefore more fecund than age-4 fish), but will also make allowances for age-4 fish that experienced more growth through better ocean conditions compared to an age-5 fish that reared in poorer ocean conditions.

<u>Within-Hatchery Program Adjustments</u>

D) At the eyed egg inventory (first trued inventory), after adjustments have been made for culling to meet BKD management objectives, the over production will be managed in one or more of the following actions as approved by the HCP-HC:

- Voluntary cooperative salmon culture programs under the supervision of the department under chapter 77.100 RCW;
- Regional fisheries enhancement group salmon culture programs under the supervision of the department under this chapter;
- Salmon culture programs requested by lead entities and approved by the salmon funding recovery board under chapter 77.85 RCW;
- Hatcheries of federally approved tribes in Washington to whom eggs are moved, not sold, under the interlocal cooperation act, chapter 39.34 RCW; and
- Governmental hatcheries in Washington, Oregon, and Idaho; or
- Culling for diseases such as BKD and IHN, consistent with the Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State; or
- Distribution to approved organizations/projects for research.

E) At tagging (second inventory correction) fish will be tagged up to 110% of production level at that life stage. If the balance of the population combined with the tagged population amounts to more than 110% of the total release number allowed by Section 10 permits then the excess will be distributed in one or more of the following actions as approved by the HCP-HC:

- Voluntary cooperative salmon culture programs under the supervision of the department under chapter 77.100 RCW;
- Regional fisheries enhancement group salmon culture programs under the supervision of the department under this chapter;
- Salmon culture programs requested by lead entities and approved by the salmon funding recovery board under chapter 77.85 RCW;
- Hatcheries of federally approved tribes in Washington to whom eggs are moved, not sold, under the interlocal cooperation act, chapter 39.34 RCW; and
- Transfer to another resource manager program such as CCT, YN, or USFWS program;

- Governmental hatcheries in Washington, Oregon, and Idaho;
- Placement of fish into a resident fishery (lake) zone, provided disease risks are within acceptable guidelines; or
- Culling for diseases such as BKD and IHN, consistent with the Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State; or
- Distribution to approved organizations/projects for research.

F) In the event that a production overage occurs after the above actions have been implemented or considered, and deemed non viable for fish health reasons in accordance with agency aquaculture disease control regulations (i.e. either a pathogen is detected in a population that may pose jeopardy to the remaining population or other programs if retained or could introduce a pathogen to a watershed where it had not previously been detected) then culling of those fish may be considered.

All, provisions, distributions, or transfers shall be consistent with the department's egg transfer and aquaculture disease control regulations as now existing or hereafter amended. Prior to department determination that eggs of a salmon stock are surplus and available for sale, the department shall assess the productivity of each watershed that is suitable for receiving eggs.

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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	June 18, 2014
From:	Mike Schiewe, Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the May 28, 2014 HCP Hatchery Committees Conference Call		

A Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees' meeting was held by conference call on Wednesday, May 28, 2014, from 9:00 am to 9:30 am. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- Mike Tonseth will send a copy of the Washington Department of Fish and Wildlife (WDFW) Wenatchee Fishery Notification letter to Kristi Geris for distribution to the Hatcheries Committees; WDFW submits this letter to the National Marine Fisheries Service (NMFS) as part of the process to authorize a conservation fishery (Item II-A).

DECISION SUMMARY

- The Hatchery Committees representatives present approved the draft Chiwawa Spring Chinook Broodstock Collection Protocol, with the U.S. Fish and Wildlife Service (USFWS) abstaining. The Colville Confederated Tribes (CCT) approved the draft protocol via email following the call on May 28, 2014 (Item II-A).

AGREEMENTS

- There were no agreements discussed during today's conference call.

REVIEW ITEMS

- Kristi Geris distributed a memo to the Hatchery Committees on February 24, 2014, which clarified standardized methods for Hatchery Monitoring and Evaluation Plan

Objective 8.3, Fecundity at Size. Comments on this memo, with regard to sample size, are due to Mike Tonseth.

- Kristi Geris sent an email to the Hatchery Committees on April 16, 2014, notifying them that the draft Non-Target Taxa of Concern Modeling Report is out for a 60-day review period, with comments due to Greg Mackey no later than Monday, June 16, 2013.

FINALIZED DOCUMENTS

- There are no documents that have been recently finalized.

I. Welcome and Agenda Review

Mike Schiewe welcomed the Hatchery Committees and said that the purpose of this call is to review the draft Chiwawa Spring Chinook Broodstock Collection Protocol (Attachment B), which was distributed to the Hatchery Committees by Kristi Geris on May 20, 2014.

II. WDFW

A. Draft Chiwawa Spring Chinook Broodstock Collection Protocol (Mike Tonseth)

Mike Tonseth said that no comments have been received on the draft protocol. He said that Step 1 is what has been previously discussed—targeting hatchery-origin Chiwawa adults (HORs) at Tumwater Dam to meet the numerical program objective if insufficient natural-origin Chiwawa adults (NORs) are captured. He said that Step 2 is targeting previously passive integrated tranponder-tagged NORs at Tumwater Dam and Step 3 is operation of the Chiwawa Weir. He said that following the last joint NMFS/USFWS Biological Opinion Coordination Meeting, several Hatchery Committees representatives convened to develop sideboard language for operating the Chiwawa Weir. He said that, as outlined in Step 3 of Attachment B, this included targeting up to 74 NORs between June 15 and August 15, 2014, and operating the weir a maximum of 15 total days during the 60-day window or until 67 bull trout have been encountered. He said that if the NOR broodstock target is not reached after 15 days of weir operation, 67 bull trout encounters, or August 15, 2014, the program will be backfilled with HORs already collected at Tumwater Dam. He added that Step 1 and Step 2 will occur simultaneously, and the amount of NORs collected will decrease the number of HORs retained for the Chiwawa program.

Lynn Hatcher asked how proportionate natural influence (PNI) will be addressed. Tonseth said that PNI will be addressed in a separate Adult Management Plan, which will likely be distributed to the Joint Fisheries Parties for review by today or tomorrow. Keely Murdoch asked about the NOR run size forecast. Tonseth replied that it is 931 NORs to Tumwater Dam, which includes all spawning aggregates, including 615 Chiwawa NORs and 233 Nason NORs. Murdock noted that if those numbers are accurate, then the run size is at the top of the sliding scale in the Wenatchee Spring Chinook Management Plan. Tonseth agreed and said that he expects to surplus about half of the HORs, which after pre-spawn mortality, will result in almost 900 total spring Chinook to the Chiwawa Basin. He added that these numbers are greater than the interim spawning target outlined in the Spring Chinook Management Plan. Bill Gale asked who the primary author of this information was. Tonseth replied that he compiles these data, but a document will come from Jeff Korth (WDFW). Tonseth said that the information is part of the Fishery Notification that WDFW will send to NMFS. He said that if the projected numbers hold true, 0.71 PNI can be expected. He said that the notification will include expected PNI and percent hatchery-origin spawners in the Chiwawa River, as well as other information including the disposition of the fish collected. He said that he will distribute the NMFS Fishery Notification from WDFW to the Hatchery Committees when it is completed.

The Hatchery Committees representatives present approved the draft Chiwawa Spring Chinook Broodstock Collection Protocol. Gale said that although USFWS approves of the sideboard language developed for operation of the Chiwawa Weir, USFWS will abstain from voting because of permitting issues. Kirk Truscott indicated via email following the call on May 28, 2014, that the CCT also approves the draft protocol. Tonseth said that the approved Chiwawa Spring Chinook Broodstock Collection Protocol will replace the existing Chiwawa language in the draft 2014 Broodstock Protocols, and will move forward as the plan for 2014.

III. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees' meetings are on June 18, 2014 (Chelan PUD); July 16, 2014 (Douglas PUD); and August 20, 2014 (Chelan PUD).

List of Attachments

Attachment A	List of Attendees
Attachment B	Draft Chiwawa Spring Chinook Broodstock Collection Protocol

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Alene Underwood*	Chelan PUD
Lynn Hatcher*	National Marine Fisheries Service
Bill Gale*	U.S. Fish and Wildlife Service
Keely Murdoch*	Yakama Nation
Mike Tonseth*	Washington Department of Fish and Wildlife

Notes:

* Denotes Hatchery Committees member or alternate

DRAFT 2014 Hybrid Broodstock Collection for the *Chiwawa River* Spring Chinook Conservation Program

Step 1: Collect up to 74 (37 females and 37 males) hatchery origin (Chiwawa) adults from Tumwater Dam. This will be sufficient adults to meet the 144,026 aggregated smolt release for the Chiwawa spring Chinook program, in the event insufficient NORs are captured for the program.

Step 2: Target natural origin adults (NOR) at Tumwater Dam that were PIT tagged as juveniles in the Chiwawa River. Use detections at Bonneville Dam and application of a geometric mean conversion to Tumwater Dam (Table 1) to estimate the number of NOR's that can likely be collected for broodstock at Tumwater Dam to reduce the level of tributary effort needed to meet the conservation program.

Table 1. PIT tagged natural origin adults to Tumwater Dam for the most recent 5-years (2009-2013) with conversion rates from Bonneville Dam.

	Detections at Bonneville Dam		Detections at Tumwater Dam			
Return year	Nason	Chiwawa	Nason	Conversion rate	Chiwawa	Conversion rate
2009	3	29	1	0.333	24	0.828
2010	15	78	2	0.133	62	0.795
2011	16	115	12	0.750	81	0.704
2012	7	60	5	0.714	52	0.867
2013	2	29	2	1.000	22	0.759
Mean	8.6	62.2	4.4	0.586	48.2	0.790
Geomean	6.3	53.8	3.0	0.474	42.5	0.788

Step 3: Operate the Chiwawa Weir on a 24-hour up/24-hour down schedule to minimize potential delay of bull trout and spring Chinook and to minimize the total number bull trout trapped/handled beginning June 15 through August 15 (per Section 10 permit 18121). The balance of production not met from NORs acquired through collection of previously PIT tagged fish at TWD and collection of NORs at the Chiwawa Weir for the Chiwawa conservation program will be met through hatchery origin adults collected at TWD (see step 1).

Specific Actions:

- Target up to 74 natural origin spring Chinook (37 females or up to 33% of the NOR component to the Chiwawa River) between 15 June and 15 August, operating the weir a maximum of 15 total days during the 60d window.

- Operate the weir under a 24 hr up/24 hr down to minimize migrational delay of bull trout and spring Chinook.

- If after 15-days of weir operation, 67 bull trout encounters, or 15 August, the NOR broodstock target is not reached, the balance of the mitigation obligation will be met through hatchery fish already retained for the Chiwawa program at TWD.

- Use historic data about NOR spring Chinook timing to the lower Chiwawa array from TWD to determine optimal dates for collection.

- Immediately remove bull trout that are caught at the Chiwawa trap and release them to a site ~10KM upstream of the weir to prevent fallback/impingement and to mitigate for potential delay. Handling and transport will be conducted by WDFW hatchery staff.

- If a bull trout is killed during trapping, despite implementing conservation measures, trapping activites will cease and not continue until additional measures to minmize risks to bull trout can be discussed with the USFWS.

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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	July 16, 2014
From:	Mike Schiewe, Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the June 18, 2014 HCP Hatchery Committees Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees' meeting was held at Chelan PUD headquarters in Wenatchee, Washington, on Wednesday, June 18, 2014, from 9:30 am to 12:30 pm. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- Chelan PUD will provide a final report on the Eastbank Fish Hatchery and Chiwawa Fish Facility water recirculation pilot studies to the Hatchery Committees by September 2014 (Item I).
- Douglas PUD and Chelan PUD will develop a list of questions regarding how incidental take is assigned by the U.S. Fish and Wildlife Service (USFWS), and will provide the list to Bill Gale to facilitate discussion at the next National Marine Fisheries Service (NMFS)/USFWS Biological Opinion (BiOp) Coordination Meeting (Item I).
- Hatchery Committees representatives will submit comments on the sample size section in the memo clarifying standardized methods for Hatchery Monitoring and Evaluation (M&E) Plan Objective 8.3, Fecundity at Size, to Mike Tonseth (Item I).
- The Washington Department of Fish and Wildlife (WDFW) will add a revised summary table to the draft 2014 Wenatchee Basin Steelhead Release Proposal, and will redistribute the final revised draft to the Hatchery Committees (Item I).
- NMFS will develop a draft Statement of Agreement (SOA) that requires Hatchery Committees approval of the annual Broodstock Collection Protocols before submission to NMFS, and will distribute the draft SOA to the Hatchery Committees by August 2014 (Item I).

- Douglas PUD will develop a draft SOA approving Grant PUD use of excess production capacity at Douglas PUD facilities for the next 10 years to produce steelhead and spring Chinook salmon, and will distribute the draft SOA to the Hatchery Committees prior to the next meeting on July 16, 2014, when the Hatchery Committees will consider approval of the SOA (Item II-A).
- Douglas PUD and Chelan PUD will develop a draft SOA that addresses fulfillment of Objective 12 in the Hatchery M&E Plan (formerly Objective 10), and will distribute the draft SOA to the Hatchery Committees prior to the next meeting on July 16, 2014, when the Hatchery Committees will consider approval of the SOA (Item II-B).
- Greg Mackey will present a summary of Non-Target Taxa of Concern (NTTOC) modeling results at the next Hatchery Committees meeting on July 16, 2014 (Item II-B).
- Chelan PUD will provide their draft 2015 Hatchery M&E Annual Implementation Plan to the Hatchery Committees for review 10 days prior to the Hatchery Committees meeting on August 20, 2014 (Item III-A).
- Chelan PUD will verify the distribution list that receives the annual Tumwater Dam Operations Plan (Item IV-C).

DECISION SUMMARY

- The Wells Hatchery Committee representatives present approved Douglas PUD's request to allow Grant PUD to use excess production capacity at Douglas PUD facilities for 1 year (2014-2015) to produce 100,000 steelhead and 134,126 spring Chinook salmon. Mike Tonseth provided WDFW approval of the request via email prior to the meeting on June 18, 2014 (Item II-A).

AGREEMENTS

- The Hatchery Committees representatives present agreed to extend the deadline for Chelan PUD to provide their draft 2015 Hatchery M&E Annual Implementation Plan to the Hatchery Committees for review from July 2014 to August 2014, 10 days prior to the Hatchery Committees meeting on August 20, 2014 (Item III-A).

REVIEW ITEMS

- Kristi Geris distributed a memo to the Hatchery Committees on February 24, 2014, that clarified standardized methods for Hatchery M&E Plan Objective 8.3, Fecundity at Size. Comments on this memo, with regards to sample size, are due to Mike Tonseth.

FINALIZED DOCUMENTS

- The Final NTTOC Modeling Report was distributed to the HCP Hatchery Committees by Kristi Geris on June 18, 2014 (Item II-B).

I. Welcome, Agenda Review, Meeting Minutes, and Action Items

Mike Schiewe welcomed the Hatchery Committees and asked for any additions or other changes to the agenda. The following revisions were requested:

- Greg Mackey added an update on the NTTOC Modeling Report.
- Lynn Hatcher added: 1) spring Chinook salmon broodstock compositing in the Wenatchee Basin; and 2) trapping at Tumwater Dam.

The Hatchery Committees reviewed the revised draft April 16, 2014 meeting minutes. Kristi Geris said that all comments and revisions received from members of the Committees were incorporated in the revised minutes, and that there are no remaining items to be discussed. The Hatchery Committees members present approved the draft April 16, 2014 meeting minutes, as revised. Kirk Truscott provided the Colville Confederated Tribes' (CCT's) approval of the draft minutes via phone to Schiewe on June 17, 2014, and Mike Tonseth provided WDFW's approval of the draft minutes via email on June 18, 2014. Geris will finalize the meeting minutes and distribute them to the Committees.

Action items from the Hatchery Committees meeting on April 16, 2014, and follow-up discussions were as follows *(note italicized item numbers below correspond to agenda items from the meeting on April 16, 2014)*:

- *Alene Underwood will review the status of pending water recirculation pilot studies at Eastbank Fish Hatchery and Chiwawa Fish Acclimation Facility, and will report back to the Hatchery Committees at the May 21, 2014 meeting (Item I).*
  Underwood said that Chelan PUD will provide a final report on the water recirculation pilot studies at Eastbank Fish Hatchery and Chiwawa Fish Facility to the Hatchery Committees by September 2014. She explained that final evaluations have been completed; however, they need to be consolidated into one comprehensive report. Bill Gale asked what evaluations will be included in the report; Underwood replied that the evaluations focus on performance of the facilities in terms of out-migrating smolts and adults. She added that in-hatchery results will not be included in the report because those data are already included in monthly reports. She said, however, that references to those documents can be included in the final report, as applicable. Gale suggested appending in-hatchery results to the final report instead, so that the information is together in one cohesive document; Underwood agreed.
- *The Yakama Nation (YN) will coordinate with Chelan PUD to develop a list of questions for Karl Halupka (USFWS) regarding how USFWS assigns incidental take, for discussion at the next NMFS/USFWS BiOp Coordination Meeting tentatively scheduled for early May 2014 (Item I).*
  Keely Murdoch said that Underwood raised the topic with Halupka about how the USFWS assigns incidental take; however, she said that his response was confusing and difficult to understand. Greg Mackey added that Halupka seemed surprised by the questions, as this was his first exposure to this issue and the potentially far-reaching implications of his answer. As a result, Mackey said the questions had not been satisfactorily answered. Mackey questioned whether Halupka was the right person to address the request, considering the legal ramifications. Gale suggested Steve Lewis (USFWS) or Jessie Gonzales (USFWS) might be better able to answer these questions. Underwood said that Lewis previously indicated that, regardless of who is using the facility or under which permit authorization, the owner of the facility is responsible for incidental take at their facility. Underwood said that Chelan PUD legal counsel does not agree with this interpretation, and questioned if Lewis's interpretation was consistent with legal requirement of the Endangered Species Act. Mackey said that Douglas PUD also briefly discussed these questions with their legal counsel. The

Douglas PUD counsel indicated that, under Lewis' interpretation of existing coverage, if Douglas PUD agreed to allow a party to use their facilities, Douglas PUD would, by default, be responsible for take. He said that their legal counsel indicated that Douglas PUD should require those requesting use of a Douglas PUD facility to obtain and provide a written statement from the federal agencies that relieves Douglas PUD of any responsibility for take from any party using their facility. Tom Kahler said that even prior to Lewis' novel interpretation of take responsibility, Douglas PUD required evidence of permit coverage from all parties who trap at a Douglas PUD facility. However, based on the advice of legal counsel, Douglas PUD would require from permitting agencies (USFWS and NMFS) documentation indicating that all take by third-party users of Douglas PUD's trapping facilities will be assigned to that respective party and not to Douglas PUD, and that the burden of obtaining the documentation lies on the third-party. Gale suggested that the Hatchery Committees ask Lewis for clarification in a meeting setting so that the entire group can participate in discussions, or have the Hatchery Committees send written questions for Lewis to reply to. Mike Schiewe suggested that if Lewis attends a meeting, the questions should be provided to Lewis in advance. Mackey and Underwood said that Douglas PUD and Chelan PUD will develop a list of questions regarding how incidental take is assigned by the USFWS, and will provide the list to Gale to facilitate discussion at the next NMFS/USFWS BiOp Coordination Meeting.

- *Hatchery Committees representatives will submit comments on the sample size section in the memo clarifying standardized methods for Hatchery M&E Plan Objective 8.3, Fecundity at Size, to Mike Tonseth (Item I).*
  This action item will be carried forward because Tonseth was not present at the meeting.
- *WDFW will add a revised summary table to the draft 2014 Wenatchee Basin Steelhead Release Proposal, and will redistribute the final revised draft to the Hatchery Committees (Item I).*
  This action item will be carried forward because Tonseth was not present at the meeting.
- *WDFW will incorporate outstanding edits and comments into the draft 2014 Broodstock Protocols, including USFWS's edits, sideboard language for tangle-netting*

in the Chewuch to obtain Chelan PUD Methow spring Chinook broodstock, and other edits discussed during today's Hatchery Committees meeting; and he will redistribute the revised draft to Kristi Geris for distribution to the Hatchery Committees (Item III-A).

Schiewe said that this action item has been completed, and added that this item also brings attention to the question of Hatchery Committees approval of the annual Broodstock Collection Protocols. Lynn Hatcher said that he discussed this with Craig Busack (NMFS) and Amilee Wilson (NMFS), and they all agreed that Hatchery Committees approval of the annual protocols should be required prior to submission to NMFS. Hatcher said that NMFS will develop a draft SOA that requires Hatchery Committees approval of the annual Broodstock Collection Protocols before submission to NMFS, and will distribute the draft SOA to the Hatchery Committees by August 2014. Schiewe noted that this requirement also needs to be included in the Section 10 permits. Hatcher agreed and said that he has already asked Wilson to insert the requirement language in the new Wenatchee steelhead permit. Schiewe also noted that a review and approval schedule will need to be developed based on an April 15 deadline to NMFS.

The Hatchery Committees reviewed the revised draft May 28, 2014 conference call minutes. Geris said that all comments and revisions received from members of the Committees were incorporated in the revised minutes, and that there are no remaining items to be discussed. The Hatchery Committees members present approved the draft May 28, 2014 conference call minutes, as revised. Truscott provided the CCT's approval of the draft minutes via phone to Schiewe on June 17, 2014, and Tonseth provided WDFW's approval of the draft minutes via email on June 18, 2014. Geris will finalize the conference call minutes and distribute them to the Committees.

II. Douglas PUD

A. DECISION: Grant PUD Access to Use Excess Production Capacity at Douglas PUD Facilities to Produce Steelhead and Spring Chinook Salmon (Greg Mackey)

Greg Mackey said that Douglas PUD has historically reared fish for Grant PUD under a sharing agreement, and each year after Grant PUD requests production for the upcoming year, Douglas PUD brings Grant PUD's request to the Wells Hatchery Committee for approval. Mackey said that he and Todd Pearsons (Grant PUD) discussed this, and because the request remains the same from year to year and does not affect Douglas PUD's own HCP production obligation, they propose foregoing this annual request-process and instead obtaining approval for that action for the next 10 years. This is described in the Douglas PUD/Grant PUD Hatchery Sharing Notice Memorandum (Attachment B) that was distributed to the Hatchery Committees by Kristi Geris prior to the meeting on June 18, 2014. Mackey said that if the numbers within the request change, a new request will be presented to the Wells Hatchery Committee for approval. He added that this 10-year approval also falls in line with the next recalculation. He said that today, he would like to obtain Wells Hatchery Committee approval of a 10 year term of production of Grant PUD's fish; however, if the Hatchery Committee wants additional time to consider this request, he would at least like to obtain approval for brood years 2014 (spring Chinook) and 2015 (steelhead).

Bill Gale asked if this approval for 10 years should be documented in a SOA, and Mackey said that a SOA had not been used in the past for the annual agreements. Keely Murdoch agreed with Gale noting that a 10-year approval should require an SOA. Mackey said that a SOA can be developed, if needed. He added that the Wells HCP explicitly contemplates sharing agreements so long as they do not impede hatchery obligations. Gale still suggested developing a SOA so that in the future this approval will be easier to track.

Murdoch said that for this particular agreement, it seems logical to make the term of the approval longer; however, she said that she would first like to discuss this with Tom Scribner prior to approving the longer duration. Mackey said that he will re-draft the memo into a SOA for approval at next month's Hatchery Committees meeting; he added that for this meeting, he would like to obtain approval for Grant PUD to rear 100,000 Wells Hatchery steelhead and 134,126 Methow Hatchery spring Chinook salmon at Douglas PUD facilities for the upcoming production year (2014-2015). Gale asked if the request is to spawn juveniles this year and rear them next year, and Mackey replied that the request is for different spawning cohorts (brood year 2014 for spring Chinook and 2015 for steelhead), but for the same rearing cohort (juveniles reared in 2015). Tom Kahler added that the Hatchery

Committees approved this same request for the 2013 spring Chinook and 2014 steelhead brood years last June 2013. The Wells Hatchery Committee representatives present approved Douglas PUD's request to allow Grant PUD access to use excess production capacity at Douglas PUD facilities for brood years 2014 (spring Chinook) and 2015 (steelhead) to produce steelhead and spring Chinook salmon. Mike Tonseth provided WDFW's approval of the request via email prior to the meeting on June 18, 2014. Douglas PUD will develop a draft SOA approving Grant PUD use of excess production capacity at Douglas PUD facilities for the next 10 brood years to produce steelhead and spring Chinook salmon, and will distribute the draft SOA to the Hatchery Committees prior to the next meeting on July 16, 2014, when the Hatchery Committees will consider approval of the SOA.

B. HETT NTTOC Modeling Report Update (Greg Mackey)

Greg Mackey said that Kristi Geris sent an email to the Hatchery Committees on April 16, 2014, notifying them that the draft NTTOC Modeling Report was out for a 60-day review period, with comments due to him no later than Monday, June 16, 2013. Mackey said that comments were received from the YN, which will be incorporated into the draft report, and a final report will be provided to Geris for distribution to the Hatchery Committees. *(Note: Mackey provided the final NTTOC Modeling Report and Microsoft Access Database containing those data used in the analyses to Geris following the meeting on June 18, 2014, which Geris distributed to the Hatchery Committees that same day.)*

Mackey noted a comment by Keely Murdoch about exclusion of age-zero fish, particularly steelhead, in instances where the geographic proximity does not allow for interactions. However, this was not the case for steelhead because all age-zero steelhead were excluded from the analysis because of temporal isolation from hatchery fish (steelhead emerge after hatchery fish have left the system). Murdoch added that certain interactions were preserved to reflect the possibility of interactions in the migration corridor. Mackey said that three steelhead NTTOC interacting with programs in the Columbia River exceeded containment objectives, and he said that Murdoch noted that age-zero fish would not be in the Columbia River and if they were included in the analysis this could be the cause of the containment exceedance. He said that that age-zero fish were not a factor (as explained above) and the reason why those three steelhead programs came out high was because disease and competition equivalent were responsible for most of the mortality. He also said that all three NTTOC populations were small and might be prone to high variability through stochastic effects in the model. He added that less is known about ecological interactions in the Columbia River (a large river) compared to in smaller rearing habitat found in the tributaries. Murdoch also added that it seemed odd that only three groups had these results.

Lynn Hatcher asked why Lake Wenatchee hatchery sockeye and White River spring Chinook salmon were modeled when those programs no longer exist. Mackey said that this modeling effort started when those programs still existed. He added that modeling those programs provides information for the future, if needed. Hatcher also noted that 41% containment seems high (the containment level for cutthroat and lamprey), and Mackey said that was an original parameter that was developed by the Hatchery Committees before he became involved in the effort. Tom Kahler recalled that in 2008 Chris Peterson (NMFS) encouraged developing the NTTOC Modeling Report so that the information could be used in the next hatchery BiOps.

Mackey said that the most reliable model runs are interactions within the Wenatchee, Methow, and Okanogan basins, in which no NTTOC interacting with in-basin programs exceeded the containment objective. He said that the Columbia River was arguably less reliable, but there were efforts to make those assessments defensible as well.

Bill Gale asked what this report means in terms of fulfillment of Objective 12 in the Hatchery M&E Plans (formerly Objective 10). He said that it seems that a best attempt at modeling hatchery programs' impacts on NTTOC is complete; however, he said Objective 12 still seems only partially fulfilled, noting that facility level impacts have not been addressed. Murdoch recalled that the plan was to complete this NTTOC Modeling Report and then identify issues, if any, that need additional discussion. Mackey said that he believes the report satisfies Objective 12, with the exception of possibly convening an expert panel, and he believes that facility level impacts are separate from Objective 12, which is about ecological fish interactions.

Mike Schiewe said that historically, no M&E objective has been finalized with a SOA, but he asked the Hatchery Committees if they would favor a SOA to complete this objective. Mackey said that this objective was not intended to be an ongoing effort. Gale noted that lamprey have not been addressed, and Mackey said that a risk assessment could not be performed on lamprey due to lack of available data, which is explained in the report. Lynn Hatcher asked if a SOA can be developed that excludes lamprey, and Schiewe said that it could. Mackey added that as more data become available on lamprey, those interactions can be further assessed. Mackey and Alene Underwood said that they will develop a draft SOA that addresses fulfillment of Objective 12 in the Hatchery M&E Plan, and will distribute the draft SOA to the Hatchery Committees prior to the next meeting on July 16, 2014, when the Hatchery Committees will consider approval. Mackey also said that he will present a summary of NTTOC modeling results at the next Hatchery Committees meeting. Mackey also stressed that this was a regional objective that was to be completed collaboratively by agencies, tribes and PUDs, and should not be viewed as a PUD-specific obligation despite the fact that the PUDs played the lead role in accomplishing the work.

III. Chelan PUD

A. Annual Hatchery M&E Implementation Plan Schedule (Alene Underwood)

Alene Underwood said that Chelan PUD would like to change the July deadline to September for submitting the annual Hatchery M&E Implementation Plan for Hatchery Committees review. She said that Chelan PUD's new 5-year agreement for M&E work makes it much easier to move annual contracts through contracting, and not as much time is needed. She said that more importantly, the field season is just starting in July, and Chelan PUD believes that it makes more sense to complete the M&E cycle in a particular year before proposing the next year of activities. She added that the September deadline should still allow plenty of time for discussion within the Hatchery Committees, and that she believes this new deadline will be a better use of everyone's time.

Keely Murdoch recalled that in 2012 and 2013, there were late changes to Chelan PUD's Hatchery M&E Implementation Plan, and that changes were negotiated before discussing them within the Hatchery Committees. She said this was the reason that the Hatchery Committees reemphasized the July deadline. Murdoch said that based on this history, she is hesitant to agree to a September deadline. She added that if there are any changes to plan implementation, additional time may be needed to discuss them within the Hatchery Committees. Underwood said that if any changes occur, they would be made in concert with WDFW; Murdoch said that those changes would also need to be discussed within the Hatchery Committees. Underwood said that Chelan PUD will not know if there are changes until after the field season is well underway. She added that most work is happening now or will be in the coming weeks. Murdoch said that a lot of work will still be ongoing in September, and so a September deadline would not be much different than July. Underwood said that it is not just about the results; it is also about the methods, and Chelan PUD would like to preserve their adaptive management flexibility. She asked if the deadline can be September for this year, and then future years could be based on how this year goes. Murdoch said that at this time, the YN is not inclined to delay the deadline.

Bill Gale asked about the timing of Chelan PUD's annual Hatchery M&E Implementation Plan, and Underwood replied that it covers activities beginning in January. Murdoch reiterated that the YN's concern has more to do with the history of delayed deadlines, and that it is the Hatchery Committees' responsibility to ensure that the respective Hatchery M&E Implementation Plans will collect those data that satisfy the Hatchery M&E Plan.

Lynn Hatcher said that he sees this as a contractor/contractee issue. He said that the key is that Chelan PUD has adequate time to complete contracts by January, and also if there are changes, those need to be vetted within the Hatchery Committees. He said that he would leave it up to Chelan PUD to decide on a deadline, so long as the Hatchery Committees have adequate time to review the plan.

Gale noted that if the July deadline has been in place and there is already a history of not having a plan in place until January, it seems that moving the deadline to September would make the situation worse—not improve it. As a compromise, the Hatchery Committees representatives present agreed to extend the deadline for Chelan PUD to provide their draft 2015 Hatchery M&E Annual Implementation Plan to the Hatchery Committees for review from July 2014 to August 2014, 10 days prior to the Hatchery Committees meeting on August 20, 2014.

B. Rocky Reach Trap Pilot Update (Catherine Willard and Alene Underwood)

Catherine Willard provided the Hatchery Committees with a Rocky Reach Trap 2014 Pilot Summary (Attachment C), which Kristi Geris distributed to the Hatchery Committees via email following the meeting on June 18, 2014. Willard said that trapping occurred for 28 days: from May 7 to 9, 2014, and from May 12 to June 5, 2014. She said that during that time, 106 passive integrated transponder-tagged adults that had been tagged in the hatchery or as out-migrating smolts were detected at the Rocky Reach Trap, 25 of which were trapped, including: 21 Methow hatchery-origin recruits (HORs); two Chewuch natural-origin recruits (NORs); one Methow-Comp NOR; and one Chiwawa HOR (stray). She added that the single trapped Chiwawa stray was the only one detected at Rocky Reach (see Table 1 in Attachment C). She said that two to three staff attended the trap at all times, and that the core trapping time periods were modified based on fish detections through the ladder (see Table 2 in Attachment C).

Alene Underwood said that there were three trapping mortalities, and Chelan PUD reported these to NMFS. She said that these mortalities included one adipose fin (ad-) absent and two ad-present fish, and she noted that the latter will be subtracted from the NORs allowance for the Chewuch tangle netting effort. She said that the ad-absent mortality was discovered as an old carcass that was likely impinged at some point during trapping. She said that the two ad-present mortalities were caught on video footage, which was reviewed to confirm the cause of death. She said that one was impinged against the ladder wall when the trap door opened during a compressor test. She added that during that time, the water was turbid and the impinged fish was not seen. She said that the other ad-present mortality was a non-target fish that was impinged in the door closure area while trapping a target fish.

Underwood said that Chelan PUD kept extensive records of fish passage while trapping, and further evaluations will be performed with those data. She noted that the trapping effort went better than expected. She said that monitoring fish passage and adjusting the core trapping time periods aided the effort. Keely Murdoch asked if there is another viewing window upstream of the trap to monitor for injured fish. Underwood said that there is not, but a camera could be installed on the backside of the trap to monitor for fish injuries and determine whether non-target fish are holding in the area where the door could impinge them against the wall. She added that Chelan PUD thought that fish would keep moving through the trap area, but this was not the case. Tom Kahler said that fish often hold immediately upstream of count windows, but are not visible from the count windows except when the hydraulics through the count window area entrain fish back into the counting chute, as is commonly observed at Wells and other dams.

Willard said that once a target fish was trapped, the fish would be scanned to confirm that it was a target fish, and then Eastbank staff were notified and arrived to pick up the fish within 1 hour. Kahler asked if there is a record of trapping success and attempts, and Underwood said that there is; however, those figures are not reflected in the summary (Attachment C). She added that those data will be included in a revised document.

Underwood said that the Chewuch tangle netting effort is the other piece to Chelan PUD's spring Chinook salmon broodstock collection effort, which will start July 15, 2014. She said that the tangle netting effort has already been approved in the Broodstock Protocols; however, Chelan PUD still needs to provide additional information on timing. Lynn Hatcher asked how many spring Chinook salmon NORs will be targeted during the tangle netting effort. Underwood said that the initial number was 38; however, subtracting the three NORs captured during the Rocky Reach Trap effort and the two NOR mortalities, the new target number is 33 NORs.

C. Penticton Sockeye Hatchery (Alene Underwood)

Alene Underwood said that construction of the Penticton Sockeye Hatchery facility is almost complete. She said that facility testing is scheduled to start on June 30, 2014, and the official commissioning is scheduled for July 15, 2014. She said that the hatchery grand opening is scheduled for September 20, 2014, which coincides with another event for the tribal elders. She said that the hatchery will be ready to receive eggs and milt in time for the sockeye spawning in October 2014. She added that a lot of time was spent on the design of the hatchery and that the construction process has progressed well.

Mike Schiewe asked about the cost to construct the facility, and Underwood said that construction of the facility was $6.4 million Canadian dollars, which at that time equaled about $6.1 million U.S. dollars (USD). She added that the total project cost was about $10 million USD split between Grant PUD and Chelan PUD; she noted that Grant PUD's proportional share was 55%. She said that Grant PUD and Chelan PUD have been the sole funders since 2006. She said that the Bonneville Power Administration funded the first 3 pilot years, then Grant PUD funded 1 year, and then Grant PUD and Chelan PUD split costs 50/50 until the most recent proportional share change. She said that the hatchery will support up to a 5-million egg program. She noted that for comparison, Shuswap Hatchery supported a 1-million egg program.

IV. NMFS

A. Hatchery and Genetic Management Plan Update (Lynn Hatcher)

Lynn Hatcher said that the next NMFS/USFWS BiOp Coordination Meeting will be held on July 9, 2014. He then reviewed Hatchery and Genetic Management Plan (HGMP) updates, as described in the following sections.

Leavenworth Spring Chinook Salmon

Hatcher said that on May 14, 2014, NMFS and USFWS agreed to extend consultation for the Leavenworth Spring Chinook Salmon BiOp, which will hopefully be completed this calendar year.

Wenatchee Steelhead

Hatcher said that the draft BiOp was completed on June 30, 2014, and the final BiOp will hopefully be completed by September 30, 2014. Bill Gale asked if in the future, NMFS can distribute the draft BiOp to all Hatchery Committees members for their information (not for review and approval). Hatcher said that he will ask Amilee Wilson about this request.

Mid-Columbia Coho

Hatcher said that additional information has been requested and that permitting is now projected to be completed by the end of September 2014. Alene Underwood asked if this will affect 2014 trapping operations at Tumwater Dam and the Dryden facility, and Keely Murdoch replied that she does not believe so, but is not completely certain yet.

Okanogan Spring Chinook Salmon and Methow Spring Chinook Salmon

Hatcher said that the final BiOp should be completed by fall 2014. Gale asked how the final BiOp is linked to the Section 10(j) permit. Hatcher explained that the Section 10(j) designation allows fish to enter the Okanogan River, whereas the BiOp and Section 10 permit, which Craig Busack is working on, allow the transfer of fish to the Okanogan River. Gale said that tagging starts in October and fish will be tagged for transfer to the Okanogan River.

Wells Hatchery Steelhead

Hatcher said that the Twisp Conservation Program and the Wells Hatchery Steelhead Program will be incorporated into the same supplemental Environmental Assessment (EA). He added that because the original EA did not address genetic effects, this discussion needs to be expanded in the supplemental EA, which is projected to be completed by July 2014.

Methow Steelhead and Spring Chinook

Hatcher said that a State Fishery Plan is still needed. Greg Mackey said that he does not believe a State Fishery Plan was ever developed for Methow spring Chinook salmon; Gale agreed but said that a supplemental State Fisheries Plan will need be developed as soon as there is a full complement of clipped Methow spring Chinook salmon on site.

Wenatchee Spring Chinook Salmon

Hatcher said that the Wenatchee Spring Chinook State Fishery Plan is complete. Gale asked who approves that plan; Hatcher replied that NMFS and WDFW approve the plan, and the CCT and the YN are also consulted on the plan.

Okanogan Steelhead

Hatcher said that the draft EA will be developed in July 2014, and that a Tribal Restoration Management Plan might also be incorporated with the EA and HGMP for public review. He said that the BiOp will be developed while the EA is out for public review, and permitting will be completed by the end of the year.

B. Spring Chinook Salmon Broodstock Compositing in the Wenatchee Basin (Lynn Hatcher)

Lynn Hatcher said that a summary of the May 2014 NMFS internal discussion on spring Chinook salmon broodstock compositing in the Wenatchee Basin (Attachment D) was distributed to the Hatchery Committees by Kristi Geris on June 17, 2014. Hatcher said that the same group will meet again at the end of July 2014 to discuss long- and short-term risks and benefits associated with compositing, and then a timeline will be developed for reinitiating consultation. He added that additional information may be requested from Chelan PUD, but this will be discussed further at the July meeting. He said that re-initiation will begin in October 2014, with a target completion date of the end of the year; he added that spring Chinook salmon broodstock compositing in the Wenatchee Basin will then be included in next year's Broodstock Collection Protocols.

Bill Gale noted that if the action going forward is to collect broodstock at both the Chiwawa Weir and Tumwater Dam, NMFS will need to consult with USFWS. Hatcher said that NMFS has discussed this and is aware of the need for consultation with USFWS. He added that NMFS plans to discuss how to engage USFWS during the meeting that is scheduled for the end of July 2014, after which NMFS will contact USFWS.

Alene Underwood asked what the mechanism is for re-initiation—would it be a request from the permit holders, and then approval by the Hatchery Committees? She also asked if it would be an addendum to the existing HGMP. Keely Murdoch recalled that Mike Tonseth indicated that previously submitted materials (as attachments to the HGMPs) included consideration of compositing. Hatcher said that because compositing was not the main action, NMFS did not analyze it. He said it was unclear whether the HGMP would need to be reopened; Murdoch said that the YN would prefer to not change the HGMP. Hatcher said that he believes a letter from the permitted parties would serve to re-initiate consultation.

C. Trapping at Tumwater Dam (Lynn Hatcher)

Lynn Hatcher said that Bryan Nordlund (NMFS) requested a status update on Tumwater Dam trapping operations with regard to changes related to the Reproductive Success Study and broodstock collection. Mike Schiewe said that Nordlund's request was sent to Alene

Underwood and will be addressed via Lance Keller (Chelan PUD) at the next HCP Coordinating Committees meeting. Bill Gale recalled that WDFW typically prepares an annual Tumwater Dam Operations Plan, and Underwood said that Chelan PUD and WDFW develop the plan collectively.

Hatcher said that he also saw another email from Nordlund regarding concerns with the denil structures installed at Tumwater Dam, indicating that the structures were designed for sockeye passage, and not for larger Chinook salmon. *(Note: Kristi Geris forwarded this email to the Hatchery Committees on June 19, 2014.)* Underwood confirmed that the design for the denil structures was taken from an old sockeye project. Gale said that Nordlund raised two concerns in that email—the other question was how spring Chinook salmon passage delay is being assessed at Tumwater Dam. Gale recalled establishing a median passage time of 24 hours to manage for, and Nordlund questioned where those data are being collected. Underwood said that 2011 was the first year that Chelan PUD monitored passage at Tumwater Dam, and they provided an update to the Hatchery Committees; in 2012, Chelan PUD provided weekly updates on fish passage at Tumwater Dam. She said she believes that Mike Tonseth appended the Tumwater Dam trapping protocols to the Broodstock Collection Protocols, and she said that Catherine Willard has been monitoring delays consistent with those protocols. Gale asked if all of those data have been compiled by season. Underwood replied that the median is compiled and calculated for every 12 fish, but those data still need to be compiled. Gale asked who receives the annual Tumwater Dam Operations Plan, and Underwood said that she will verify the distribution list that receives that plan.

V. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees' meetings are on July 16, 2014 (Douglas PUD); August 20, 2014 (Chelan PUD); and September 17, 2014 (Douglas PUD).

List of Attachments

Attachment A	List of Attendees
Attachment B	Douglas PUD/Grant PUD Hatchery Sharing Notice Memorandum
Attachment C	Rocky Reach Trap 2014 Pilot Summary

Attachment D Basin Summary of the May 2014 NOAA Fisheries Internal Discussion on Spring Chinook Broodstock Compositing in the Wenatchee

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Alene Underwood*	Chelan PUD
Catherine Willard*	Chelan PUD
Greg Mackey*	Douglas PUD
Tom Kahler*	Douglas PUD
Peter Graf†	Grant PUD
Lynn Hatcher*	National Marine Fisheries Service
Bill Gale*	U.S. Fish and Wildlife Service
Keely Murdoch*	Yakama Nation

Notes:

* Denotes Hatchery Committees member or alternate

† Joined by phone

MEMORANDUM

TO: Wells HCP Hatchery Committee

FROM: Greg Mackey

DATE: June 18, 2014

SUBJECT: Douglas-Grant Hatchery Sharing Notice to HCP Hatchery Committee

Douglas PUD and Grant PUD entered into hatchery sharing agreements in 2013 that extend until 2052 for Wells Hatchery and Methow Hatchery. Historically, the HCP HC was presented with an annual request for approval of fish production on behalf of Grant PUD at the Douglas PUD-owned hatchery facilities. The HCP HC annually approved the use of the excess rearing capacity at these facilities to produce fish for Grant PUD.

Fish production levels for the two PUDs have been established through 2023, since the last recalculation. The next recalculation is scheduled to be implemented in 2024 – the next scheduled opportunity for production numbers to change. Douglas PUD proposes to replace the annual notification and request for approval of Grant PUD's production at Douglas facilities to a single approval that extends until 2023, or until production numbers for either or both PUDs change. At that time, a new notice of production and request for approval will be presented to the HCP HC with a term that extends until the next scheduled opportunity for production numbers to change. Douglas PUD has sufficient production capability at both of its hatcheries to meet its mitigation obligations and produce the requested fish for Grant PUD.

Grant PUD's production at Douglas PUD facilities for 2014-2023

Wells Hatchery Steelhead: Total 100,000 yearling steelhead

Methow Hatchery Spring Chinook: 134,126 yearling spring Chinook.

Rocky Reach Trap (RRT) Pilot, 2014

Summary

- Trapping began May 7th and concluded on June 5th
- Trapping occurred for 28 days (May 7th to May 9th and May 12th to June 5th).
- 106 target fish were detected at Rocky Reach between May 7th and June 5th.

Table 1. Type of targeted fish detected and trapped at RRT between May 7th and June 5th.

Type	Targeted fish detected at RR[1]	# Trapped (% Trapped)
Methow Hatchery Origin	88	21 (24%)
Chewuch Natural Origin	6	2 (33%)
Methow Natural Origin	11	1 (9%)
Chiwawa Hatchery Origin	1	1 (100%)

[1]Between the trapping dates of May 7th to June 5th.

- Core trapping hours = 7:00 a.m. to 3:00 p.m.; if a target fish was detected in the ladder the trapping crew would extend their hours.

Table 2. Percent of targeted fish detected at RR during time periods.

Time period	Percent of targeted fish detected at RR
7:00 a.m. to 3:00 p.m.	54%
3:00 p.m. to 7:00 p.m.	21%
7:00 pm to 7:00 a.m.	25%

Table 3. Summary of trapping mortalities.

Date	AD present or AD absent
05/14/14	AD Present
05/22/14	AD Present
05/29/14	Ad Absent/Jack

Summary of NOAA Fisheries Internal Discussion on Spring Chinook Broodstock Compositing in the Wenatchee Basin

Since 2007, a variety of approaches has been tried to collect tributary-specific spring Chinook brookstocks in the Wenatchee Basin. None of them has proven to be satisfactory in accomplishing genetic goals. In February 2014, the Yakama Nation formally proposed to the Priest Rapids Coordinating Committee Hatchery Sub-Committee a composite broodstock approach. During discussion of the proposal, NMFS indicated that even if it agreed in principle to the approach, it would not able to authorize it under the current biological opinion and permits – the opinion would have to be amended, fully evaluating the effects of this change. As amendment of the opinion in this direction would be a major shift away from years of tributary-specific orientation (and years of justification of that orientation), a critical first step in considering compositing is an internal NMFS. NMFS made a commitment to the Joint Fisheries Parties to have this initial discussion in May 2014.

Accordingly, NMFS staff met internally to discuss compositing on May 30, 2014. Those participating were Craig Busack, Lynn Hatcher and Amilee Wilson from the West Coast Regional Office; and Tom Cooney and Mike Ford from the Northwest Fisheries Science Center. The following paragraphs summarize the discussion.

1. NMFS remains committed to fostering genetic diversity among the major spring Chinook spawning areas in the Wenatchee Basin. We feel considerable diversity likely existed before disruption by the Grand Coulee Fish Management Program (GCFMP) in the 1940's. This belief is supported not only by the early genetic work done on spring Chinook in the basin, but more recently by a new draft manuscript by Ford et al. that demonstrates that homing rates to natal areas by natural-origin fish are high.

2. The original diversity among these areas has likely been eroded by the GCFMP, population bottlenecks in the early 1990's, and more recently by extensive straying from the Chiwawa hatchery program. Due to these factors and consistent with current patterns of directly measured genetic diversity, we believe the available evidence indicates there is currently very little genetic differentiation among these major spawning areas. Therefore, although promoting diversity is clearly desirable, the risk of losing current levels of diversity among these two major spawning areas is not a major concern in the short term. We believe that other genetic managements, such as overall program reductions, managing for PNI, removal of hatchery fish through adult management, and other major actions implemented to reduce genetic impacts of hatchery operations, are higher immediate priorities.

3. Given the current low levels of genetic differentiation between fish from Nason Creek and Chiwawa River, the current program of genetic classification seems an expensive and intrusive procedure that is unlikely to be successful at preserving among area diversity even if fully implemented. After weighing the short-term risks and benefits of collecting broodstock for the Nason Creek and Chiwawa River hatchery programs, the above genetic management activities pose less short-term risk to the Wenatchee spring Chinook salmon population than utilizing current genetic-based methods for identifying Nason Creek and Chiwawa River broodstock through collection, transporting, holding, and potential re-transporting and release of surplus endangered spring Chinook salmon above Tumwater Dam.

4. Considering the overall risk and feasibility of various approaches currently proposed for broodstock collection, we feel the best approach is option 3 presented by the Yakama Nation, which consists of Chiwawa broodstock collection at Chiwawa weir, and composite collection for the Nason program at Tumwater dam.

5. Our support of compositing at this time is a short-term action, and is made within the context of the overall genetic management approach. In the long run, among-subpopulation diversity should be restored. We feel this point of view is consistent with the genetic and phenotypic diversity objectives of Upper Columbia recovery plan. As abundance and productivity improve, and more recovery attention is focused on diversity, we will initiate discussions among the Joint Fisheries Parties on how best to shape hatchery production in the basin to achieve diversity objectives.

ANCHOR QEA

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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	August 20, 2014
From:	Mike Schiewe, Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the July 16, 2014 HCP Hatchery Committees Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees' meeting was held at Douglas PUD headquarters in East Wenatchee, Washington, on Wednesday, July 16, 2014, from 9:30 am to 1:00 pm. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- Chelan PUD will provide a final report on the water recirculation pilot studies at Eastbank Fish Hatchery and Chiwawa Fish Facility to the Hatchery Committees by September 2014 (Item I).
- Alene Underwood will coordinate with Steve Lewis (U.S. Fish and Wildlife Service [USFWS]) and arrange for Lewis to discuss how incidental take is assigned by USFWS during the next Hatchery Committees meeting on August 20, 2014 (Item I).
- Hatchery Committees representatives will submit comments on the sample size section in the memo clarifying standardized methods for Hatchery Monitoring and Evaluation (M&E) Plan Objective 8.3, Fecundity at Size, to Mike Tonseth (Item I).
- The Washington Department of Fish and Wildlife (WDFW) will add a revised summary table to the draft 2014 Wenatchee Basin Steelhead Release Proposal, and Mike Tonseth will redistribute the final revised draft to the Hatchery Committees (Item I).
- The National Marine Fisheries Service (NMFS) will develop a draft Statement of Agreement (SOA) that requires Hatchery Committees approval of the annual Broodstock Collection Protocols before submission to NMFS, and will distribute the draft SOA to the Hatchery Committees by August 2014 (Item I).
- Chelan PUD will provide their draft 2015 Hatchery M&E Annual Implementation

Plan to the Hatchery Committees for review 10 days prior to the Hatchery Committees meeting on August 20, 2014 (Item I).

- Chelan PUD will develop a draft SOA that acknowledges partial fulfillment of Hatchery M&E Plan Objective 10, and also includes the qualifications of this partial fulfillment, as discussed during today's Hatchery Committees meeting (Item II-C).
- WDFW will provide NMFS' approval to modify trapping operations at Tumwater Dam from 3 days per week, 16 hours per day, and not exceeding 48 hours per week, to 7 days per week, 10 hours per day, and not exceeding 48 hours per week (i.e., "modified trapping operations") to Kristi Geris for distribution to the Hatchery Committees (Item IV-B).
- WDFW will obtain USFWS approval of the modified Tumwater Dam operations no later than Thursday, July 17, 2014, at 1:00 p.m., and will provide USFWS' approval to Kristi Geris for distribution to the Hatchery Committees (Item IV-B).
- WDFW will re-evaluate the modified Tumwater Dam operations and will provide a recommendation for a path forward to Kristi Geris for distribution to the Hatchery Committees no later than Monday, July 21, 2014, at 12:00 p.m. (Item IV-B).

DECISION SUMMARY

- The Wells Hatchery Committee representatives present approved the SOA approving Grant PUD use of excess production capacity at Douglas PUD facilities through 2023 to produce steelhead and spring Chinook salmon (Item II-A).

AGREEMENTS

- The Hatchery Committees representatives present agreed to continue the modified Tumwater Dam operations through Monday, July 21, 2014, pending USFWS approval on Thursday, July 17, 2014 (Item IV-B).

REVIEW ITEMS

- Kristi Geris distributed a memo to the Hatchery Committees on February 24, 2014, that clarified standardized methods for Hatchery M&E Plan Objective 8.3, Fecundity at Size. Comments on this memo, with regards to sample size, are due to Mike Tonseth (Item I).

FINALIZED DOCUMENTS

- The Final 2013 Chelan PUD and Grant PUD Hatchery M&E Report was posted to the HCP Hatchery Committees Extranet Site on July 17, 2014, as described in an email distributed to the Hatchery Committees by Kristi Geris that same day. *(Note: this second final version replaces the final version that was originally distributed on June 2, 2014.)*

I. Welcome, Agenda Review, Meeting Minutes, and Action Items

Mike Schiewe welcomed the Hatchery Committees and asked for any additions or other changes to the agenda. The following revisions were requested:

- Mike Tonseth added updates on: 1) spring Chinook salmon adult management; 2) broodstock collection in the Wenatchee Basin; and 3) Wenatchee Steelhead Biological Opinion (BiOp).
- Greg Mackey added a discussion on rearing coho at Wells Hatchery for the Yakama Nation's (YN's) Coho Reintroduction Program.
- Kirk Truscott added an update on the Colville Confederated Tribes' (CCT's) Okanogan Endangered Species Act (ESA) Section 10(j) permit.
- Alene Underwood added an update on tangle netting spring Chinook in the Chewuch River.

The Hatchery Committees reviewed the revised draft June 18, 2014 meeting minutes. Kristi Geris said that there were two outstanding items remaining to be discussed, as follows:

- Regarding Chelan PUD's Penticton Sockeye Hatchery agenda item, Tom Kahler requested clarification on what the $10 million (U.S. dollars [USD]) cost split between Grant PUD and Chelan PUD entailed. Alene Underwood clarified that the $10 million USD was the total project cost.
- Regarding NMFS' Hatchery and Genetic Management Plan (HGMP) update, Douglas PUD requested clarification on the Methow steelhead update, noting that the discussion, as reflected in the minutes, focused on Methow spring Chinook salmon.

Mike Tonseth clarified that WDFW is developing a State Fishery Plan for Methow steelhead in addition to what was noted about Methow spring Chinook salmon.

Keely Murdoch also noted that during the review of the Hatchery Committees April 16, 2014 action items, regarding the discussion of incidental take, it was Underwood—not Murdoch—who raised the issue with Karl Halupka (USFWS).

Geris said that she will incorporate the changes discussed, and that all other comments and revisions received from members of the Committees were incorporated in the revised minutes. The Hatchery Committees members present approved the draft June 18, 2014 meeting minutes, as revised. Geris will finalize the meeting minutes and distribute them to the Committees.

Action items from the Hatchery Committees meeting on June 18, 2014, and follow-up discussions were as follows *(note italicized item numbers below correspond to agenda items from the meeting on June 18, 2014)*:

- *Chelan PUD will provide a final report on the Eastbank Fish Hatchery and Chiwawa Fish Facility water recirculation pilot studies to the Hatchery Committees by September 2014 (Item I).*
  This action item will be carried forward.
- *Douglas PUD and Chelan PUD will develop a list of questions regarding how incidental take is assigned by the USFWS, and will provide the list to Bill Gale to facilitate discussion at the next NMFS/USFWS BiOp Coordination Meeting (Item I).*
  Gale said that Steve Lewis was unable to attend the last NMFS/USFWS BiOp Coordination Meeting to discuss incidental take, nor was Lewis able to attend today's Hatchery Committees meeting; however, Lewis indicated that he may be available to attend the Hatchery Committees meeting on August 20, 2014. Greg Mackey said that USFWS distributed a draft memorandum that defined incidental take, as well as explained rules on how incidental take may and may not be shared; however, the memorandum did not explain facility owner liability with regard to third-party actions at a facility. Mackey suggested that Douglas PUD, Chelan PUD, and Grant PUD follow up with USFWS regarding a path forward. He added that this technically

is not a Hatchery Committees issue. Mike Schiewe agreed and said that this issue is ultimately a legal counsel matter. Kirk Truscott said that incidental take should be associated to a program and not assigned to the facility owner. Mackey said that this is what needs to be clarified. Alene Underwood said that she will coordinate with Lewis and arrange for him to discuss how incidental take is assigned by USFWS during the next Hatchery Committees meeting on August 20, 2014.

- *Hatchery Committees representatives will submit comments on the sample size section in the memo clarifying standardized methods for Hatchery M&E Plan Objective 8.3, Fecundity at Size, to Mike Tonseth (Item I).*
  Tonseth indicated that this memorandum is still under development and requested carrying this action item forward.
- *WDFW will add a revised summary table to the draft 2014 Wenatchee Basin Steelhead Release Proposal, and will redistribute the final revised draft to the Hatchery Committees (Item I).*
  Mike Tonseth said that he will verify that the updated table was incorporated into this proposal, and will distribute the final revised draft to the Hatchery Committees.
- *NMFS will develop a draft SOA that requires Hatchery Committees approval of the annual Broodstock Collection Protocols before submission to NMFS, and will distribute the draft SOA to the Hatchery Committees by August 2014 (Item I).*
  This action item will be carried forward.
- *Douglas PUD will develop a draft SOA approving Grant PUD use of excess production capacity at Douglas PUD facilities for the next 10 years to produce steelhead and spring Chinook salmon, and will distribute the draft SOA to the Hatchery Committees prior to the next meeting on July 16, 2014, when the Hatchery Committees will consider approval of the SOA (Item II-A).*
  Greg Mackey provided this draft SOA to Kristi Geris on July 14, 2014, which Geris distributed to the Hatchery Committees that same day.
- *Douglas PUD and Chelan PUD will develop a draft SOA that addresses fulfillment of Objective 12 in the Hatchery M&E Plan (formerly Objective 10), and will distribute the draft SOA to the Hatchery Committees prior to the next meeting on July 16, 2014, when the Hatchery Committees will consider approval of the SOA (Item II-B).*

Greg Mackey said that a SOA has not yet been developed and that this will be further discussed during today's meeting.

- *Greg Mackey will present a summary of Non-Target Taxa of Concern (NTTOC) modeling results at the next Hatchery Committees meeting on July 16, 2014 (Item II-B).*

  This will be discussed during today's meeting.
- *Chelan PUD will provide their draft 2015 Hatchery M&E Annual Implementation Plan to the Hatchery Committees for review 10 days prior to the Hatchery Committees meeting on August 20, 2014 (Item III-A).*

  This action item will be carried forward.
- *Chelan PUD will verify the distribution list that receives the annual Tumwater Dam Operations Plan (Item IV-C).*

  Bill Gale said that USFWS was interested in verifying that Steve Lewis and Karl Halupka are included on this distribution list. Mike Tonseth confirmed that the annual Tumwater Dam Operations Plan was sent to Craig Busack and Halupka. Mike Schiewe asked Gale if he thought the plan should be distributed to the entire Hatchery Committees; Gale said that he did. Tonseth said that he thought this was already the case. He added that NMFS is now requiring site-based plans for all trapping locations, which has created substantially more work. Gale noted that including all of the site-based trapping plans might create sequencing issues and may even delay completion of the annual Broodstock Protocols. Tonseth agreed and said that these site-based plans are intended to be appended to the Broodstock Protocols. Schiewe recalled NMFS' plan to require Hatchery Committees approval of the annual Broodstock Protocols, which also necessitates revisiting the schedule and the level of detail in the protocols to streamline the process. Gale asked if the appendices to the protocols would also be subject to Hatchery Committees approval; Tonseth replied that he believes so.

II. Douglas PUD

A. DECISION: Grant PUD Access to Use Excess Production Capacity at Douglas PUD Facilities to Produce Steelhead and Spring Chinook Salmon (Greg Mackey)

Greg Mackey said that a draft SOA approving Grant PUD use of excess production capacity at Douglas PUD facilities for the next 10 years to produce steelhead and spring Chinook salmon was distributed to the Hatchery Committees by Kristi Geris on July 14, 2014. Mackey acknowledged that the draft SOA was not provided 10 days in advance of the meeting, as typically required for SOAs; however, he said that Douglas PUD would like the Wells Hatchery Committee's approval of the SOA if the Committee is ready to vote. He emphasized that this agreement does not impact Douglas PUD's production, and that this has historically been an annual request, but since the request does normally not change year-to-year, Douglas PUD decided to revise this annual approval to be a 10-year approval, which coincides with the next scheduled recalculation.

Mike Tonseth noted concern locking the agreement into a 10-year block of time, which does not account for changes that could occur in a 10-year period. He said, for example, changes with Chiwawa spring Chinook salmon and the former Turtle Rock occurred within a 10-year window. Keely Murdoch suggested that the last sentence in the agreement addresses this potential issue; however, Tonseth noted that the sentence only addresses changes in "production," adding that production may not be the only driver. Mackey suggested, instead, revising "production" to "hatchery programs." Mike Schiewe also suggested including Douglas PUD in the last sentence in the agreement (i.e., changes by Grant PUD or Douglas PUD). Mackey suggested omitting "Grant PUD" to address this. Wells Hatchery Committee members also noted that changes in hatchery programs "may" trigger a new request—not necessarily "will" trigger a new request. Kirk Truscott also suggested making the agreement specific to the next 10-year block of time (i.e., through 2023), as opposed to making it open-ended. He also asked if the production levels could be moved from the background information to the actual statement; however, Mackey indicated that he would prefer to keep the production levels out of the actual statement.

The Wells Hatchery Committee representatives present approved the SOA allowing Grant PUD use of excess production capacity at Douglas PUD facilities through 2023 to produce steelhead and spring Chinook salmon. Mackey incorporated revisions as discussed and provided the final SOA (Attachment B) to Geris following the meeting on July 16, 2014, which Geris distributed to the Hatchery Committees that same day.

B. PRESENTATION: Ecological Risk Assessment of Upper-Columbia Hatchery Programs on NTTOC (Greg Mackey)

Greg Mackey said that the Ecological Risk Assessment of Upper-Columbia Hatchery Programs on NTTOC presentation (Attachment C) was distributed to the Hatchery Committees by Kristi Geris prior to the meeting on July 16, 2014. He said that this presentation highlights the salient points of the modeling effort and that the final NTTOC Modeling Report, which was distributed to the Hatchery Committees by Geris on June 18, 2014, includes in-depth details. Mackey recognized the Hatchery Evaluation Technical Team (HETT) for their contributions to this effort, and said that members of the HETT are listed on slide 1 of Attachment C. He added that Carmen Andonaegui (WDFW) also helped with this effort when she provided technical support to the HETT (prior to her employment with WDFW).

Mackey reviewed the background and objectives of the NTTOC modeling effort, noting that it was an interagency, tribal, and PUD collaborative effort to address hatchery impacts on NTTOC. He said that a Predation, Competition, and Disease (PCD Risk 1) risk model was used for all interactions except for those involving Pacific lamprey and Westslope Cutthroat (these species could not be modeled with PCD Risk 1), which turned out to be a more difficult process than anticipated. He recalled that a Delphi process with outside experts was also planned to evaluate hatchery impacts on NTTOC; however, the Delphi panel was put on hold because the modeling results suggested very low risk to NTTOC with few interactions exceeding the containment levels.

Mackey reviewed components of the PCD Risk model (which was developed by Craig Busack), including explanations of population overlap, habitat complexity, predation, and competition. Mike Schiewe asked for clarification of the term "competition equivalence." Mackey explained that when fish compete with each other some fish do not necessarily die from the direct interaction, but are affected with lower fitness, for example due to slower growth. Based on this premise, the model estimates a population cost (i.e., how many fish would have died from the interactions). He added that it is somewhat like an indirect cumulative cost.

Mackey summarized that 50 hatchery programs and 25 NTTOC populations were identified for the risk analysis, resulting in 526 interactions. He said that there were insufficient data for cutthroat to use the PCD Risk model, and therefore, they were omitted from the modeling. He said that lamprey cannot be modeled in PCD Risk, but furthermore, there were insufficient data and information available regarding salmonid and lamprey ecological interactions, particularly pertaining to hatchery salmonids. He added that the Chief Joseph Hatchery program was not included in the modeling, and that 134 interactions that were attempted failed to run due to the PCD Risk model either crashing or taking far too long to run, yielding a total of 202 successful model runs.

Mackey said that for cutthroat, population overlap was used to estimate the maximum possible mortality that could occur. He noted that the containment level for cutthroat was 41% and that spatial overlap was very low, and so even if the entire cutthroat population died in the space of overlap, the 41% containment level would not be reached. He said that as a result, the HETT determined that cutthroat are at low risk from hatchery programs. He said that with regard to lamprey, there are minimal population and spatial data available, and not enough to perform a risk assessment. He suggested revisiting lamprey as a separate effort in the future if more information becomes available.

Mackey reviewed the database schema and interface of the PCD model (slides 9 and 10 of Attachment C). He noted that each variable (with a few exceptions) had a most likely and maximum and minimum value (i.e., a range). He said that "Percent Habitat Complexity," "Percent Habitat Segregation," "Disease Mortality Rate for Fish with No Dominance Encounters," and "Disease Mortality Rate for Fish with Max Dominance" were populated based on best scientific judgment, and all other variables were populated based on empirical data. He said that the "Dominance Mode" was set to a neutral value for all runs making that variable a non-factor. He also noted that "Percentage of Body Weight Loss Causing Death" is related to dominance encounters (i.e., weight loss affects competition equivalents).

Mackey reviewed the results of the three populations that exceeded the containment level, which he noted were all small summer steelhead sub-populations, including Twisp River summer steelhead interacting with Chelan Falls Hatchery summer Chinook salmon, Chiwawa summer steelhead interacting with Wells Hatchery summer steelhead, and Omak Creek summer steelhead interacting with Wells Hatchery summer steelhead (slide 13 of Attachment C). He also noted that the containment level for these NTTOC is 5%, and the exceedances barely exceeded 5%. He said that these exceedances are not worrisome because they were so small, and also considering the lack of understanding about interactions occurring in the Columbia River (i.e., population overlap, habitat segregation, and behavioral interactions are poorly understood in the mainstem Columbia River compared to the tributaries). He also added that the three exceedances had large variability compared to the other interactions, noting that the other interactions had almost no variability (slide 14 of Attachment C). Schiewe asked if sensitivity testing was performed. Mackey replied that Todd Pearsons (Grant PUD) performed some sensitivity testing, but that he thinks Pearsons may have been focusing more on what was causing the model to stall. He added, however, that he believes Pearsons and Busack did complete additional testing when the model was developed and no issues were found.

Mackey said that the main sources of mortality were disease and competition equivalence (slide 15 of Attachment C) for the three steelhead NTTOC interactions that exceeded containment. Tom Kahler asked if the Twisp steelhead NTTOC and Columbia River summer Chinook salmon interaction were yearling releases, and Mackey replied that they were—specifically Chelan Falls yearling releases. Alene Underwood noted that when the NTTOC project started, those fish would have been from Turtle Rock. Mackey agreed, noting that the interaction and release location had been modified in the model, as appropriate. Murdoch asked about excluding age-zero steelhead, and Mackey confirmed that age-zero steelhead were excluded from the analysis because of temporal isolation from hatchery fish (steelhead emerge after hatchery fish have left the system). He said that the density of Columbia River fish was calculated based on a fish size-territory size relationship and the overlap with NTTOC was very low. He reiterated that not a lot is known about habitat use and spatial separation in the mainstem Columbia River, and so data related to habitat were based on best professional judgments. He also noted that the other similar interactions that did not exceed the containment level had similar variable inputs as those few that experienced exceedances. He reviewed the cumulative effects for Twisp steelhead NTTOC as an example, pointing out the pattern of increasing mortality with the number of hatchery programs encountered noting that when the NTTOC interact with Columbia River program that produced the exceedance, the mortalities significantly increase (slide 16 of Attachment C). Thus, only the one interaction with an exceedance was driving exceedance at the roll up level.

Mackey reviewed the conclusions, noting that mortality rates were overall very low. He said that there were no in-basin containment level exceedances, and only three exceedances overall; he added that in general, the risk of hatchery fish was found to be low. Kirk Truscott asked if different disease data were entered in the model to account for programs that are more prone to disease. Mackey replied that the same data were applied to all programs.

C. DISCUSSION: NTTOC Objective Finalization (Greg Mackey)

Greg Mackey recalled the major effort to complete the NTTOC modeling and analyses, noting that it took about 2 years of data organization before the modeling could even start. Keely Murdoch said that at this point, she thinks Objective 10 (the "NTTOC Objective", now Objective 12 in the new M&E Framework) has been satisfied. She recalled that the Hatchery Committees agreed to complete the NTTOC modeling and develop a report summarizing the results in order to identify any major issues with hatchery fish and NTTOC interactions, which she noted is now complete. Kirk Truscott agreed that Objective 10 has been addressed, although, he also added that it would be interesting to re-run the three exceedances. He also noted that several interactions were not modeled, but said that modeling those interactions did not seem critical to fulfilling Objective 10.

Mike Tonseth asked if the models were run using the hatchery release numbers in place prior to the hatchery re-calculation. Mackey replied that the models were run using the recalculated numbers as approved by the Hatchery Committees. Tonseth said that he believed that the Hatchery Committees had accomplished all they could for now, and suggested perhaps re-running the models following the next recalculation. Bill Gale also agreed that Objective 10 has been addressed for now; however, he noted that if numbers increase or new data become available, the Committees might consider re-running some interactions. He added that there is still a lot of uncertainty, for example, around the subject of disease transmission and about potential interaction with lamprey. Gale reminded the Hatchery Committees that lamprey were listed as a NTTOC, and since they have not yet been addressed, they are still an outstanding commitment. Mackey agreed, but added that the PUDs should not be held solely accountable to address lamprey when new data become available. He reminded the committees that the NTTOC objective in the Hatchery M&E Monitoring Plans is a regional objective involving the state and federal agencies and tribes.

Schiewe suggested developing a draft SOA that acknowledges partial fulfillment of Hatchery M&E Plan Objective 10, and including the qualifications of this partial fulfillment, as discussed during today's Hatchery Committees meeting. Alene Underwood said that Chelan PUD will develop the draft SOA and provide it to the Hatchery Committees for review.

D. Rearing Coho at Wells Hatchery for the YN's Coho Reintroduction Program (Greg Mackey and Keely Murdoch)

Greg Mackey said that the YN provided an initial proposal to Douglas PUD for rearing coho at Wells Hatchery. He said that Douglas PUD's current coho mitigation agreement expires within a few years, and the idea is to develop a collaborative rearing agreement, where some fish will be produced on behalf of the YN and Douglas PUD would rear an additional 50,000 for their HCP NNI mitigation. He said that the details are still being discussed and will eventually be presented to the HCP Coordinating Committees. Keely Murdoch concurred, noting that the YN and Douglas PUD wanted to be certain the Hatchery Committees were aware that these discussions were ongoing. She added that it is still not clear what rearing capacity will be available at Wells, and that these details need to be worked out prior to developing a draft proposal. Kirk Truscott asked if the YN will be rearing all of their coho at Wells Hatchery, and Murdoch replied that they will not. She said that rearing space in the lower Columbia has been somewhat limited and that this will help. She said that the YN is having permitting issues with building their own facility in the Wenatchee, so rearing coho at Wells would be a solution to the production issues they are facing now. She explained that there is a ramping-up phase in the Methow to 1 million fish, and then it will ramp back down.

Truscott asked if the YN's current agreement is tied to the Columbia River Fish Accords funding period; Murdoch said that she did not believe so. She explained that the HCP included a provision to decide whether to include coho as a Plan Species in 2005; however, at that time it was unknown whether the reintroduction experiment was going to receive continued funding from the Bonneville Power Administration (BPA) and a decision was delayed until 2007 when coho was determined to qualify as a Plan Species. She added that the agreement was not intended to line up with the Accords; however, it just happened to occur in sync. She also added that the SOA making coho a Plan Species did not mention the Accords. Mike Schiewe asked, with the Accords in place, if funding for the Coho Reintroduction Program started coming out of the Accords. Murdoch said that the Coho Reintroduction Program started independently from the Accords, and when the program was cut back, it was then tied into the Accords. Schiewe asked if the YN will still have a coho program if the Accords funding is discontinued; Murdoch replied that yes, there is a funding agreement with BPA that goes beyond the Accords funding.

III. Chelan PUD

A. Tangle Netting in the Chewuch (Alene Underwood)

Alene Underwood recalled that Chelan PUD has a total of 15 days to tangle net in the Chewuch to obtain broodstock for their Methow spring Chinook salmon program. She said that last Monday, July 14, 2014, following receipt of a technical support letter from NMFS, Chelan PUD and WDFW started snorkeling in the Chewuch. She said that to date, two natural-origin (NORs) and one hatchery-origin (HOR) spring Chinook salmon have been collected. Kirk Truscott noted that the NORs collected to date were confirmed by passive integrated transponder (PIT)-tag readers. Underwood added that major adult holding areas have also been identified based on work conducted by Charlie Snow's (WDFW) team.

Bill Gale asked if any bull trout have been encountered in the holding areas, and Underwood said that to her knowledge no bull trout have been encountered to date. Mike Tonseth said that one bull trout was seen late yesterday, July 15, 2014.

Peter Graf (Grant PUD) said that Grant PUD will likely not start their tangle netting efforts in Nason Creek this week due to high flows. He added that the rest area used for a tangle netting staging area is also being used as a staging area for firefighters fighting the central Washington fires. He said that Grant PUD will distribute emails notifying interested parties when they plan to begin tangle netting efforts, which he said would likely be next week. Keely Murdoch noted that the YN plans to observe tangle netting efforts in the Chewuch and in Nason Creek.

IV. WDFW

A. Spring Chinook Salmon Adult Management and Broodstock Collection in the Wenatchee Basin (Mike Tonseth)

Mike Tonseth said that a spreadsheet summarizing 2014 spring Chinook salmon adult management and broodstock collection in the Wenatchee Basin (Attachment D) was distributed to the Hatchery Committees by Kristi Geris on July 15, 2014. Tonseth recalled that 204 Chiwawa broodstock were being targeted to meet the aggregated mitigation levels for Grant PUD and Chelan PUD, absent certainty in acquiring wild fish for the respective conservation programs. He said that 205 HORs have been collected to date, including 102 females and 103 males. He said, in addition, that 25 PIT-tagged Chiwawa NORs have been collected from Tumwater Dam, including 11 females and 14 males; 26 Chiwawa NORs have been collected from the Chiwawa Weir, including 19 females and 7 males; and no broodstock have been collected from Nason Creek. He said that following evaluation on Monday, July 14, 2014, the actual Chiwawa NOR broodstock numbers on hand are 52 total, including 29 females and 23 males, leaving 8 females and 14 males left to acquire to meet the full Chiwawa conservation program.

Tonseth said that to date, 65 PIT-tagged Chiwawa NORs have been detected over Bonneville Dam, and 31 of those have also been detected over Priest Rapids Dam. He said that 25 of those 31 detected over Priest Rapids Dam have been collected, and at least 3 of the 31 detected over Priest Rapids Dam have also been detected over Tumwater Dam. He said that only six of the PIT-tagged Nason NORs have been detected over Bonneville Dam, only one of those has also been detected over Priest Rapids Dam, and zero have been detected over Tumwater Dam. He said that an estimated 2,263 Chiwawa HORs have made it to Tumwater Dam, including an estimated 160 Chiwawa HORs removed through the Wenatchee spring Chinook salmon conservation fishery. He said that the current passage of age-4 and age-5

NORs over Tumwater Dam is 847, which is about 91% of the pre-season estimate (931 age-4 and age-5 fish only). He added that 1,111 HORs have been surplused from Tumwater Dam, 42% of which were jacks. He also noted that during the 6 days of trapping at the Chiwawa Weir, 35 bull trout were encountered.

Tonseth said that a total of 626 spring Chinook salmon have been caught to date in the Wenatchee spring Chinook salmon conservation fishery, including 572 HORs. He added that among the HORs, about 160 are estimated to be Chiwawa-origin, and about 412 are estimated to be Leavenworth (Carson)-origin. He said that those numbers will be confirmed once additional data are obtained from creel surveys. He said that total estimated mortality was seven spring Chinook salmon, including two that were poached, and he noted that the total allowable take is 12. He added that there was an estimated five bull trout encounters.

Bill Gale asked how the "potential Leavenworth Hatchery fish passed" numbers were derived. Tonseth explained that those numbers were estimated based on adipose fin (ad)-clipped, coded-wire-tagged (CWT) fish counts, but he cautioned that the numbers may be quite liberal and should not be relied on because they were developed for escapement purposes.

Gale also asked about trapping operations at the weir. Tonseth said that trapping at the weir is up for 24 hours and then down for 24 hours in an effort to minimize delays, and he noted that NORs appear to be waiting to pass the weir until trapping is down for 24 hours. He said that staff have created shady areas and constructed an artificial logjam to create a holding pool near the entrance of the weir to try to lure fish into the area. Gale suggested, with regard to bull trout, contacting Karl Halupka (USFWS) to brainstorm ideas on how to minimize bull trout encounters and make trapping more efficient.

B. Proposed Modification to Tumwater Dam Operation (Mike Tonseth)

Mike Tonseth said that sockeye have started to arrive at Tumwater Dam in large numbers. He added that about 50 adult spring Chinook salmon are still passing the dam per day, of which about 60% are HORs and mostly jacks. He said that according to the Tumwater Operations Plan, once sockeye arrive at the dam, spring Chinook salmon trapping operations will be reduced to 3 days per week, 16 hours per day, and not to exceed 48 hours per week. He said that beginning last Friday, July 11, 2014, because there were so many spring Chinook salmon passing the dam, WDFW modified the trapping operations to 7 days per week, 10 hours per day, and not to exceed 48 hours per week. He said that since these operations deviate from the Tumwater Operations Plan, WDFW would like Hatchery Committees concurrence to run these modified operations until Monday, July 21, 2014, when operations will be re-revaluated based on how many spring Chinook salmon are still passing the dam (i.e., cost-benefit for continuing adult management).

Keely Murdoch recalled that historically, delays at Tumwater Dam have been highly correlated with large sockeye numbers passing the dam. She said that as long as no delays are occurring at the dam and a median travel time of less than 48 hours is maintained, then the YN approves of the modified trapping operations. Tonseth said that he contacted NMFS regarding these modified trapping operations and that Amilee Wilson (NMFS) indicated via email that NMFS approved of the modified operations provided that delay monitoring remain in place (i.e., monitoring for every ten PIT-tagged fish). Tonseth said that this year, WDFW is monitoring delay for every PIT-tagged fish and will continue to do so during the modified trapping operations. Mike Schiewe asked if trapping will cease if delay is observed in any one fish, and Tonseth said that is correct. Schiewe asked how quickly delay data are made available, and Tonseth said that as soon as delays are observed he receives those data. He added that if no delays are observed, he receives summary data weekly. Alene Underwood added that Chelan PUD staff also monitors delay on a daily basis.

Schiewe asked if trapping operations will transition back to those in the Tumwater Operations Plan if, on Monday, July 21, 2014, it does not appear beneficial to continue adult management; Tonseth confirmed that is correct. Schiewe asked what criteria will be used to determine “benefit.” Tonseth said that if the numbers of spring Chinook salmon removed will not appreciably affect percent hatchery origin spawners on the spawning grounds, or that the benefit will not outweigh the risk of delay, then trapping operations will transition to the original plan.

Bill Gale said that he does not have an issue with the modified trapping operations; however, he said that formal USFWS approval will need to be obtained from Karl Halupka or Steve Lewis. Underwood asked when the 48 hours ends, since these modified trapping operations began on Friday, July 11, 2014; Tonseth replied that it ends tomorrow, Thursday, July 17, 2014 at 1:00 p.m. Tonseth noted that next year, this transition should not be an issue because adjustments will be made earlier in the season to manage for the end of the spring Chinook salmon run.

Kirk Truscott said that he is concerned that 8,000 sockeye just passed Tumwater Dam in 1 day, and more will likely pass on a daily basis soon. Tonseth said that if that many fish start passing Tumwater Dam in a single day, trapping should be halted.

Underwood said that Chelan PUD discussed with WDFW the importance of having the proper approvals in place for these modified operations. She said that Chelan PUD has received approval from NMFS; however, if approval is not obtained from USFWS before 1:00 p.m. tomorrow, Chelan PUD will halt trapping operations.

Truscott asked if a large proportion of spring Chinook salmon passing Tumwater Dam are jacks; Tonseth said that he would review passage records to see if that is the case. Tonseth said that jacks do typically make up a large portion of the late return. Truscott asked whether there is really a biological risk to allowing them to pass if, based on findings from the Reproductive Success Study, the preponderance of fish are jacks. He added that jacks do not appear to contribute substantially to reproduction in the basin. Murdoch noted that the permit also has proportionate natural influence requirements.

Schiewe summarized that WDFW is asking the Hatchery Committees to approve modified trapping operations at Tumwater Dam through Monday, July 21, 2014. Tonseth added that WDFW needs time on Monday morning to review spring Chinook salmon passage numbers to determine if counts have dropped to where they do not benefit adult management. He also added that he is not sure how many fish that would be, and that he will need to discuss this with Andrew Murdoch (WDFW).

The Hatchery Committees representatives present agreed to continue trapping operations at Tumwater Dam 7 days per week, 10 hours per day, and not exceeding 48 hours per week (i.e., "modified Tumwater Dam operations") through Monday, July 21, 2014, pending USFWS approval on Thursday, July 17, 2014. Tonseth said that WDFW will obtain USFWS approval of the modified Tumwater Dam operations no later than Thursday, July 17, 2014, at 1:00 p.m., and will provide USFWS' approval to Kristi Geris for distribution to the Hatchery Committees. Tonseth said that WDFW will also provide NMFS' email approval of the modified Tumwater Dam operations to Geris for distribution to the Hatchery Committees. Lastly, Tonseth said that WDFW will re-evaluate the modified Tumwater Dam operations and will provide a recommendation for a path forward to Geris for distribution to the Hatchery Committees no later than Monday, July 21, 2014, at 12:00 p.m.

C. Wenatchee Steelhead BiOp Update (Mike Tonseth)

Mike Tonseth noted that the Wenatchee steelhead BiOp is now out for review.

V. CCT

A. CCT's Okanogan Section 10(j) Permit (Kirk Truscott)

Kirk Truscott said that on July 11, 2014, NMFS published the Okanogan ESA Section 10(j) Permit in the Federal Register. He said the permit becomes effective 30 days after being published.

VI. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees' meetings are on August 20, 2014 (Chelan PUD); September 17, 2014 (Douglas PUD); and October 15, 2014 (Chelan PUD).

List of Attachments

Attachment A	List of Attendees
Attachment B	Final SOA Approving Grant PUD Use of Excess Production Capacity at Douglas PUD Facilities through 2023 to Produce Steelhead and Spring Chinook Salmon

Attachment C	Ecological Risk Assessment of Upper-Columbia Hatchery Programs on NTTOC Presentation
Attachment D	2014 Spring Chinook Adult Management and Broodstock Collection in the Wenatchee Basin spreadsheet

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Alene Underwood*	Chelan PUD
Greg Mackey*	Douglas PUD
Tom Kahler*	Douglas PUD
Peter Graf	Grant PUD
Bill Gale*†	U.S. Fish and Wildlife Service
Mike Tonseth*	Washington Department of Fish and Wildlife
Kirk Truscott*	Colville Confederated Tribes
Keely Murdoch*	Yakama Nation

Notes:

* Denotes Hatchery Committees member or alternate
† Joined by phone

Wells HCP Hatchery Committees
Statement of Agreement

Approval of Grant PUD Requests to Douglas PUD Under Hatchery Sharing Agreements for Fish Production – Ten Year Approvals. July 16, 2014

Statement

The Wells HCP Hatchery Committee agrees to approve Grant PUD's request to Douglas PUD to produce fish under hatchery sharing agreements through 2023. Changes in hatchery programs at either the Wells or Methow hatcheries may trigger a new hatchery sharing production approval request to the Wells HCP HC.

Background

Douglas PUD and Grant PUD entered into hatchery sharing agreements in 2013 that extend until 2052 for Wells Hatchery and Methow Hatchery. Historically, the HCP HC was presented with an annual request for approval of fish production on behalf of Grant PUD at the Douglas PUD-owned hatchery facilities. The HCP HC annually approved the use of the excess rearing capacity at these facilities to produce fish for Grant PUD.

Fish production levels for the two PUDs have been established in the most recent recalculation through 2023. The next recalculation is scheduled to be implemented in 2024 – the next scheduled opportunity for production numbers to change. Douglas PUD proposes to replace the annual notification and request for approval of Grant PUD's production at Douglas facilities to a single approval that extends until 2023, or until Grant's production numbers change. At that time, a new notice of production and request for approval will be presented to the HCP HC with a term that extends until the next scheduled opportunity for production numbers to change. Douglas PUD has sufficient production capability at both of its hatcheries to meet its mitigation obligations and produce the requested fish for Grant PUD.

Grant PUD's production at Douglas PUD facilities for 2014-2023

Wells Hatchery Steelhead: Total 100,000 yearling steelhead

Methow Hatchery Spring Chinook: 134,126 yearling spring Chinook.

ECOLOGICAL RISK ASSESSMENT OF UPPER-COLUMBIA HATCHERY PROGRAMS ON NON-TARGET TAXA OF CONCERN

Gregory Mackey	Douglas PUD
Todd N. Pearsons	Grant PUD
Matt R. Cooper	U.S. Fish and Wildlife Service
Keely G. Murdoch	Yakama Nation
Andrew R. Murdoch	Washington Department of Fish and Wildlife
Tracy W. Hillman	Bioanalysts, Inc.

"FINAL

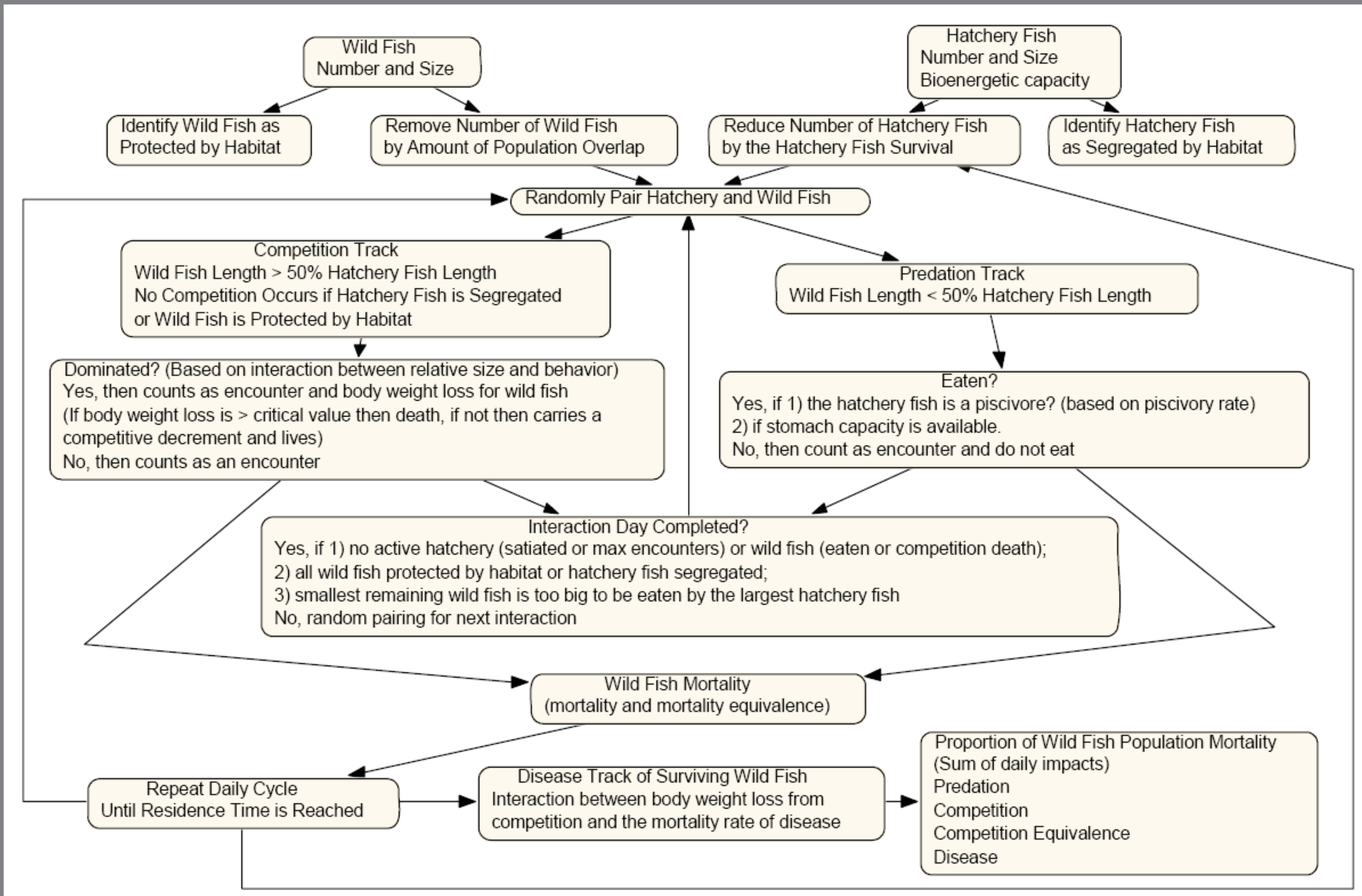
Rocky Reach, Rock Island, and Wells HCP Hatchery Committees
Summary and Strategy for Monitoring and Evaluation Plan Objective 10
(NTTOC)

August 19, 2009"

- **Chelan PUD Objective 10**: Determine if ecological interactions attributed to hatchery fish reduce the abundance, size, or distribution of non-target taxa (NTT).

- **Douglas PUD Objective 10**: Determine if the release of hatchery fish impacts non-target taxa of concern (NTTOC) within acceptable limits.

PCD Risk Model



Interactions

Hatchery Programs	NTTOC Populations	Interactions	NTTOC Omitted	Programs Omitted
50	25	526		
		-110	Westslope Cutthroat and Pacific Lamprey	
		-80		Chief Joseph Hatchery
		336	Total Interactions Attempted	
		-134	Failed Model Runs	
		202	Successful Model Runs	

Westslope Cutthroat

- Used population overlap (spatial) metric to estimate the maximum possible mortality that could occur.
- Containment level was 41%
- All interactions (spatial overlap) were very low (<=3%; N=45 hatchery programs).

Pacific Lamprey

- Sufficient information not available to perform risk assessment
  - Limited spatial distribution information
  - Lack of abundance estimates
  - Lack of basic information on mechanisms of interaction with salmon and steelhead

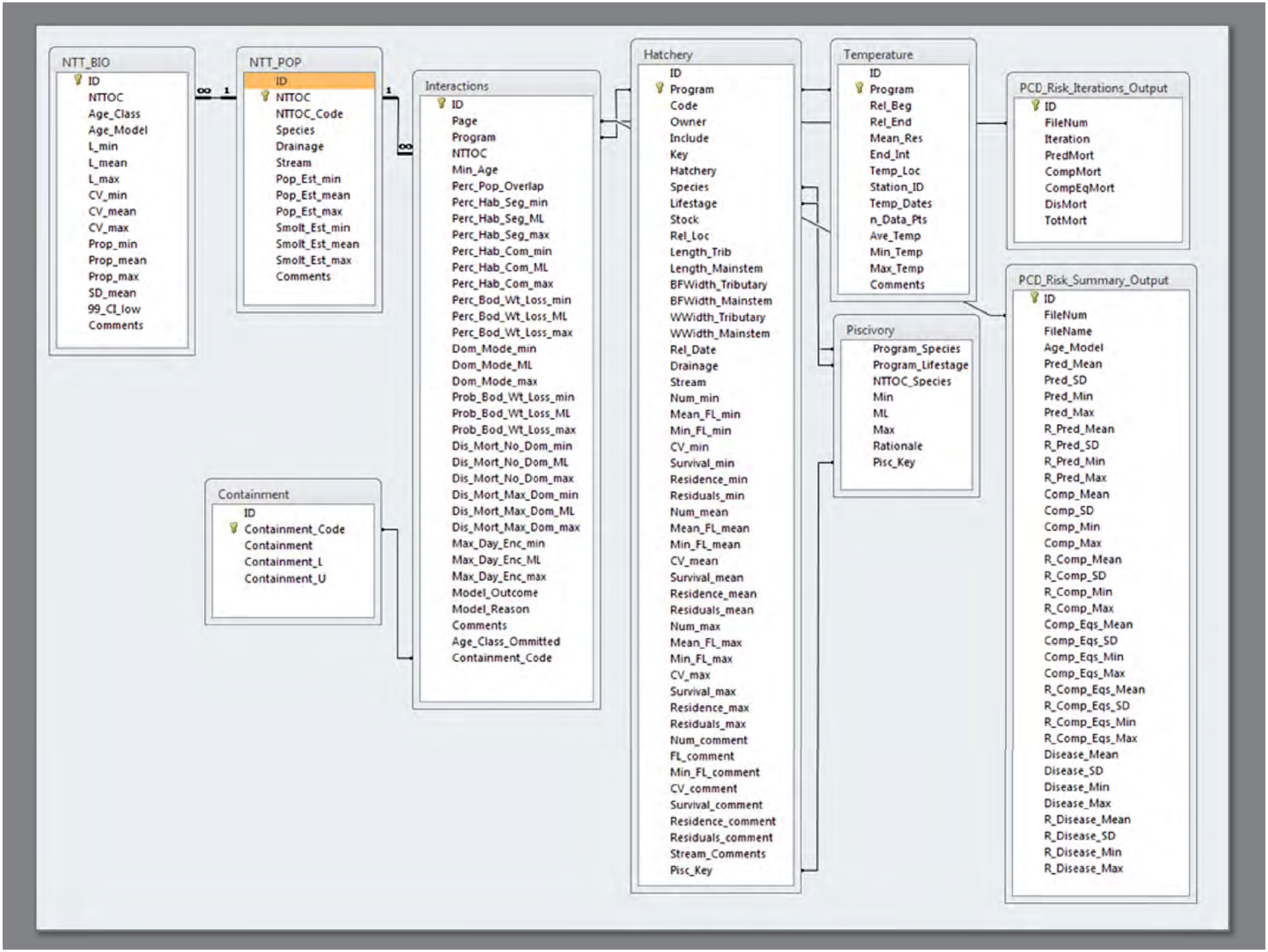
Data Resources

- Hatchery program size and biological data
- NTTOC population and biological data
- Data describing ecological interactions between NTTOC and hatchery fish

- Best available data
- Literature values if local data were not available
- Best professional judgment

BPJ

Name	Affiliation	HETT Member
John Arterburn	Coleville Confederated Tribes	no
Charles Snow	WDFW	no
John Crandall	Wild Fish Conservancy	no
Kirk Truscott	Coleville Confederated Tribes	no
David Hopkins	USFWS	no
Matt Cooper	USFWS	yes
Tracy Hillman	BioAnalysts	yes
Keely Murdoch	Yakama Nation	yes
Todd Pearsons	Grant PUD	yes
Andrew Murdoch	WDFW	yes
Greg Mackey	Douglas PUD	yes
Joe Miller	Chelan PUD	yes


NTT_BIO
ID
NTTOC
Age_Class
Age_Model
L_min
L_mean
L_max
CV_min
CV_mean
CV_max
Prop_min
Prop_mean
Prop_max
SD_mean
99_CI_low
Comments
NTT_POP
ID
NTTOC
NTTOC_Code
Species
Drainage
Stream
Pop_Est_min
Pop_Est_mean
Pop_Est_max
Smolt_Est_min
Smolt_Est_mean
Smolt_Est_max
Comments
Interactions
ID
Page
Program
NTTOC
Min_Age
Perc_Pop_Overlap
Perc_Hab_Seg_min
Perc_Hab_Seg_ML
Perc_Hab_Seg_max
Perc_Hab_Com_min
Perc_Hab_Com_ML
Perc_Hab_Com_max
Perc_Bod_Wt_Loss_min
Perc_Bod_Wt_Loss_ML
Perc_Bod_Wt_Loss_max
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Dom_Mode_ML
Dom_Mode_max
Prob_Bod_Wt_Loss_min
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Prob_Bod_Wt_Loss_max
Dis_Mort_No_Dom_min
Dis_Mort_No_Dom_ML
Dis_Mort_No_Dom_max
Dis_Mort_Max_Dom_min
Dis_Mort_Max_Dom_ML
Dis_Mort_Max_Dom_max
Max_Day_Enc_min
Max_Day_Enc_ML
Max_Day_Enc_max
Model_Outcome
Model_Reason
Comments
Age_Class_Ommitted
Containment_Code
Containment
ID
Containment_Code
Containment
Containment_L
Containment_U
Hatchery
ID
Program
Code
Owner
Include
Key
Hatchery
Species
Lifestage
Stock
Rel_Loc
Length_Trib
Length_Mainstem
BFWidth_Tributary
BFWidth_Mainstem
WWidth_Tributary
WWidth_Mainstem
Rel_Date
Drainage
Stream
Num_min
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Min_FL_min
CV_min
Survival_min
Residence_min
Residuals_min
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Mean_FL_mean
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End_Int
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Temp_Dates
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Ave_Temp
Min_Temp
Max_Temp
Comments
Piscivory
Program_Species
Program_Lifestage
NTTOC_Species
Min
ML
Max
Rationale
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Iteration
PredMort
CompMort
CompEqMort
DisMort
TotMort
PCD_Risk_Summary_Output
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FileNum
FileName
Age_Model
Pred_Mean
Pred_SD
Pred_Min
Pred_Max
R_Pred_Mean
R_Pred_SD
R_Pred_Min
R_Pred_Max
Comp_Mean
Comp_SD
Comp_Min
Comp_Max
R_Comp_Mean
R_Comp_SD
R_Comp_Min
R_Comp_Max
Comp_Eqs_Mean
Comp_Eqs_SD
Comp_Eqs_Min
Comp_Eqs_Max
R_Comp_Eqs_Mean
R_Comp_Eqs_SD
R_Comp_Eqs_Min
R_Comp_Eqs_Max
Disease_Mean
Disease_SD
Disease_Min
Disease_Max
R_Disease_Mean
R_Disease_SD
R_Disease_Min
R_Disease_Max

PCDRisk-1 Model Inputs: NTTOC Risk Assessment

Interaction ID: **157** Owner: **DPUD**

Number of Iterations	Default = 50		
Scaling Factor	Default = 1		
Hatchery Species	Columbia Subyearling Summer Chinook (Wells)		
Natural Species	Spring Chinook (Chewuch River)		
Number of Hatchery Fish	376,027	438,680	498,500
Number of Natural Fish	59,040	264,811	607,043

Hatchery Fish Details

Mean L			CV			Minimum L
108.1	111.5	116.9	0.056	0.070	0.093	63

Natural Fish Details

	Mean L			CV			Prop. in Class		
Age Class 1	30	38	69	0.04	0.10	0.17	0.94	0.97	0.98
Age Class 2	92.9	95.7	99.9	0.08	0.09	0.09	0.02	0.03	0.06

Minimum L: 25

"Age Class" uses,by default, 1 as the youngest NTTOC age available for interaction with hatchery fish. Does not necessarily represent true age.

Hatchery Fish Residence Time	15	36	79
Hatchery Fish Survival rate	0.16	0.31	0.45
Percentage Habitat Complexity	1	5	10
Percentage Population Overlap	0.3		
Percent Habitat Segregation	15	30	45
Probability Dominance Results in Body Weight Loss	0.00	0.05	0.10
Dominance Mode	3		
Percentage of Body Weight Loss Causing Death	46	50	74
Maximum Daily Encounters per Hatchery Fish	1	1	1
Piscivory Rate	0.0000	0.0000	0.0001
Temperature (Celsius)	9.7	10.3	11.2
Disease Mortality Rate for Fish with No Dominance Encounters	0.0000	0.0000	0.0001
Disease Mortality Rate for Fish with Max Dominance	0.0000	0.0100	1.0000

Entered by: Date:

Output File: PCD-157.out

Run time:

Interaction Roll Up

	NTTOC Population Level	
Program	**Sub-Population**	**Population**
Natal Basin - Unique	x	
Natal Basin - All	x	x
Columbia - Unique	x	
Columbia - All	x	x
Natal Basin + Columbia	x	x

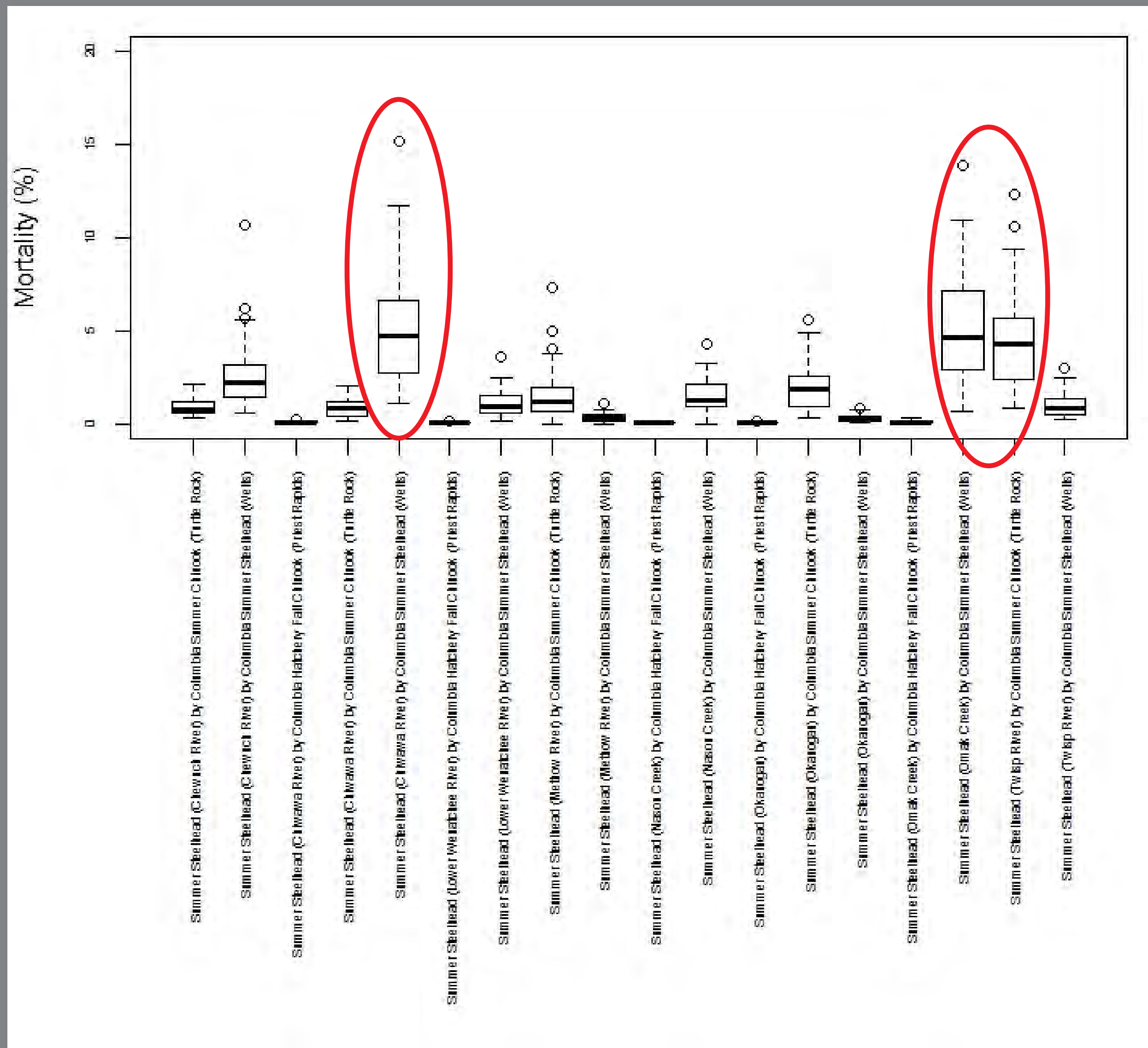
Interaction Roll Up Example

		NTTOC Population Level	
		Sub-Population	**Population**
Program		Twisp Steelhead	Methow Steelhead
Natal Basin - Unique	6 unique programs	6	
Natal Basin - All	6 programs combined	1	1 (13 interactions)
Columbia - Unique	2 unique programs	2	
Columbia - All	2 programs combined	1	1 (6 interactions)
Natal Basin + Columbia	8 programs combined	1	1 (19 interactions)

Results

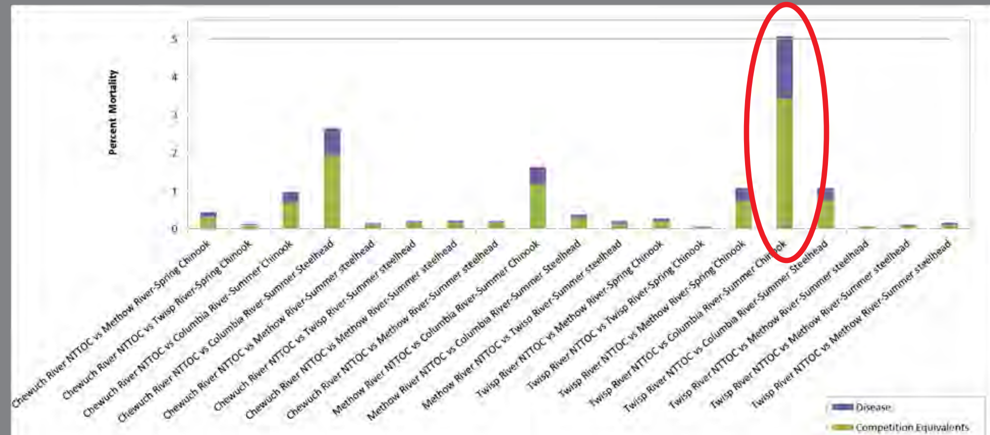
NTTOC Level			Interaction Level	
Population	Sub-Population		Hatchery Program(s)	% Mortality
Methow Basin Summer Steelhead				
	Twisp River Summer Steelhead		Natal basin + Columbia releases roll-up	7.88
	Twisp River Summer Steelhead		Columbia releases roll-up	6.15
	Twisp River Summer Steelhead		Chelan Falls Hatchery Summer Chinook	5.08
Wenatchee Basin Summer Steelhead				
	Chiwawa Summer Steelhead		Natal basin + Columbia releases roll-up	8.27
	Chiwawa Summer Steelhead		Columbia releases roll-up	6.18
	Chiwawa Summer Steelhead		Wells Hatchery summer steelhead	5.15
Okanogan Basin Summer Steelhead				
	Omak Creek Summer Steelhead		Natal basin + Columbia releases roll-up	5.78
	Omak Creek Summer Steelhead		Columbia releases roll-up	5.27
	Omak Creek Summer Steelhead		Wells Hatchery summer steelhead	5.14

Variability Drives Results

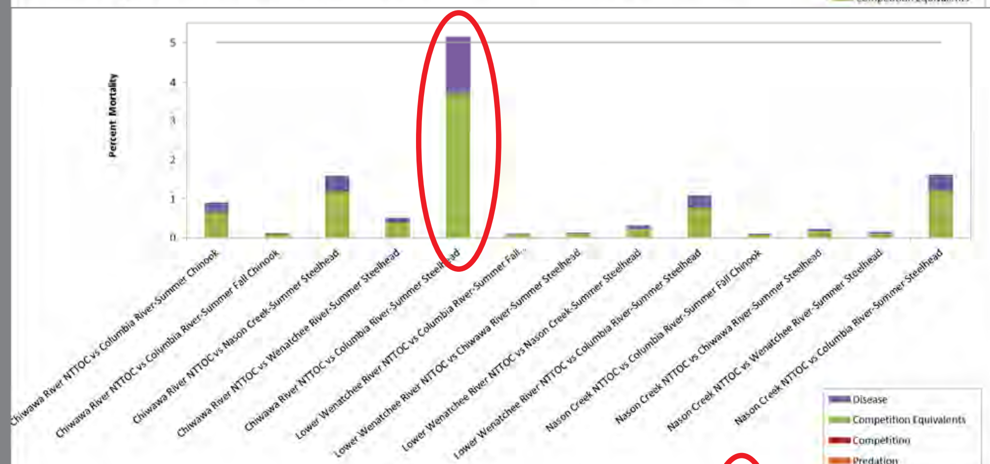


Sources of Mortality

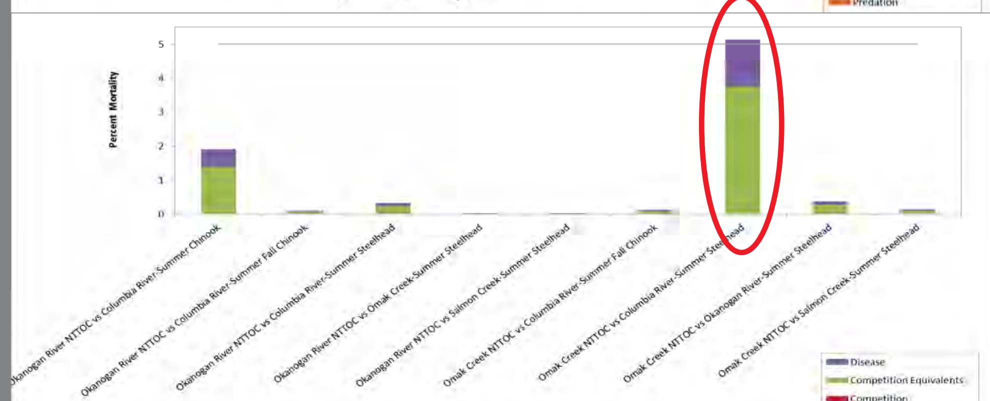
Twisp Steelhead NTTOC x Columbia River Summer Chinook



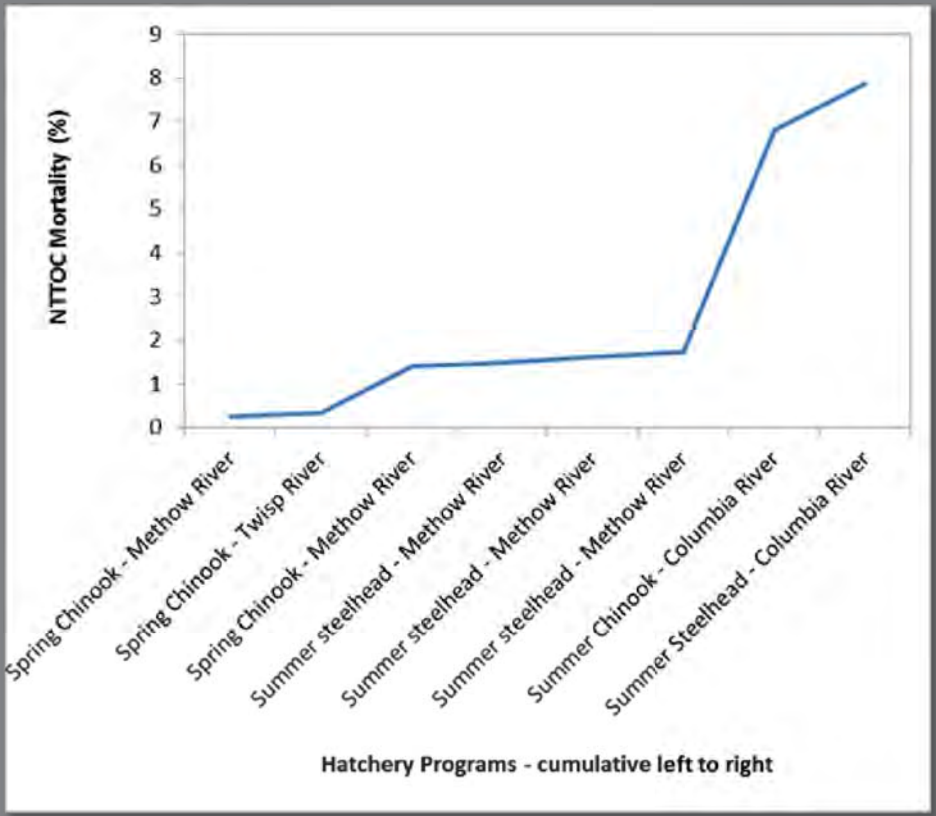
Chiwawa Steelhead NTTOC x Columbia River Steelhead



Omak Steelhead NTTOC x Columbia River Steelhead



Cumulative Effects



Twisp Steelhead NTTOC

Conclusions

- Interaction mortality rates were very low
- No exceedances in-basin
- 3 Exceedances with Columbia Programs on NTTOC steelhead
  - All 3 just over 5%
  - Less confident in the Columbia interactions modeling results
  - High variability among modeling runs
- Rollups did not exceed containment objectives, except for the 3 steelhead NTTOC
- Conclude risk of hatchery programs to NTTOC is low

Tumwater Data as of 7/14/14 however does not include spring Chinook counts via video during 14hr open period beginning 7/11/14

	Target Chiwawa Broodstock Collections		Targert Chiwawa Hatchery Escapement	
	Hatchery		Adult Hatchery	
	Female	Male	Female	Male
Remaining	0	-1	30	25
Original Targets	*102*	*102*	*515*	*302*

Survey Date for SPCH	Collected						Passed																		Hatchery Surplus					Total Passed	Total To Tumwater
	Hatchery		Wild				Total Hatchery		Chiwawa Hatchery		Potential White River Hatchery		Potential Leavenworth Hatchery		Potential Hatchery Summers		All Wild Chinook			Wild Spring Chinook			Potential Summers		Adult		Jacks Male	Hatchery Fallbacks			
			Wild_NAS		Wild_CHI																										
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Unknown	Female	Male	Unknown	Female	Male	Female	Male		Female	Male		
Total to Date	102	103	0	0	11	14	526	345	501	286	4	39	21	22	4	1	430	471	8	396	451	8	34	20	387	261	463	16	9	1726	3067

Broodstock Collection @ Chiwawa Weir

As of 7/15/14

Total Trapping Days Available			15	
Total Trapping Days Used			6	
Percent Trapping Days Used			0.400	
Bull trout Encounters Available			67	
Bull Trout Encounters To Date			35	
Percent of Allowable Encounters			0.522	
	Male	Female	Total	
Wild Spring Chinook	7	19	26	Sent to EBFH for broodstock
Hatchery Spring Chinook	9	23	32	Passed upstream

Wenatchee Spring Chinook Fishery

Catch	626	
Total	626	
Hatchery	572	(estimated 160 Chiwawa origin, 412 Carson origin)
Wild	54	

Hook and Release Mortality	5
Direct Mortality (poaching)	2
Total Mortality	**7**
Estimated Bull Trout Encounters	**5**

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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	September 17, 2014
From:	Mike Schiewe, HCP Hatchery Committees Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the August 20, 2014 HCP Hatchery Committees Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees meeting was held at Chelan PUD headquarters in Wenatchee, Washington, on Wednesday, August 20, 2014, from 9:30 am to 12:00 pm. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- Chelan PUD will provide a final report on the water recirculation pilot studies at Eastbank Fish Hatchery and Chiwawa Fish Facility to the Hatchery Committees by December 2014 (Item I).
- Hatchery Committees representatives will submit comments on the sample size section in the memo clarifying the standardized methods for Hatchery Monitoring and Evaluation (M&E) Plan Objective 8.3, Fecundity at Size, to Mike Tonseth (Item I).
- The Washington Department of Fish and Wildlife (WDFW) will add a revised summary table to the draft 2014 Wenatchee Basin Steelhead Release Proposal and will redistribute the final revised draft to the Hatchery Committees (Item I).
- Tom Kahler will coordinate with Ritchie Graves (National Marine Fisheries Service [NMFS]) and Scott Carlon (NMFS) for clarification on the Wells HCP requirement to submit the annual Broodstock Collection Protocols to the Wells HCP Coordinating Committee and NMFS Hydro Program for annual approval prior to trapping at Wells Dam; Kahler will also discuss this with the Wells HCP Coordinating Committee at their next meeting on August 26, 2014 (Item II-A).

- Mike Schiewe, Lynn Hatcher, and Mike Tonseth will revise the draft Broodstock Collection Protocols Statement of Agreement (SOA) and will also develop a draft schedule to meet the April 15 submittal deadline to NMFS (Item II-A).
- Mike Tonseth will coordinate with NMFS and the U.S. Fish and Wildlife Service (USFWS) to develop a list of key components that need to be included in the annual Broodstock Collection Protocols; he will also tentatively identify components that may be removed in order to streamline the annual review and approval process (Item II-A).
- Lynn Hatcher will confirm NMFS' willingness to delegate approval of the annual Broodstock Collection Protocols to their HCP Hatchery Committees and Coordinating Committees representatives (Item II-A).
- Steve Lewis (USFWS) will obtain an update from Karl Halupka (USFWS) on USFWS Wenatchee Section 7 consultation and will provide the update to Kristi Geris for distribution to the Hatchery Committees (Item II-B).
- Lynn Hatcher will discuss spring Chinook salmon broodstock compositing in the Wenatchee Basin during the Hatchery Committees meeting on September 17, 2014 (Item II-C).
- Steve Lewis will obtain clarification from Jessie Gonzales (USFWS) regarding how incidental take is assigned when multiple parties are requesting take authorization and will provide the clarification to Kristi Geris for distribution to the Hatchery Committees (Item III-A).
- Chelan PUD will add Methow spring Chinook salmon to Table 1 of the draft 2015 Chelan PUD Hatchery M&E Implementation Plan and will provide the revised draft to Kristi Geris for distribution to the Hatchery Committees (Item III-B). *(Note: Catherine Willard provided the revised draft plan to Geris on August 21, 2014, which Geris distributed to the Hatchery Committees that same day.)*
- Hatchery Committees representatives will submit edits and comments on the revised draft 2015 Chelan PUD Hatchery M&E Implementation Plan to Chelan PUD by September 10, 2014 (Item III-B).
- Chelan PUD will provide the revised draft Non-Target Taxa of Concern (NTTOC) SOA to Kristi Geris for distribution to the Hatchery Committees (Item III-D). *(Note: Catherine Willard provided the revised draft SOA to Geris following the meeting on*

August 20, 2014, which Geris distributed to the Hatchery Committees that same day.)

- Mike Tonseth will provide Keely Murdoch with a list of deadlines for when WDFW needs approvals in place prior to conducting coded wire tagging (CWT) activities (Item IV-A).

DECISION SUMMARY

- There were no decisions approved during today's meeting.

AGREEMENTS

- There were no agreements considered during today's meeting.

REVIEW ITEMS

- Kristi Geris distributed a memo to the Hatchery Committees on February 24, 2014, that clarified standardized methods for Hatchery M&E Plan Objective 8.3, Fecundity at Size. Comments on this memo, with regards to sample size, are due to Mike Tonseth (Item I).
- Kristi Geris distributed a revised draft 2015 Chelan PUD Hatchery M&E Implementation Plan to the Hatchery Committees on August 21, 2014. Comments on this draft plan are due to Chelan PUD by September 10, 2014 (Item III-B).

FINALIZED DOCUMENTS

- There are no documents that have been recently finalized.

I. Welcome

A. Review Agenda, Review Last Meeting Action Items, Approve the HCP-HC July 16, 2014 Meeting Minutes (Mike Schiewe)

Mike Schiewe welcomed the Hatchery Committees and asked for any additions or changes to the agenda. The following revisions were requested:

- Alene Underwood added a brief update on the Carlton Facility pump system.
- Lynn Hatcher added spring Chinook salmon broodstock compositing in the Wenatchee Basin.

The Hatchery Committees reviewed the revised draft July 16, 2014 meeting minutes. Kristi Geris said that all comments and revisions received from members of the Committees were incorporated in the revised minutes and there were no outstanding edits or questions to discuss. She also noted that Kirk Truscott provided the Colville Confederated Tribes' (CCT) approval of the meeting minutes via email on August 18, 2014, pending the addition of one minor edit, as distributed to the Hatchery Committees that same day. Keely Murdoch also noted that during the discussion about rearing Coho salmon at Wells Hatchery for the Yakama Nation's (YN's) Coho Salmon Reintroduction Program, she said that the YN is having permitting issues with building their own facility in the Wenatchee—not the Methow. Geris said that she will make this revision prior to distributing the final meeting minutes to the Committees. The Hatchery Committees members present approved the draft July 16, 2014 meeting minutes, as revised.

Action items from the Hatchery Committees meeting on June 18, 2014 and follow-up discussions were as follows (italicized item numbers below correspond to agenda items from the meeting on July 16, 2014):

- *Chelan PUD will provide a final report on the water recirculation pilot studies at the Eastbank Fish Hatchery and Chiwawa Fish Facility to the Hatchery Committees by September 2014 (Item I).*
  Alene Underwood said that Chelan PUD will provide this report by December 2014. This action item will be carried forward.
- *Alene Underwood will coordinate with Steve Lewis (USFWS) and arrange for Lewis to discuss how incidental take is assigned by USFWS during the next Hatchery Committees meeting on August 20, 2014 (Item I).*
  This will be discussed during today's meeting.
- *Hatchery Committees representatives will submit comments on the sample size section of the memo clarifying standardized methods for Hatchery M&E Plan Objective 8.3, Fecundity at Size, to Mike Tonseth (Item I).*
  This action item will be carried forward.

- *WDFW will add a revised summary table to the draft 2014 Wenatchee Basin Steelhead Release Proposal and Mike Tonseth will redistribute the final revised draft to the Hatchery Committees (Item I).*
  This action item will be carried forward.
- *NMFS will develop a draft SOA that requires Hatchery Committees approval of the annual Broodstock Collection Protocols before submission to NMFS and will distribute the draft SOA to the Hatchery Committees by August 2014 (Item I).*
  NMFS provided this draft SOA to Kristi Geris on August 5, 2014, which Geris distributed to the Hatchery Committees that same day. This will be discussed during today's meeting.
- *Chelan PUD will provide their draft 2015 Hatchery M&E Annual Implementation Plan to the Hatchery Committees for review 10 days prior to the Hatchery Committees meeting on August 20, 2014 (Item I).*
  Chelan PUD provided this draft plan to Kristi Geris on August 8, 2014, and Geris distributed the plan to the Hatchery Committees on August 9, 2014. This will be discussed during today's meeting.
- *Chelan PUD will develop a draft SOA that acknowledges partial fulfillment of Hatchery M&E Plan Objective 12 (formerly Objective 10) and also includes the qualifications of this partial fulfillment, as discussed during today's Hatchery Committees meeting (Item II-C).*
  Chelan PUD provided this draft SOA to Kristi Geris on August 18, 2014, which Geris distributed to the Hatchery Committees that same day. This will be discussed during today's meeting.
- *WDFW will provide NMFS' approval to modify trapping operations at Tumwater Dam from 3 days per week, 16 hours per day, and not exceeding 48 hours per week, to 7 days per week, 10 hours per day, and not exceeding 48 hours per week (i.e., "modified trapping operations") to Kristi Geris for distribution to the Hatchery Committees (Item IV-B).*
  Mike Tonseth said that the local wildfires temporarily halted trapping operations at Tumwater Dam, making this action item unnecessary, as explained in an email distributed to the Hatchery Committees by Kristi Geris on July 22, 2014.

- *WDFW will obtain USFWS approval of the modified Tumwater Dam operations no later than Thursday, July 17, 2014, at 1:00 p.m., and will provide USFWS' approval to Kristi Geris for distribution to the Hatchery Committees (Item IV-B).*
  Mike Tonseth said that the local wildfires temporarily halted trapping operations at Tumwater Dam, making this action item unnecessary, as explained in an email distributed to the Hatchery Committees by Kristi Geris on July 22, 2014.
- *WDFW will re-evaluate the modified Tumwater Dam operations and will provide a recommendation for a path forward to Kristi Geris for distribution to the Hatchery Committees no later than Monday, July 21, 2014, at 12:00 p.m. (Item IV-B).*
  Mike Tonseth said that the local wildfires temporarily halted trapping operations at Tumwater Dam, making this action item unnecessary, as explained in an email distributed to the Hatchery Committees by Kristi Geris on July 22, 2014.

B. U.S. Fish and Wildlife Service HCP-HC Alternate Representative Change (Mike Schiewe)

Mike Schiewe said that Bill Gale provided a letter from USFWS changing the USFWS HCP Hatchery Committees Alternate Representative from Jim Craig to Matt Cooper. Gale added that Cooper will likely attend the Hatchery Committees meeting on September 17, 2014, and will also attempt to attend meetings on a regular basis.

II. NMFS

A. DECISION: Draft Broodstock Collection Protocols SOA (Lynn Hatcher)

Lynn Hatcher said that a draft Broodstock Protocols SOA was distributed to the Hatchery Committees by Kristi Geris on August 5, 2014. Comments were received from Chelan PUD, the YN, USFWS, and WDFW, and a revised draft Broodstock Protocols SOA was distributed to the Hatchery Committees by Geris on August 15, 2014. Douglas PUD also provided suggested language for the SOA, which Geris distributed in a separate email to the Hatchery Committees on August 15, 2014. Kirk Truscott indicated via email on August 18, 2014, that the CCT do not have additional edits to the revised draft SOA. He indicated that the CCT would approve a final SOA that stipulates that the Committees will approve the annual protocols and provide them to NMFS by April 15 (schedule to be developed) and NMFS will review the protocols for consistency with permit take provisions and respond in writing.

Hatcher said that NMFS is already planning to include in the new Section 10 permits that the annual Broodstock Collection Protocols will be reviewed and approved by the Hatchery Committees by April 15. He added that NMFS is not advocating changes to the annual Broodstock Collection Protocols process; rather, this new language is just explaining the approval process. He also agreed with Mike Tonseth's recommended edit which indicates that implementation of this SOA satisfies both the Hatchery Committees' submission requirement and subsequent responsibility of NMFS to provide a written response to the Permit Holders.

Greg Mackey said that Craig Busack recently distributed the draft spring Chinook salmon permit, which includes a statement simply indicating that the Hatchery Committees will develop and submit the Broodstock Collection Protocols by April 15; which, Mackey said, is essentially all this SOA should reiterate. Hatcher agreed and said that originally this SOA was only one statement, but has since grown. Mike Schiewe noted that Truscott also recommended, prior to the meeting, the SOA be shortened to simply indicate that the Hatchery Committees will develop and submit the Broodstock Collection Protocols by April 15.

Tonseth said that he agrees with submitting the annual protocols by April 15; however, he also recommended developing an amendment process that can be implemented in the event a component of the protocols is not ready for submission by the April 15 deadline.
Alene Underwood said that Chelan PUD is supportive of the SOA so long as it moves away from the annual reauthorization language that existed in the previous permits. Schiewe recommended shortening the SOA to a simple statement of intent and also incorporating a schedule to meet the April 15 deadline. Tonseth said that Douglas PUD had a good suggestion for a simplified version in the email that was distributed to the Hatchery Committees by Geris on August 15, 2014.

Tonseth also noted that he does not recall receiving written concurrence from NMFS on the annual protocols, as stipulated in the current permits. He suggested that this was partially satisfied when NMFS approved the annual protocols via Hatchery Committees vote. Hatcher agreed with Tonseth, adding that he (Hatcher) is in frequent communication with Busack, who has approval authority.

Bill Gale asked about the approval process when Chris Peterson was the NMFS HCP Hatchery Committees representative. Tonseth recalled that Peterson used to provide email concurrence of the annual protocols, but NMFS would abstain from voting in the Hatchery Committees because they were a regulatory party.

Tom Kahler said that, related to scheduling and the April 15 submittal deadline to NMFS, he recently noticed that the Adult Passage Plan portion of the Wells HCP stipulates "…Broodstock Collection Protocols are developed by WDFW and are annually submitted to the Wells HCP Coordinating Committee and NMFS Hydro Program for annual approval prior to trapping at the Dam…" Kahler said that Douglas PUD has not been doing this; only recently, has Douglas PUD been presenting the proposed schedule for all parties planning trapping at Wells Dam to the HCP Coordinating Committees. He said that these approvals should be built into the schedule for the Broodstock Collection Protocols and he will coordinate with Ritchie Graves (NMFS) and Scott Carlon (NMFS) for clarification on this Wells HCP requirement and will also discuss this with the Wells HCP Coordinating Committee at their next meeting on August 26, 2014.

Gale asked Hatcher if accepting NMFS' approval of the protocols via Hatchery Committees vote would serve as final approval by NMFS. Hatcher said that this has been discussed, but he will verify internally NMFS' delegation of approval of the annual Broodstock Collection Protocols to their HCP Hatchery Committees and Coordinating Committees representatives. Schiewe, Hatcher, and Tonseth also indicated that they will revise the draft Broodstock Collection Protocols SOA and will also develop a draft schedule to meet the April 15 submittal deadline to NMFS.

Tonseth recalled discussions of removing unneeded information from the annual Broodstock Collection Protocols in order to streamline the review process. Gale asked if there was interest in separating the protocols by basin. Tonseth said that the old permits had different deadlines for spring Chinook salmon and summer steelhead programs; however, to streamline the process, the two documents were combined. He added that he does not believe that producing two documents would be beneficial. Underwood added that because Chelan PUD has fish in both basins, this would create more work to track. Tonseth said that he will coordinate with NMFS and USFWS to develop a list of key components that need to be included in the annual Broodstock Collection Protocols; he will also tentatively identify components that may be removed in order to streamline the annual review and approval process.

B. Hatchery and Genetic Management Plan (HGMP) Update (Lynn Hatcher)

Lynn Hatcher reported good progress with the permitting process and that NMFS is still targeting to complete permitting by the end of this year.

Greg Mackey noted an email recently distributed by Amilee Wilson (NMFS). He explained that there was a discussion within NMFS (general council and NEPA staff) regarding the need for a reduced hatchery program alternative for Environmental Impact Statements on hatchery programs. He said that this has held up progress with permitting; however, Rob Jones (NMFS) ultimately decided on the need to include a reduced program alternative. Mackey said that this specific email was regarding steelhead; however, his understanding is that all National Environmental Policy Act processes will now need to consider a reduced program alternative. He added that this decision was based on two lawsuits that established a legal precedent that appears to be in conflict with NEPA guidelines.

Mackey said that Craig Busack distributed the draft Methow Hatchery spring Chinook salmon permit (as well as the Winthrop NFH draft permit and the Okanogan Section 10[j]), which is now under review by Douglas PUD. Mackey said that Douglas PUD plans to complete their review by September 1, 2014. Mike Tonseth said that he is also reviewing the draft Methow spring Chinook salmon and Winthrop spring Chinook permits and plans to complete them by September 1, 2014, as well.

Alene Underwood asked for an update on the USFWS Wenatchee Section 7 bull trout consultation. Bill Gale said that the local wildfires have caused a lot of delay due to emergency consultations and Steve Lewis said that he will obtain an update from Karl

Halupka and will provide the update to Kristi Geris for distribution to the Hatchery Committees.

C. Spring Chinook Salmon Broodstock Compositing in the Wenatchee Basin (Lynn Hatcher)

Lynn Hatcher requested that spring Chinook salmon broodstock compositing in the Wenatchee Basin be added to the Hatchery Committees September 17, 2014 meeting agenda.

III. Chelan PUD

A. Incidental Take Discussion (Alene Underwood and Steve Lewis [USFWS])

Alene Underwood recalled the Hatchery Committees' interest in better understanding how incidental take is assigned when the operators are not owners of the facility. She said that Karl Halupka distributed a general question and answer memorandum that defined incidental take and explained rules on incidental take; however, the memorandum did not explain facility owner liability with regard to third party operators at a facility.

Bill Gale asked Steve Lewis if the Rocky Reach Biological Opinion (BiOp) includes blanket coverage of all operations at Tumwater Dam, and if so, what the limits were for this coverage. He said that he was particularly interested in the situation when parties other than Chelan PUD conducted operations at Tumwater Dam and how the cumulative effects are analyzed. Lewis replied that most routine operations are covered under the Rocky Reach BiOp, but new or unrelated studies requiring use of the facilities typically require a separate BiOp and take coverage. He said that cumulative effects of multiple programs are considered when issuing permits and Incidental Take Statements.

Tom Kahler said that at Wells Dam, Douglas PUD has incidental take permits for operating the fish ladders and broodstock facilities in the ladders and WDFW is a co-permittee. He added that Douglas PUD's Wells Dam BiOp covers all mitigation actions under the Wells HCP. He asked if actions implemented by contractors and the co-permittee are covered by Douglas PUD's permit. Lewis replied that they generally are. Kahler then asked, for example, if the Columbia River Inter-Tribal Fish Commission (CRITFC) wants to sample sockeye salmon at Wells Dam during which they may take steelhead at Wells Dam, does Douglas PUD have incidental take coverage for CRITFC's actions? Lewis said that in this particular case, CRITFC should have their own permit, and therefore, incidental take would be assigned to them. Kahler said that it was his understanding, based on hearsay from within the local fisheries community that even if CRITFC has coverage, then incidental take would be assigned to Douglas PUD. Lewis said that is not the case. Underwood asked if the entity conducting the action has the appropriate permits in place to perform that action, and the action is not linked to the facility owner's program, then incidental take is not assigned to the facility owner? Lewis said that is correct.

Keely Murdoch asked how incidental take is assigned when the take is caused by facility infrastructure. She said, for example, if the gaskets around false flooring were installed to prevent fish from slipping through the cracks, and the gasket then deteriorates allowing fish to slip through the cracks when a third party is operating the trap, would it be the owner's—not the operator's—responsibility for any take from a failure? Lewis said that in this case, there should be coordination with the action agency on the need for maintenance and repair and it would be up to the operator and the facility owner to agree on assignment of take; if an agreement is not reached, then USFWS would decide how to assign the take.

Gale noted that regarding cumulative effect, the PUDs may have coverage for multiple actions at a single facility. He asked how take is assigned when considering cumulative effects, when additional parties use the facility. He added that if several operators request take, and then the cumulative take approaches or exceeds the allowable take, who is assigned that take? Lewis said that he has not encountered this situation, but will obtain clarification from Jessie Gonzales (USFWS) regarding how incidental take is assigned when multiple parties are requesting take authorization. He said that he will provide clarification to Kristi Geris for distribution to the Hatchery Committees.

Greg Mackey asked how facility owners can verify that an entity requesting to operate at the facility has the appropriate coverage for their actions; he asked if the operator should contact USFWS to obtain a letter verifying that the third party's permit properly covers take for the proposed action at the facility. Lewis replied that yes, the operator can contact USFWS to confirm the proper coverage is in place. Mike Tonseth suggested that the facility owner should be copied on the issuance of the permit. Lynn Hatcher added that the facility owner should request a copy of the permit to verify that the operator is covered. Mackey pointed out that the onus of proof of proper coverage would be on the third party requesting to use the facility, not on the owner. The facility owners are not ESA experts or enforcement. Kahler said that Douglas PUD's policy has been that if it turns out the entity requesting to operate at the facility does not have the proper coverage, they would not be allowed to operate at the facility.

B. Draft 2015 Chelan PUD Hatchery M&E Implementation Plan (Catherine Willard)

Catherine Willard said that the draft 2015 Chelan PUD Hatchery M&E Implementation Plan was distributed to the Hatchery Committee by Kristi Geris on August 9, 2014. Kirk Truscott provided comments to Chelan PUD on the draft plan on August 18, 2014, and a revised draft plan was distributed to the Hatchery Committees by Geris on August 19, 2014. Truscott indicated that the revised draft adequately addressed the CCT's comments and the CCT are in general agreement with the plan; however, he would like to hear the outcome of the Committees discussion before the CCT approves the plan.

Willard said that the revised draft 2015 plan is essentially the same as the 2014 plan with the sockeye salmon addendum incorporated, as shown in tracked changes located at the end of the revised draft. Willard reviewed other key changes including Truscott's edits as well as the addition of a sentence regarding potentially modifying methods in the 2015 plan based on the completion and evaluation of 2014 M&E activities. Mike Tonseth noticed that Methow spring Chinook salmon were not included in Table 1 (study design elements and associated objectives) and Willard said that she will add Methow spring Chinook salmon to Table 1 and will provide the revised draft to Geris for distribution to the Hatchery Committees. *(Note: Willard provided the revised draft plan to Geris on August 21, 2014, which Geris distributed to the Hatchery Committees that same day.)*

Tonseth also suggested adding sockeye salmon to Table 1. Alene Underwood explained that because Table 1 applies to plan objectives that did not pertain to sockeye salmon, they were omitted from the table. Hatchery Committees representatives agreed to submit edits and comments to the revised draft 2015 Chelan PUD Hatchery M&E Implementation Plan to

Chelan PUD by September 10, 2014; Chelan PUD will request approval of the plan at the Hatchery Committees meeting on September 17, 2014.

C. Spring Chinook Surveys and Wildfire Closures (Catherine Willard)

Catherine Willard said that due to the local wildfires, Chelan PUD has not been able to access the Little Wenatchee River and Peshastin Creek to conduct spring Chinook salmon surveys until this week. Mike Tonseth also noted that WDFW distributed an email on August 5, 2014, notifying the Hatchery Committees that tangle netting efforts were temporarily halted due to the wildfires. Willard said that prior to the wildfires, Chelan PUD was able to obtain 49 spring Chinook broodstock in the Chewuch River via tangle netting efforts.

D. Hatchery M&E Plan Objective 12 (formerly Objective 10) NTTOC SOA (Alene Underwood)

Alene Underwood said that a draft NTTOC SOA was distributed to the Hatchery Committees by Kristi Geris on August 18, 2014. Underwood said that this SOA is intended to memorialize the partial fulfillment of Hatchery M&E Plan Objective 12 (formerly Objective 10) and to also document future plans to complete this objective, when possible. She said that today, she would like to discuss the draft SOA, and then request approval of the SOA at the Hatchery Committees meeting on September 17, 2014.

Bill Gale noted that NMFS was not included in the statement section of the SOA and Underwood added NMFS, as noted. Gale also commented that the last sentence in the statement section reads as though future evaluations may occur only if additional information becomes available for lamprey and he added that this should apply to other species as well. Greg Mackey agreed that there will likely be more data forthcoming for all species; however, he suggested that future risk assessment of NTTOC should be done via a new Objective rather than keeping the current Objective 12 open indefinitely. He added that this SOA should only address the recent effort to fulfill M&E Objective 12, and if the topic of NTTOC is revisited, he suggested the need to develop a new study plan, possibly using a different approach. Mackey also indicated that the Hatchery Committees must consider the management implications of findings in any future NTTOC risk assessment. Mackey added that agreements should be reached in advance regarding what actions should occur based on specific findings; he said that this should be one of the considerations in rethinking the approach. He also added that Busack is considering ways to get this model recoded into a more current format and would like to use it in future ESA consultations.

Hatchery Committees representatives discussed and agreed on revisions to the draft SOA to ensure that future NTTOC evaluations may be conducted and will include any potential species. Underwood said that she will provide the revised draft NTTOC SOA to Geris for distribution to the Hatchery Committees. *(Note: Catherine Willard provided the revised draft SOA to Geris following the meeting on August 20, 2014, which Geris distributed to the Hatchery Committees that same day.)*

E. Carlton Pump System (Alene Underwood)

Alene Underwood said that two weeks ago, Chelan PUD conducted a semi-annual, routine maintenance at the Carlton Ponds intake. She said that divers cleared the screens of sediment build-up, large sticks, and other debris, and overall, the screens were in good condition. She explained that to clean the screens, the screens are removed and a blind is inserted to keep unscreened water out of the area while debris is removed; once complete, the blind is pulled and the screens are put back in place. She said that when the screens were put back in place, a vacuum effect was noticed, and Chelan PUD thinks they may have allowed debris to get into the pump. She said that a diver also observed several small fish swimming behind the screens; however, the species of fish were unidentifiable by the diver. She said that Chelan PUD is now monitoring the screens as directed by their Permit 37 and they are currently working to develop a plan to prevent this situation in the future. She said that the solution may require installing different equipment so the screens will not need to be pulled for cleaning.

Mike Tonseth asked if this issue is anticipated to affect planned fish transfers this fall and Underwood replied that it should not. Steve Lewis asked if lamprey were found in the sediment. Underwood said that Chelan PUD did look for lamprey and found four, which were removed and relocated.

IV. Yakama Nation

A. 2015 Expanded Acclimation Request Update (Keely Murdoch)

Keely Murdoch said that since 2010, the YN's annual expanded acclimation request for Grant PUD spring Chinook salmon production has been reviewed and approved by the Priest Rapids Coordinating Committees Habitat Sub Committee (PRCC HSC); however, she said that this request may also be relevant to the Hatchery Committees as it relates to the Methow Fish Hatchery. Murdoch said that the request is essentially the same as last year. She said that last year, the YN requested approval to acclimate 50,000 spring Chinook salmon at the Mid-Valley Pond Acclimation Site and the PRCC HSC approved 25,000. She said that 50,000 was requested because CWT marked groups were tagged in groups of 50,000 fish. She said that this year, a spreadsheet was distributed to the PRCC HSC, which will be discussed during the PRCC HSC meeting on August 21, 2014. She said that passive integrated transponder (PIT)-tagging is planned for the end of September 2014. She said that this year, the YN will be using the USFWS PIT-tagging trailer (last year, Biomark was contracted to conduct the PIT-tagging). Tom Kahler asked about the crew doing the PIT-tagging; Murdoch said that she did not have this information but hoped to have it by tomorrow's PRCC HSC meeting.

Greg Mackey explained that, for context, the Methow Hatchery historically targeted production of 550,000 spring Chinook salmon. He said that now, the number is 165,000. He said that this reduced number is a result of several changes, including recalculation of No-Net-Impact requirements and Chelan PUD moving their spring Chinook salmon production from Methow Hatchery. He said that the Methow program strives to obtain natural-origin recruits (NORs) for broodstock, so reliance on hatchery-origin recruits (HORs) is reduced related to the smaller program size; however, HORs are still needed. He added that some of those HORs will also be transferred to Winthrop for use as broodstock in their safety-net program. He said that Douglas PUD's draft Methow Hatchery permit includes a sliding scale for percent hatchery origin spawners (pHOS). He said that if fish are acclimated off-station, it may compromise the ability to manage for pHOS because fish will be less likely to home to the volunteer channel at Methow Hatchery (and Winthrop NFH). He summarized that NMFS wants to manage pHOS, but the actual level depends on NORs.

Murdoch said that she believes many of the issues that Mackey refers to factored into the PRCC HSC's decision last year. She added that, regarding lower fish numbers with unique CWTs, the number of fish returning to the hatchery versus the number of fish that do not return to the hatchery can be estimated, whereas without a unique CWT, it is hard to tell. Bill Gale asked, in future years, can plans be developed to allow more flexibility? Mike Tonseth said that he would have to review past meeting minutes; however, he said that he believes the PRCC HSC settled on 25,000 for two primary reasons: 1) adult management and what Mackey just discussed; and 2) lack of dedicated CWT groups because the request was not made in time (i.e., the 25,000 group was not unique). Murdoch said that these deadlines need to be better communicated. Tonseth agreed, noting that there is flexibility; however, not for this year. He added that if the request was made in February or March 2014, then fish could have been marked differently; he said that now, they are all co-mingled. He added that there are three separate CWT codes available and Murdoch said that she understood there were more. Tonseth said that there are not and that PIT-tags would be needed to assess additional specific release groups. He said that he will provide Murdoch with a list of deadlines for when WDFW needs approvals in place prior to conducting CWT activities.

Tonseth said that as for the YN's request, constraints are almost identical to last year and added that he is probably more inclined to lean towards the 25,000 this year. Mackey commented on control and treatment groups. He said that in the past, he believes the control group on station was held in a raceway rather than the on-station acclimation pond where all the other fish were held and suggested instead that this year the control group be held in the acclimation pond. He said that according to the table that the YN distributed, in pond survival was not substantially different from the hatchery during the first and second years; however, in 2012, in pond survival was 7% lower and then became progressively lower. He said that the smolt-to-adult return ratio (SARs) from Twisp and Chewuch acclimation ponds are dramatically lower than SARs from fish released on-station at Methow Hatchery. He said that apparently somehow, transferring fish results in lower SARs in spring Chinook salmon. Charlie Snow (WDFW) confirmed that the reduction in SARs is not attributable to mortality in the ponds, and said that no real cause or reason for this has become evident to him. Combined, these two sources of mortality could have a large effect on the overall number of returns and could indeed result in a net loss of spawners in reaches targeted by off-site acclimation and a potential for broodstock collection problems. He said there are a lot of unknowns that converge on management issues that influence how many fish should be acclimated off-station.

Gale asked if acclimated fish may be returning to the hatchery (i.e., not homing to the acclimation site) and if it is possible that the difference in the SARs is due to the efficacy of recovering fish that return to the hatchery. Snow said that there may be variability in some stocks; however, he did not think this was the case because the vast majority of CWT recoveries are on the spawning grounds and not in the hatchery. Mackey said that using a measure of central tendency to assess the spatial distribution of spawners is not the appropriate metric. What is important is the spatial distribution by reach. Mackey noted that the spatial distribution graphs in the 5-Year Hatchery M&E Report indicated that essentially all reaches were at 50% HORs or higher; so all reaches were well-populated with HORs. He also added that considering all of these issues, it is critical to understand how many spawners are needed for each reach targeted by off-site acclimation and how many hatchery fish should be released in order to augment wild spawner numbers to meet the reach-level spawner escapement goal. He asked what is the net gain or loss?

Mackey recommended that the PRCC HSC consider what metrics they would like to have for decision making. He stressed that making acclimation requests at least 1 year ahead of time would allow more time to evaluate assessment data and management options, and agree on numbers and marking.

V. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees' meetings are on September 17, 2014 (Douglas PUD); October 15, 2014 (Chelan PUD); and November 19, 2014 (Douglas PUD).

List of Attachments

Attachment A	List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Alene Underwood*	Chelan PUD
Catherine Willard*	Chelan PUD
Greg Mackey*	Douglas PUD
Tom Kahler*	Douglas PUD
Todd Pearsons	Grant PUD
Lynn Hatcher*	National Marine Fisheries Service
Bill Gale*	U.S. Fish and Wildlife Service
Steve Lewis	U.S. Fish and Wildlife Service
Mike Tonseth*	Washington Department of Fish and Wildlife
Charlie Snow†	Washington Department of Fish and Wildlife
Keely Murdoch*	Yakama Nation

Notes:
* Denotes Hatchery Committees member or alternate
† Joined by phone

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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	November 5, 2014
From:	Mike Schiewe, HCP Hatchery Committees Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the September 17, 2014 HCP Hatchery Committees Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees meeting was held at the Grant PUD office in Wenatchee, Washington, on Wednesday, September 17, 2014, from 9:30 am to 2:00 pm. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- Chelan PUD will provide a final report on the water recirculation pilot studies at Eastbank Fish Hatchery and Chiwawa Fish Facility to the Hatchery Committees by December 2014 (Item I).
- Mike Tonseth will provide a revised memo clarifying standardized methods for Hatchery Monitoring and Evaluation (M&E) Plan Objective 8.3, Fecundity at Size, to the Hatchery Committees for review by December 2014 (Item I).
- The Washington Department of Fish and Wildlife (WDFW) will add a revised summary table to the draft 2014 Wenatchee Basin Steelhead Release Proposal, and will redistribute the final revised draft to the Hatchery Committees by December 2014 (Item I).
- Mike Tonseth will coordinate with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) to develop a list of key components that are required in the annual Broodstock Collection Protocols; he will also tentatively identify components that may be removed in order to streamline the annual review and approval process (Item I).
- Chelan PUD will incorporate revisions to the 2015 Chelan PUD Hatchery M&E Implementation Plan, as discussed during today's meeting, and will provide the

final plan, as approved by the Hatchery Committees, to Kristi Geris for distribution to the Hatchery Committees (Item II-A).

- Chelan PUD will add NMFS to the background language of the Non-Target Taxa of Concern (NTTOC) Statement of Agreement (SOA), and will provide the final SOA, as approved by the Hatchery Committees, to Kristi Geris for distribution to the Hatchery Committees (Item II-B).
- Lynn Hatcher will brief Scott Carlon (NMFS HCP Coordinating Committees Representative) on the Hatchery Committees' approval of the Broodstock Collection Protocol SOA (Item III-A).
- Kristi Geris will distribute to the Hatchery Committees the Hatchery Committees approved Broodstock Collection Protocols SOA, with revisions incorporated as discussed during today's meeting (Item III-A). *(Note: Geris distributed the approved SOA to the Hatchery Committees following the meeting on September 17, 2014.)*
- Greg Mackey and Catherine Willard will evaluate Methow River environmental conditions following the wild fires and landslides that occurred earlier this summer, and their potential impacts on natural production and implications for Hatchery Program Management for discussion at the Hatchery Committees meeting on October 15, 2014 (Item IV-C).
- Chelan PUD will provide electronic copies of the HCP Hatchery Committees Chair position documents to Kristi Geris for distribution to the Hatchery Committees (Item VI-B). *(Note: Chelan PUD provided these documents to Geris on September 18, 2014, which Geris distributed to the Hatchery Committees that same day.)*
- Hatchery Committees representatives will review the HCP Hatchery Committees Chair position documents, and will: 1) provide edits and comments on the documents to Alene Underwood, Greg Mackey, and Tom Kahler; 2) contact qualified candidates to gauge interest in the position; 3) inform interested candidates that they may contact Mike Schiewe to discuss the position; and 4) obtain a résumé or curriculum vitae (CV) from interested candidates to discuss at the Hatchery Committees meeting on October 15, 2014 (Item VI-B).
- Hatchery Committees representatives will provide recommendations on how to conduct interviews for the HCP Hatchery Committees Chair position (Item VI-B).

- Alene Underwood and Kristi Geris will distribute a Doodle Poll for a meeting in early November 2014 to develop the short list of candidates to interview for the HCP Hatchery Committees Chair position (Item VI-B). *(Note: Geris distributed a Doodle Poll to the Hatchery Committees on September 18, 2014.)*

Milestone	Date
1. Present spectre of Mike Schiewe's retirement to Hatchery Committees and Coordinating Committees (September 17 and 23, respectively)	September 17, 2014
2. Parties (Hatchery Committees and Coordinating Committees representatives) provide additional candidates for consideration and provide edits and comments on qualifications and Scope of Work before the October meetings (October 15 and 28, respectively), with presentations of each candidate and discussion about qualifications and Scope of Work at the October meetings	October 15, 2014
3. Select short list of candidates at intermediate meeting in early November, and begin to develop interview questions	Week of November 3, 2014
4. Finalize candidate list for interview and questions	November 19, 2014
5. Candidate interviews at joint Hatchery Committees and Coordinating Committees meeting	December 2014
6. Facilitator selection	January 2015
7. Begin to shadow Mike in March and April, if contracting prior to the February meeting is possible	February 2015

DECISION SUMMARY

- The Rocky Reach and Rock Island Hatchery Committees representatives present approved the 2015 Chelan PUD Hatchery M&E Implementation Plan, as revised (Item II-A).
- The Hatchery Committees representatives present approved the SOA, finalizing the NTTOC Objective (Hatchery M&E Plan Objective 12 [Formerly Objective 10]), as revised (Item II-B).
- The Hatchery Committees representatives present approved the Broodstock Collection Protocols SOA, as revised (Item III-A).

AGREEMENTS

- There were no agreements considered during today's meeting.

REVIEW ITEMS

- Kristi Geris sent an email to the Hatchery Committees on September 4, 2014, notifying them that the draft Douglas PUD 2013 Hatchery M&E Annual Report is available for download from the HCP Hatchery Committees Extranet Site. This draft report is available for a 60-day review period with comments due to Greg Mackey no later than Monday, November 3, 2014 (Item IV-A).
- The HCP Hatchery Committees Chair position documents that were provided to the Hatchery Committees by Alene Underwood at the Hatchery Committees meeting on September 17, 2014, are out for review with comments due to Underwood no later than October 15, 2014 (Item VI-B).
- Kristi Geris sent an email to the Hatchery Committees on September 24, 2014, notifying them that the draft 2015 Douglas PUD Hatchery M&E Implementation Plan is available for download from the HCP Hatchery Committees Extranet Site. This draft report is available for a 60-day review period with comments due to Greg Mackey no later than November 24, 2014 (Item IV-B).

FINALIZED DOCUMENTS

- The Final 2015 Chelan PUD Hatchery M&E Implementation Plan was distributed to the Hatchery Committees by Kristi Geris on September 24, 2014.
- The Final Twisp Steelhead Relative Reproductive Success 2013 Genotyping Report was posted to the Hatchery Committees Extranet Site on October 2, 2014, as Kristi Geris notified the Hatchery Committees that same day.

I. Welcome

A. Review Agenda, Review Last Meeting Action Items, Approve the August 20, 2014 Meeting Minutes (Mike Schiewe)

Mike Schiewe welcomed the Hatchery Committees and asked for any additions or changes to the agenda. The following revisions were requested:

- Lynn Hatcher added spring Chinook salmon broodstock compositing in the Wenatchee Basin.
- Kirk Truscott added a discussion on the *Columnaris* outbreak at Chief Joseph Hatchery (CJH).
- Schiewe added a discussion on the HCP Hatchery Committees Chair Position, and also reminded the Hatchery Committees of the Okanagan Nation Alliance (ONA) Update that will take place during the Priest Rapids Coordinating Committee Habitat Sub-Committee (PRCC HSC) meeting following the Hatchery Committees meeting.

The Hatchery Committees reviewed the revised draft August 20, 2014 meeting minutes. Kristi Geris noted one late revision that was received from Steve Lewis (USFWS) via email on September 11, 2014, about the incidental take discussion. Geris said that Lewis clarified that the memorandum that Karl Halupka (USFWS) provided to the Hatchery Committees on selected aspects of incidental take was for general information purposes only, and does not change or modify any existing Endangered Species Act (ESA) rules or regulations. Geris said that all other comments and revisions received from members of the Committees were incorporated into the revised minutes. The Hatchery Committees members present approved the draft August 20, 2014 meeting minutes, as revised.

Action items from the Hatchery Committees meeting on August 20, 2014 and follow-up discussions were as follows (italicized item numbers below correspond to agenda items from the meeting on August 20, 2014):

- *Chelan PUD will provide a final report on the water recirculation pilot studies at Eastbank Fish Hatchery and Chiwawa Fish Facility to the Hatchery Committees by December 2014 (Item I).*

  This action item was confirmed for December 2014 and will be carried forward.
- *Hatchery Committees representatives will submit comments on the sample size section in the memo clarifying the standardized methods for Hatchery M&E Plan Objective 8.3, Fecundity at Size, to Mike Tonseth (Item I).*

  Tonseth will provide a revised memo clarifying standardized methods for Hatchery M&E Plan Objective 8.3, Fecundity at Size, to the Hatchery Committees by December 2014.

- *WDFW will add a revised summary table to the draft 2014 Wenatchee Basin Steelhead Release Proposal and will redistribute the final revised draft to the Hatchery Committees (Item I).*
  Mike Tonseth said that he will complete this action item by December 2014.
- *Tom Kahler will coordinate with Ritchie Graves (NMFS) and Scott Carlon (NMFS) for clarification on the Wells HCP requirement to submit the annual Broodstock Collection Protocols to the Wells HCP Coordinating Committee and NMFS Hydro Program for annual approval prior to trapping at Wells Dam; Kahler will also discuss this with the Wells HCP Coordinating Committee at their next meeting on August 26, 2014 (Item II-A).*
  Mike Schiewe said that this action item was completed, and will be discussed further during today's meeting.
- *Mike Schiewe, Lynn Hatcher, and Mike Tonseth will revise the draft Broodstock Collection Protocols SOA and will also develop a draft schedule to meet the April 15 submittal deadline to NMFS (Item II-A).*
  A revised draft Broodstock Collection Protocols SOA was distributed to the Hatchery Committees by Kristi Geris on September 12, 2014. This will be discussed during today's meeting.
- *Mike Tonseth will coordinate with NMFS and USFWS to develop a list of key components that need to be included in the annual Broodstock Collection Protocols; he will also tentatively identify components that may be removed in order to streamline the annual review and approval process (Item II-A).*
  Tonseth said that input was received from NMFS; however, not from USFWS. This action item will be carried forward to the Hatchery Committees meeting on October 15, 2014.
- *Lynn Hatcher will confirm NMFS delegation of approval of the annual Broodstock Collection Protocols to their HCP Hatchery Committees and Coordinating Committees representatives (Item II-A).*
  Hatcher said that he confirmed with Bob Turner (NWR Salmon Management Division) that NMFS agreed to delegate approval of the annual Broodstock Collection Protocols to their HCP Hatchery Committees representative, and that this will be discussed further during today's meeting.

- *Steve Lewis will obtain an update from Karl Halupka on USFWS Wenatchee Section 7 consultation and will provide the update to Kristi Geris for distribution to the Hatchery Committees (Item II-B).*
  Lewis' update was distributed to the Hatchery Committees by Geris on August 25, 2014, which indicated that the Wenatchee Basin Hatchery and Genetic Management Plan (HGMP) consultations were delayed by wild fire consultations; however, they have now resumed. Mike Tonseth added that the next NMFS and USFWS Biological Opinion (BiOp) Coordination Meeting is scheduled for next week.
- *Lynn Hatcher will discuss spring Chinook salmon broodstock compositing in the Wenatchee Basin during the Hatchery Committees meeting on September 17, 2014 (Item II-C).*
  Hatcher said that this will be discussed during today's meeting.
- *Steve Lewis will obtain clarification from Jessie Gonzales (USFWS) regarding how incidental take is assigned when multiple parties are requesting take authorization and will provide the clarification to Kristi Geris for distribution to the Hatchery Committees (Item III-A).*
  Lewis' update was distributed to the Hatchery Committees by Geris on August 25, 2014, which indicated that with multiple project proponents at one facility, each of the proponents should have incidental take coverage (pre-project implementation), and take would be assigned to the individual proposed action.
- *Chelan PUD will add Methow spring Chinook salmon to Table 1 of the draft 2015 Chelan PUD Hatchery M&E Implementation Plan and will provide the revised draft to Kristi Geris for distribution to the Hatchery Committees (Item III-B).*
  Catherine Willard provided the revised draft plan to Geris on August 21, 2014, which Geris distributed to the Hatchery Committees that same day.
- *Hatchery Committees representatives will submit edits and comments on the revised draft 2015 Chelan PUD Hatchery M&E Implementation Plan to Chelan PUD by September 10, 2014 (Item III-B).*
  Catherine Willard indicated that no comments were received, and that this will be discussed further during today's meeting.

- *Chelan PUD will provide the revised draft NTTOC SOA to Kristi Geris for distribution to the Hatchery Committees (Item III-D).*
  Catherine Willard provided the revised draft SOA to Geris following the meeting on August 20, 2014, which Geris distributed to the Hatchery Committees that same day.
- *Mike Tonseth will provide Keely Murdoch with a list of deadlines for when WDFW needs approvals in place prior to conducting coded wire tagging (CWT) activities (Item IV-A).*
  Tonseth said that he will provide this to Murdoch by Monday, September 22, 2014.

II. Chelan PUD

A. DECISION: Revised Draft 2015 Chelan PUD Hatchery M&E Implementation Plan (Alene Underwood)

Alene Underwood said that a revised draft 2015 Chelan PUD Hatchery M&E Implementation Plan was distributed to the Hatchery Committees by Kristi Geris on August 21, 2014, and that no comments were received on the revised draft plan.
Keely Murdoch raised additional questions and requested clarifications, as follows:

- <u>2.1 Broodstock Collection and Stock Assessment</u> (page 8 of 28): Murdoch asked how stock assessments for Methow spring Chinook salmon will be conducted. Underwood said that Chelan PUD is still working through the details, but that carcass recovery and spawning ground surveys will be used for stock assessment. Murdoch asked if stock assessments will be conducted in coordination with Charlie Snow (WDFW), and Underwood replied that they would, so those data will be consistent.
  Kirk Truscott asked if stock assessments still occur at Wells Dam. Greg Mackey said yes, that fish counts, including tracking hatchery versus wild, are tracked at the dam; however, he said that spawning ground surveys are used for most of the stock assessment and provide more precise data. He also added that Douglas PUD does not sample spring Chinook salmon at Wells Dam to obtain a complete stock assessment. Rather, fish are sampled opportunistically during broodstock collection. Murdoch suggested clarifying these details in the plan.
- <u>2.3 Release Monitoring</u> (page 9 of 28): Murdoch asked if there is passive integrated transponder-tag detection at the Chewuch Pond and Methow sub-basin. Underwood

clarified that this language is specific to the Chiwawa River, and that Chelan PUD still needs to clarify the Chewuch release monitoring language.

- 3.1 Freshwater Productivity of Supplemented Stocks (page 12 of 28): Murdoch asked, regarding specific actions to monitor the freshwater productivity of supplemented spring Chinook salmon in the Methow sub-basin, what the timeline is to resolve this and hold discussions within the Hatchery Committees? Underwood said that Chelan PUD plans to develop an amendment for freshwater productivity, similarly to what was done for sockeye last year, which would be presented to the Hatchery Committees by the end of 2014 or the beginning of 2015. Murdoch suggested including a statement that indicates that approval of this plan does not constitute approval of what will be done in the Methow sub-basin. Mike Schiewe suggested instead inserting a sentence indicating that actions for freshwater productivity in the Methow sub-basin will be presented to the Hatchery Committees in December 2014 for approval.
- 6.1 Juvenile Monitoring (page 18 of 28): Murdoch asked, based on 2014 results, if the lower Wenatchee smolt trap is a viable trap location for the sockeye smolt population. Catherine Willard said that Chelan PUD has not yet analyzed those data, but that adequate numbers of sockeye smolt were tagged using that trap location in 2014. She also noted that there is a statement included in the plan which indicates that after review of the 2014 results, the 2015 plan can be modified as needed.

The Rocky Reach and Rock Island Hatchery Committees representatives present approved the 2015 Chelan PUD Hatchery M&E Implementation Plan, as revised. Underwood said that she will incorporate revisions to the plan, as discussed during today's meeting, and will provide the final plan to Geris for distribution to the Hatchery Committees.

B. DECISION: Hatchery M&E Plan Objective 12 (Formerly Objective 10) NTTOC SOA (Alene Underwood)

Alene Underwood said that a revised draft NTTOC SOA was distributed to the Hatchery Committees by Kristi Geris on August 20, 2014. Mike Schiewe said that revisions included clarification that additional NTTOC evaluations may be conducted as new information becomes available, and the addition of NMFS to the statement language. Bill Gale noted that NMFS also needs to be added to the background language, as well.

The Hatchery Committees representatives present approved the SOA, finalizing the NTTOC Objective (Hatchery M&E Plan Objective 12 [Formerly Objective 10]), as revised. Underwood said that Chelan PUD will add NMFS to the background language of the NTTOC SOA, and will provide the final SOA to Geris for distribution to the Hatchery Committees.

III. NMFS

A. DECISION: Broodstock Collection Protocols SOA (Lynn Hatcher)

Lynn Hatcher said that a revised draft Broodstock Collection Protocols SOA was distributed to the Hatchery Committees by Kristi Geris on September 12, 2014. He said that this revised SOA simplifies the first draft, and also includes language on process and schedule. Alene Underwood said that Chelan PUD provided edits on the revised SOA, which were distributed to the Hatchery Committees by Geris on September 16, 2014. Underwood said that, regarding the statement about NMFS approval, she revised “participation in the review and approval,” to read “participation in the development and submission” of the annual Broodstock Collection Protocols, noting that “approval” is stated later in the sentence. Bill Gale suggested keeping “approval,” so that the sentence reads “participation in the development, submission, and approval.”

Mike Tonseth said that, regarding the footnote, he reviewed the Wells HCP and it was specific to activities involving the Wells Dam ladder traps. He said that, further, after review of the Rocky Reach and Rock Island HCPs, he found no reference requiring HCP Coordinating Committees approval of the annual Broodstock Collection Protocols, as was required in the Wells HCP; therefore, the footnote was included to clarify this. Greg Mackey noted that the Committees could invoke other trapping locations if they so choose. Mike Schiewe suggested revising “Wells Dam ladder traps” to read “Wells Project facilities.”

Gale noted that there is no reference in this SOA to USFWS Ecological Services ESA Section 7 approval of the annual Broodstock Collection Protocols, and added that he anticipates that this will be an additional requirement. He asked if a placeholder should be included indicating that this process may need to be amended as USFWS requirements become apparent. Tonseth said that this SOA is a specific condition under NMFS Section 10, not under USFWS Section 7. He suggested that rather than delay this SOA, that the USFWS representative could develop a separate SOA for USFWS, if appropriate. Mackey noted that because this is a HCP Committee charged with managing Plan species, the USFWS representative should consult within the USFWS as needed to assure the Services interests are represented when reviewing and approving the Broodstock Protocols. Mackey said that he does not believe a separate SOA is needed.

Kirk Truscott asked why the footnote limits HCP Coordinating Committees involvement to only Wells Project facilities when the HCP Coordinating Committees addresses trapping issues that are not only associated to Wells Project facilities. Tonseth said that the reasoning behind the footnote is because language was specifically included in the Wells HCP and not in the Rocky Reach or Rock Island HCPs. Underwood said that this SOA does not necessarily preclude involvement from the Rocky Reach and Rock Island HCP Coordinating Committees, noting that the Hatchery Committees meeting minutes and major actions are presented to the HCP Coordinating Committees, which provides the HCP Coordinating Committees the opportunity to stay abreast of Hatchery Committees activities and discussions. Truscott said that as the footnote reads now, review of the annual protocols would go only to the Wells HCP Coordinating Committees; which, Schiewe noted, are the same Joint Fisheries Parties representatives as for the Rocky Reach and Rock Island Coordinating Committees. Truscott said that just because language is only included in the Wells HCP, that this does not preclude making it inclusive of all the Committees. Tonseth said that his concern with referencing the Wells HCP is the potential for micro-management to occur; the HCPs are very clear on roles and responsibilities for the Hatchery Committees and Coordinating Committees. The Hatchery Committees agreed on referencing the Wells HCP in the footnote, with the notion that the HCP Coordinating Committees would also review this language.

Gale asked if the HCP Coordinating Committees will need to approve this SOA, as well. Schiewe replied that yes, they will need to approve the part that documents the requirement for HCP Coordinating Committees approval. He added that the HCP Coordinating Committees' next meeting is next Tuesday, September 23, 2014, where he and Scott Carlon can lead this discussion on the Broodstock Collection Protocol SOA. Hatcher said that he will also brief Carlon on the Hatchery Committees approval of the Broodstock Collection Protocol SOA.

Mackey suggested that responsible parties should be identified under the process and schedule section of the SOA. He recalled that initial discussions included assigning responsibility for development of the annual protocols to the Hatchery Committees—not just a responsibility for WDFW. Tonseth asked if the current (Wenatchee) permits already indicate that development of the annual protocols is the responsibility of WDFW. Underwood said that the current permits indicate that development of the protocols is the responsibility of the applicants, and she suggested revising the SOA to reflect that "Permit Holders," not "WDFW," will prepare a draft Broodstock Collection Protocol for review.

Schiewe noted that the deadline specified in the SOA for the first draft for review is 10 days prior to the February meeting, and asked if this deadline is realistic. Tonseth said that the deadline is realistic, noting that he expects to start drafting the protocols by December 2014.

The Hatchery Committees representatives present approved the Broodstock Collection Protocols SOA, as revised. Geris will distribute to the Hatchery Committees the Hatchery Committees approved Broodstock Collection Protocols SOA, with revisions incorporated as discussed during today's meeting. *(Note: Geris distributed the approved SOA to the Hatchery Committees following the meeting on September 17, 2014. The "Permit Holders" revision was unintentionally dropped from the SOA that was distributed to the Hatchery Committees on September 17, 2014, and so a revised SOA that included this revision was distributed to the Hatchery Committees by Geris on September 19, 2014 [Attachment B].)*

B. HGMP Update (Lynn Hatcher)

Lynn Hatcher said that the next NMFS/USFWS BiOp Coordination Meeting is scheduled for Thursday, September 25, 2014, where he plans to provide a detailed HGMP update. He reviewed highlights, as follows:

- Methow spring Chinook salmon: Hatcher said that the Methow and Okanogan 10(j) spring Chinook programs are being separated into two BiOps. The Okanogan BiOp is scheduled for completion by the end of October 2014 to meet the deadline to move spring Chinook from Winthrop NFH to the Okanogan. Primary Methow issues remaining are research, monitoring and evaluation, and evaluating an approach for a change to proportionate natural influence (PNI) from percent hatchery-origin spawners (pHOS).

C. Spring Chinook Salmon Broodstock Compositing in the Wenatchee Basin (Lynn Hatcher)

Lynn Hatcher said that NMFS has decided to write a supplemental Wenatchee spring Chinook salmon BiOp, but that a final decision will not be made until a decision is received from USFWS on bull trout. He said that NMFS had forwarded to the USFWS three alternatives for review, and that NMFS hopes to: 1) receive a response from USFWS by the end of September 2014; 2) finalize discussions with USFWS and notify the Hatchery Committees in October 2014; and 3) write the supplemental BiOp and revise the Section 10 Permit by December 2014. He said that NMFS is targeting December because they want to have clear direction when the annual Broodstock Collection Protocols are developed. He added that revising the Section 10 Permit should go quickly because only the genetics effects analysis component will be revised.

Bill Gale said that on September 5, 2014, he and Amilee Wilson (NMFS) received a draft document analyzing hatchery influence on baseline bull trout, forwarded by Karl Halupka. Gale said that he believes this is the first step in providing the required information to NMFS.

Alene Underwood noted that Chelan PUD has been waiting for a BiOp from Halupka on the Wenatchee Programs for quite a while now, and that this supplemental Wenatchee spring Chinook salmon BiOp is only detracting from that. Underwood requested that the USFWS provide an update on their priority list for BiOps and where Chelan PUD's BiOp fits into that list at the next NMFS/USFWS BiOp Coordination Meeting. She also said that receiving status updates from USFWS would be helpful. Gale said that he will ask Halupka about this, and he asked when Chelan PUD would like the status updates, at Hatchery Committee meetings or at the NMFS/USFWS BiOp Coordination Meetings. Underwood said that anytime would be beneficial, just more often than every other month. Tonseth said that he would also note this request at the NMFS/USFWS BiOp Coordination Meeting next week.

IV. Douglas PUD

A. Draft 2013 Wells and Methow Hatchery M&E Report for Hatchery Committees Review (Greg Mackey)

Greg Mackey said that Kristi Geris sent an email to the Hatchery Committees on September 4, 2014, notifying them that the draft Douglas PUD 2013 Hatchery M&E Annual Report is available for download from the HCP Hatchery Committees Extranet Site. He said that this draft report is available for a 60-day review period with comments due to him no later than Monday, November 3, 2014. He said that the format of the report is similar to Chelan PUD's Annual Hatchery M&E Report.

Mackey said that Douglas PUD was formerly scheduled to provide this report to the Hatchery Committees for review by June of each year. However, the Hatchery Committees agreed to change the timing to July in 2012. Mike Tonseth noted that the deadline is driven by terms and conditions of the BiOp, so a reasonable timeline needs to be included in the permit. Mackey recalled that the June deadline was originally deemed infeasible for many reasons, including lag times in getting scale and CWT data back from the State and inadequate time to complete analysis of data while current year M&E activities were ongoing. He added that with the new permits coming out, confirmation should be made that the July timeline is achievable. He added that he believed that an August deadline would be achieved more reliably; Charlie Snow could provide Douglas PUD with a draft in June, WDFW could finalize the document in July, and the report would go to the Hatchery Committees for a 60-day review in August, and then approval would occur in October.

B. Draft 2015 Douglas PUD Hatchery M&E Implementation Plan (Greg Mackey)

Greg Mackey said that the draft 2015 Douglas PUD Hatchery M&E Implementation Plan is almost completed; however, there are still a few items that need to be finalized. He said that the elements in the plan are essentially the same as last year, and that the review period will be a 60-day review period. He said that he plans to distribute the plan by next week, and added that, for efficiency, Douglas PUD will initiate contracting with WDFW prior to finalization of the plan. *(Note: Kristi Geris sent an email to the Hatchery Committees on September 24, 2014, notifying them that the draft 2015 Douglas PUD Hatchery M&E Implementation Plan is available for download from the HCP Hatchery Committees Extranet Site. This draft report is available for a 60-day review period with comments due to Mackey no later than November 24, 2014.)*

C. Methow River Conditions and Implications for Populations and Hatchery Program Management (Greg Mackey)

Greg Mackey recalled the large mudslide that occurred near Carlton on the Methow River following this summer's wild fires. He said that the mudslide had a major effect on the river, and that the fish in the river below the mudslide likely died. He added that there may also be runoff with excessive levels of mud and ash for a number of years, which could have a large impact if it coincides with smolt migration. He suggested that it would be prudent to consider management strategies and actions for hatchery program releases that might be implemented to minimize impacts. One example might be releasing fish prior to heavy spring runoff in an attempt to allow them to move out before encountering potentially lethal conditions. He also suggested the possibility of temporarily releasing the Methow Safety Net steelhead at a different location to avoid the impacted areas of the river; he noted that mitigating actions may need to be considered for multiple years.

Mike Tonseth said that WDFW is concerned about impacts to acclimation facilities. He said that Methow Hatchery will likely not be directly impacted because most of the damage is downstream; however, the Chewuch Pond intake may be compromised. He said that there is a lot of debris entering the river from beaver ponds breaking, and the cumulative effects of damage to all of the small tributaries can be significant.

Keely Murdoch said that she is not overly concerned about silt loading, noting that this topic was recently considered by the Regional Technical Team. However, she acknowledged that lower elevation runoff may cause some issues because it typically occurs earlier in the year. She said that unless there are operational issues such as clogging of intake screens and rearing facilities, then she is not certain that altering fish releases would be justified.

Mackey said that he was concerned that impacts could be more wide-spread than clogging of screens. For example, the large amounts of ash entering the river could potentially rapidly change the pH. He added that he believes it is prudent to consider the options, and said that he would like to have input from the Hatchery Committees on ideas.

Catherine Willard suggested researching how other states, such as Idaho, have historically handled similar situations. Tonseth said that he thinks a significant impact might be to the natural spawners, noting that the silt loads still present along the shorelines may result in egg suffocation. Bill Gale asked if this issue is affecting M&E work in the Methow, and noted that some issues have been encountered in the Entiat. Tonseth said that this issue has not yet significantly affected M&E work in the Methow; however, he noted that it would only take one large rain event to change that.

Mackey and Willard said that they will evaluate Methow River environmental conditions following the wild fires and landslides that occurred earlier this summer, and their potential impacts on natural production and implications for Hatchery Program Management for discussion at the Hatchery Committees meeting on October 15, 2014.

V. Colville Confederated Tribes (CCT)

A. Columnaris Outbreak at CJH (Kirk Truscott)

Kirk Truscott said that in early August 2014, cost share partners were notified of increasing mortalities of the Leavenworth spring Chinook salmon broodstock being held at CJH. He said that USFWS responded quickly and identified the bacterium causing *Columnaris* as a gill infection (external—not internal). He said that bath treatments with chloramine-T were started immediately and reduced mortality rates; however, only temporarily. He said that the fish were treated again with some success, but again, only temporarily reducing mortality. He said that chloramine-T drip treatments were also attempted with no success. He said that ultimately, 65% of the broodstock was lost, including 77% of the females. He said that he spoke with Pat Phillips (CJH manager) who estimated that about 250,000 spring Chinook salmon eggs are currently on station. Truscott said that more eggs might be obtained from Leavenworth National Fish Hatchery. He added that the same broodstock holding protocols that were used last year with almost no mortalities were used this year, and also summer Chinook salmon that were on the same water source at the same location did not develop *Columnaris*. Bill Gale suggested that the outbreak could be associated to transport stress, but Truscott said that the fish were transported in June 2014 and mortalities started happening in August 2014. Truscott said that the CCT are discussing how to minimize risk next year with USFWS. He said that the goal is to produce 700,000 spring Chinook salmon.

VI. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees' meetings are on October 15, 2014 (Chelan PUD); November 19, 2014 (Douglas PUD); and December 17, 2014 (Chelan PUD).

B. HCP Hatchery Committees Chair Position (Mike Schiewe)

Mike Schiewe said that last month, he conveyed his plans to retire in April 2015 to Chelan PUD and Douglas PUD. Schiewe said that now, it is up to the HCP Committees to choose a new HCP Chair(s). He said that that selecting the first HCP Chair (himself) required more than a few months of discussions and review of potential candidates by the HCP signatories.

Greg Mackey said that the Wells Aquatic Settlement Work Group (SWG), which Schiewe also Chairs, began discussing the process for hiring a new Aquatic SWG Chair earlier this month, shortly after Schiewe informed the PUDs of his plans. Since the Aquatic SWG meeting in August, Douglas PUD has been considering how a new Chair(s) would be selected, including: 1) contracting the same Chair for all three Committees (Aquatic SWG, Coordinating Committees, and Hatchery Committees), which would facilitate communication between Committees, but is not mandatory; 2) Selecting separate Chairs to serve the groups; 3) setting up a schedule, Scope of Work, and position qualifications for selection of the Chair positions; and 4) identifying potential candidates for each Committee Chair. He said that Tom Kahler has started contacting potential candidates to gauge interest. Douglas PUD has thought carefully about potential candidates, and after preliminary conversations with those candidates that expressed interest, feels that several have strong potential for the HCP Chair positions. Mackey and Alene Underwood distributed handouts with information on a proposed process for selecting a new Chair and CVs of the potential candidates they had identified. Mackey reviewed the schedule for the selection of the HCP Chair(s) (Attachment C), noting that the plan is to contract a new Chair in time to shadow Schiewe before he retires.

Underwood said that selection of a new HCP Chair or Chairs will be the responsibility of all the signatories to the HCP. She noted that the Scope of Work (Attachment D) and position qualifications (Attachment E) are written to cover both the Hatchery Committees and HCP Coordinating Committees; she noted these were developed based on the original documents that were used to contract the first HCP Chair, and have been updated to indicate the importance of the need for a strong support staff (to be supplied by the contracted Chair).

Underwood said that with regard to schedule, Hatchery Committees representatives should review the HCP Hatchery Committees Chair position documents, and: 1) provide edits and comments on the documents to Underwood, Mackey, and Kahler; 2) contact qualified candidates to gauge interest in the position; 3) have interested candidates contact Schiewe to discuss the responsibilities of the position; and 4) obtain a résumé or CV from interested candidates to discuss at the Hatchery Committees meeting on October 15, 2014. Underwood noted the two résumés and one CV of candidates that were also handed out during today's meeting, which she said offer good examples of the level of detail that is needed from candidates. She added that Chelan PUD will provide electronic copies of the HCP Hatchery Committees Chair position documents to Kristi Geris for distribution to the Hatchery Committees. *(Note: Chelan PUD provided these documents to Geris on September 18, 2014, which Geris distributed to the Hatchery Committees that same day.)*

Underwood said that she and Geris will distribute a Doodle Poll for an interim meeting following the next Hatchery Committees meeting on October 15, 2014, in early November 2014, to discuss a list of candidates to consider for the HCP Hatchery Committees Chair position(s), and also to develop interview questions. *(Note: Geris distributed a Doodle Poll to the Hatchery Committees on September 18, 2014.)* Mackey said that they have a record of questions used in the first interview process.

Keely Murdoch said that, regarding the position qualification for work experience in the Columbia Basin hydrosystem (Attachment E), she did not think that that criterion should eliminate a potential facilitator. Murdoch said, for example, that Elizabeth McManus (Ross Strategic, PRCC HSC Facilitator) does a good job distilling issues and obtaining resolution, but she does not have a fisheries background. Bill Gale added that it is the Hatchery Committees representatives that bring the technical expertise to the discussions. Schiewe agreed that having an effective facilitator is important, but that the HCPs specify the selection of a Chair, not just a meeting facilitator. He added that the Chair is a non-voting member of the committees and is expected to participate in all discussions and other activities. Underwood emphasized the importance of contracting someone who has a balance of facilitation and technical skills. She said that she views this position as more than just a facilitator, and that the Committees would need someone who also has technical experience.

Lynn Hatcher asked about the administrative component of the Hatchery Committees. Underwood replied that the Chair and the administrative component are a package deal; the new Chair would need to provide all services needed to fill the position, which includes in addition to running the meetings, note taking, Committee documentation, email distributions, and annual reports. She said that when considering a candidate, they need to demonstrate the ability to provide the full suite of services.

Kirk Truscott asked about the résumés and CVs that were handed out, and Mackey said that Douglas PUD contacted those candidates and they expressed interest in one or more of the Committees.

Gale asked about the workload for chairing all three Committees. Schiewe said that workload varies during the year; however, he said that typically, the Chair and administrative component require about 30 to 40% of their respective workloads. He added that this position might be difficult for someone who wants to work only a part-time schedule limited to specific days because Committees work often is unpredictable over the course of a week or month. He emphasized the importance of administrative and technical support, as the position would be difficult to manage with only one person; he also noted the large workload required to complete the HCP annual reports.

Hatcher asked if the Hatchery Committees and HCP Coordinating Committees will hold separate interviews for their respective Chairs. Underwood said that she believes that if the same candidate is interviewing for both the Hatchery Committees and HCP Coordinating Committees Chair positions, then those interviews would likely be held jointly. She said, however, that if the candidates are different, then the interviews may be held separately. She added that she is not certain whether the HCP Coordinating Committees will need to also approve the Hatchery Committees Chair, and she noted that Kahler plans to have this same discussion at the HCP Coordinating Committees meeting on September 23, 2014.

Schiewe said that when he was interviewed 10 years ago, a combination of Policy, Coordinating, and Hatchery committees representatives conducted the interviews. Underwood said that process will probably also be the process followed this time. Hatchery Committees representatives agreed to provide recommendations on how to participate in an interview panel for the HCP Chair positions.

Underwood said that the working plan is to conduct candidate interviews in December 2014, make a selection by January 2015, and contract a new Chair in February 2015, so that the new Chair or team can shadow the current team in March and April, prior to Schiewe's retirement.

Gale said that he likes the idea of a combined Hatchery Committees and HCP Coordinating Committees interview team, and making sure that each signatory is included. Truscott agreed that keeping the same process as last time is a good approach. Todd Pearsons (Grant PUD) indicated that Grant PUD has interest in utilizing the same Chair for the HCPs and PRCC HSC.

VII. PRCC HSC Meeting

A. Okanagan Nation Alliance Update (Rich Bussanich, Howie Wright, and Dr. Kim Hyatt)

Rich Bussanich (ONA) presented Okanagan Sockeye Re-Introduction to Skaha Lake: Peer Review and Hatchery Progress (Attachment F), which was distributed to the Hatchery Committees by Kristi Geris following the meeting on September 18, 2014. Bussanich thanked everyone for their continued support and interest in this effort. He provided a brief overview on the background of the ONA, including membership, geographical location, and their mission, which focuses on the wild Okanagan sockeye population. He then reviewed the historical range of Okanagan sockeye and also key ecosystem-level questions that were considered during the design phase of the project. He noted that Slide 6 of Attachment F describes ONA's journey since 1997, from concept to terms of reference to 2014.
Todd Pearsons asked if someone could explain what spawning platforms are. Bussanich replied that spawning platforms refer to gravel placement in rivers for spawning habitat, the design of which is based on hydraulic modeling. He explained further that habitat groups work with engineers to design gravel placements designed for different species.

Bussanich provided a brief overview on project design, implementation, and monitoring. He reviewed key metrics based on results from broodyears 2004 to 2014, noting that hatchery (Skaha Lake) is outperforming wild (Osoyoos Lake) in egg-to-fry survival; which, he added, is expected when fish are in a hatchery.

Bussanich reviewed key questions based on a review of the past 8 years, and points to consider for each question (Attachment F, Slides 12 to 16). He also reviewed aspects of the 2014 to 2015 Kl cpe' lk' stim' Salmon Hatchery Work Plan, including target dates and fish numbers. Dr. Kim Hyatt added that with the natural production that this effort hopes to replicate, this should create higher fish density levels than have ever before been evaluated in these lakes.

Lastly, Bussanich reviewed photographs of the Kl cpe' lk' stim' Salmon Hatchery, including a photograph of progress on construction of the hatchery (Attachment F, Slide 21), a collage depicting raceways, a sediment tank, a volitionally fed gravity tank (Attachment F, Slide 22), hatchery staff (Attachment F, Slide 23), and a photograph of the lab (Attachment F, Slide 24).

Lynn Hatcher asked what the next steps were for transporting fish across the dam at Okanagan Lake. Howie Wright said that trap and transport have been proposed at different locations around the lake. He added that they need to locate spawning areas. He said that so far, shore spawners have not been found at Osoyoos Lake or Skaha Lake, but he believes that Okanagan Lake is different. Dr. Hyatt added that there is a lot of spawning in gravel out-washed fans, wherever there is suitable substrate and groundwater conditions. Wright noted that this effort will not be conducted jointly with the Mid-Columbia PUDs or the Department of Fisheries and Oceans Canada; rather, ONA will submit on this effort separately.

Hatcher asked about the expected turnout for the Grand Opening Ceremony of the Kl cpe' lk' stim' Salmon Hatchery on September 20, 2014. Wright said that 50 to 70 attendees are confirmed, but he added that he is not certain how many will actually attend. David Duvall (Grant PUD) noted that the event is more than just a ceremonial grand opening for the hatchery, and Wright confirmed that the event is also a Salmon Festival, which will follow on September 21, 2014.

Greg Mackey asked, with regard to upcoming Skaha Lake sockeye reintroduction efforts, what thought has been given to managing sockeye and kokanee hybridization if it should occur at levels deemed to be a problem. Bussanich said that monitoring will continue. He said that there has also been discussion about developing a more detailed monitoring framework. He said that risk assessments have been conducted for Okanagan Lake, and that they expect to adaptively manage as needed. Dr. Hyatt said that from a regulatory agency point of view, the issue with hybridization with kokanee is a moving target. He said that in the Skaha Lake system, evidence is clear that McIntyre Dam and Okanagan Falls Dam have not been total barriers to access by anadromous sockeye over their history. He suggested that the entry has been at a level too low for detection. He said it is clear that under certain hydraulic conditions, adult sockeye have been able to pass McIntyre Dam as well as Okanagan Falls Dam, which suggests there has always been an opportunity for hybridization. He said that the Authority (i.e., Ministry of Environment and Department of Fisheries and Oceans) does not have a detailed policy to address hybridization, other than they are in favor of managing for the wild fish population. He said that in Skaha Lake there is a requirement for the Provincial Agency to establish benchmarks to monitor, and the goal is to address those benchmarks. He said that regarding Okanagan Lake, there are several potential issues, and it is clearer what the concerns might be. He said that there are separate genetic concerns about the beach spawning and the stream spawning groups of kokanee. He said that the beach spawning populations have undergone a strong recovery with the protections against redd desiccation provided by the Fish and Water Management Tool (FWMT). He said that the concern is about the larger bodied stream-spawning kokanee, which may affect the other groups. *(Note: Tom Kahler later clarified that the fear is that Sockeye entering Okanagan Lake would compete directly with the stream-spawning kokanee for that spawning habitat, and/or that Sockeye would spawn with kokanee resulting in progeny with a greater propensity for anadromy, further reducing the population of large, stream-spawning kokanee.)*

FWMT

Dr. Hyatt said that fish-friendly flows are being achieved in the Okanagan Basin. He said that the 2013 to 2014 fish and water-year went well, again, noting that drought and desiccation were both avoided. He said that the operation team was also able to assess earth and dam impacts from the 2010 Testalinden Creek landslide on fish production. He said that, in general, based on juvenile production, the 2012 to 2013 returns probably would have returned an additional 125,000 to 175,000 adult sockeye if the breach had not occurred. He added that within the central interior of British Columbia on a tributary to the Fraser River, there was recently a tailings dam breach from mining, which is larger than the 2010 Testalinden Creek landslide. He said that there is currently an effort to evaluate this breach and how to assess impacts. Lastly, he noted an overview paper on a decade of water managers using the Fish and Water Management Tool, which should be in print over the next couple of months.

David Duvall asked if there was a flow pulse this last fall to help with the temperature oxygen squeeze. Dr. Hyatt said that a temperature squeeze began to develop in late July 2014. He said that typically, a pulse is scheduled for late August to early September; however, this year, the pulse was moved up to early August, and was held for 2 weeks. He said that signature impacts will be evaluated once those data are available.

List of Attachments

Attachment A	List of Attendees
Attachment B	Hatchery Committees Approved Broodstock Collection Protocols SOA
Attachment C	Schedule for Selection of the HCP Chairs
Attachment D	Scope of Work for Selection of the HCP Chairs
Attachment E	Position Qualifications for the HCP Chairs
Attachment F	Okanagan Sockeye Re-Introduction to Skaha Lake: Peer Review and Hatchery Progress

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Dr. Kim Hyatt†	Fisheries and Ocean Canada
Rich Bussanich†	Okanagan Nation Alliance
Howie Wright†	Okanagan Nation Alliance
Alene Underwood*	Chelan PUD
Catherine Willard*	Chelan PUD
Greg Mackey*	Douglas PUD
Todd Pearsons	Grant PUD
Lynn Hatcher*	National Marine Fisheries Service
Bill Gale*	U.S. Fish and Wildlife Service
Matt Cooper*	U.S. Fish and Wildlife Service
Mike Tonseth*	Washington Department of Fish and Wildlife
Kirk Truscott*	Colville Confederated Tribes
Keely Murdoch*	Yakama Nation

Notes:

* Denotes Hatchery Committees member or alternate

† ONA Update

HCP Hatchery Committees

Draft Statement of Agreement

Annual Broodstock Collection Protocols

September 17, 2014

Deleted: September 3, 2014

In fulfillment of requirements of existing and forthcoming ESA permits for the HCP hatchery programs, the Wells, Rocky Reach, and Rock Island HCP Hatchery Committees (HC) agree to develop and submit to National Marine Fisheries Service (NMFS) annual brood stock collection protocols each year by April 15.

Process and Schedule: The Permit Holders will prepare a draft broodstock collection protocol for review by the HC and the Coordinating Committees[1] (CC) no later than 10 days prior to their respective February meetings. Following Committees review and revision, a final broodstock collection protocols will be subject to approval at the March HC and CC[1] meetings and submitted to NMFS by April 15.

Deleted: Washington Department of Fish and Wildlife (WDFW)

NMFS Approval: Participation in the development, submission, and approval of the annual broodstock collection protocols within the Committees by the NMFS HCP-HC and CC[1] representatives will constitute NMFS acceptance and approval of the annual broodstock collection protocols.

Deleted: review

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[1] Coordinating Committee (CC) approval meets the Wells HCP requirement for approval of broodstock collection and M&E activities involving the Wells Project facilities.

Deleted: only applies to the

Deleted: CC and is limited to

Deleted: Dam ladder traps

Schedule for Selection of HCP Hatchery and Coordinating Committees Facilitators – *Draft September 17, 2014*

Milestone	Date
1. Present specter of Mike Schiewe's retirement to HC and CC (September 17 and 23, respectively)	September 17, 2014
2. Parties (via HC and CC members) provide additional candidates for consideration and provide edits/comments on qualifications and SOW before the October meetings (15th and 18th, respectively), with presentations of each candidate and discussion about qualifications and SOW at the October meetings	October 15, 2014
3. Select short list of candidates at intermediate meeting in early November, begin to develop interview questions	Week of November 3rd
4. Finalize candidate list for interview and questions	November 19, 2014
5. Candidate interviews at joint HC and CC meeting	December 2014
6. Facilitator selection	January 2015
7. Contracting prior to February meeting is possible, begin to shadow Mike in March and April	February 2015

Scope of Work

Selected Candidate will provide facilitation services as Chairperson of the Wells, Rocky Reach, and Rock Island Habitat Conservation Plans (HCPs) Hatchery Committees. These three committees meet collectively to minimize participant time-commitments and to facilitate coordinated implementation of overlapping obligations.

Services provided will include the following:

- Schedule and arrange all meetings of the Hatchery Committees (HC) in accordance with the processes outlined in the HCPs
- Chair all meetings of the Hatchery Committees
- Facilitate the flow of information among parties between meetings
- Work between meetings to understand all of the parties concerns and close gaps between parties on issues so that decisions can be made at the meetings
- Provide neutral facilitation services for all meetings while maintaining the integrity of the HCPs
- Assist the committees in the maintenance of established rules of process, and development of additional rules as necessary
- Preparation of meeting agendas, meeting minutes, and meeting "action items" lists
- Preparation of annual reports to the chair of the Coordinating Committees (CC) on the progress of implementation of each HCP's Hatchery Compensation Plans, for inclusion in the CC's annual reports to the Federal Energy Regulatory Commission
- Develop schedules for, and ensure that all reports are approved and finalized by required dates
- Facilitate the flow of information between all three primary HCP committees by communication with the chair of the CC, including a monthly report of HC activity to the CC following the monthly HC meeting and preceding the monthly CC meeting
- Attend regional meetings as appropriate and agreed to by the HC
- Maintain the administrative record of HCP implementation by ensuring the archiving of HC files in the HCP Extranet (housed and maintained by Douglas PUD)
- Facilitate the decision-making processes established in the HCPs and subsequent HC agreements regarding the following HC responsibilities (and other issues):
    - Review and approval of study plans and results
    - Development and approval of an annual broodstock collection protocols
    - 5-year hatchery monitoring and evaluation (M&E) plans
    - Annual M&E implementation plans and reports
    - 5-year M&E analysis reports
    - 10-year hatchery program reviews
    - Development of schedules and dates of performance
    - 10-year adjustments of hatchery-compensation levels ("recalculation")

Qualifications for HCP Hatchery Committees Chairperson

Applicants for HCP Hatchery Committees Chair must possess general knowledge and have working experience in at least one aspect of the scientific, engineering, and policy/legal issues within the Columbia Basin hydrosystem, and specifically understand the role of hatchery production in fisheries management. Applicants must also demonstrate an understanding of the Endangered Species Act (ESA) and the purpose and function of a habitat conservation plan (HCP) in achieving compliance with the ESA. The successful applicant must have experience in productive participation in and/or (preferably) effectively facilitating multi-party dialog and decision-making on complicated and sometimes contentious technical and policy issues. The Chairperson must perform the duties and responsibilities specified in the Wells, Rocky Reach, and Rock Island Habitat Conservation Plans, and must obtain a thorough familiarity with those HCPs and serve as a defender of their integrity. Applicants must not have conflicts of interest that would compromise their ability to serve as a neutral facilitator of the HCP Hatchery Committees. Additional experience with and/or knowledge about the effects of hydroelectric projects on adult and juvenile salmonids, and salmonid habitat restoration and protection, is desired, but not required. Successful applicants must demonstrate the ability to provide substantial administrative assistance necessary to perform the following:

- Maintain the near-real-time flow of information between Hatchery Committees members and associated participants
- Schedule meetings and develop meeting agendas within the timeframe established in the HCPs
- Provide detailed draft meeting notes in a timely manner, and produce revised notes for Committees review prior to the next meeting
- Maintain the administrative record for the Hatchery Committees (resides on a web-accessible MS SharePoint site housed by Douglas PUD)
- Report on meeting summaries to the HCP Coordinating Committees prior to each Coordinating Committees meeting
- Produce an annual report of Hatchery Committees activities to the Coordinating Committees Chair by early January of each year

Okanagan Sockeye Re-Introduction to Skaha Lake: Peer Review & Hatchery Progress

Presented by: Richard Bussanich rbussanich@syilx.org

& Howie Wright hwright@syilx.org

syilx Okanagan Nation Alliance

Presented to Public Utility Districts (Grant County, Chelan)

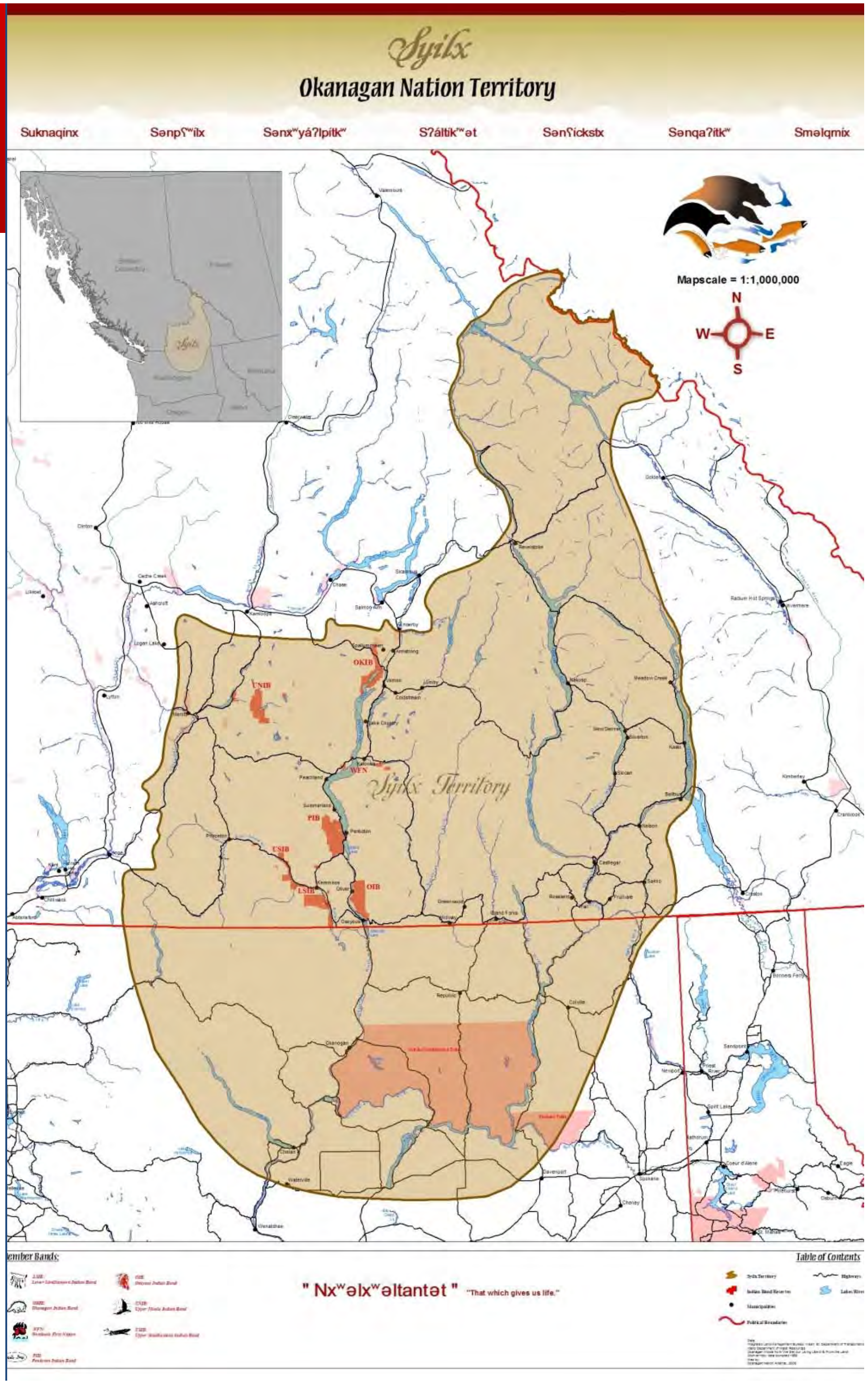
17 September, 2014

Okanagan Nation Alliance

Seven member band communities:

1. Osoyoos Indian Band
2. Penticton Indian Band
3. Westbank First Nation
4. Okanagan Indian Band
5. Upper Nicola Band
6. Lower Similkameen Band
7. Upper Similkameen Band

And the Colville Confederated Tribes (USA)



Mission:

To stabilize and rebuild the declining wild Okanagan sockeye population, to return sockeye to their former habitat and migration range, and to revitalize the Okanagan Nation salmon fishery.

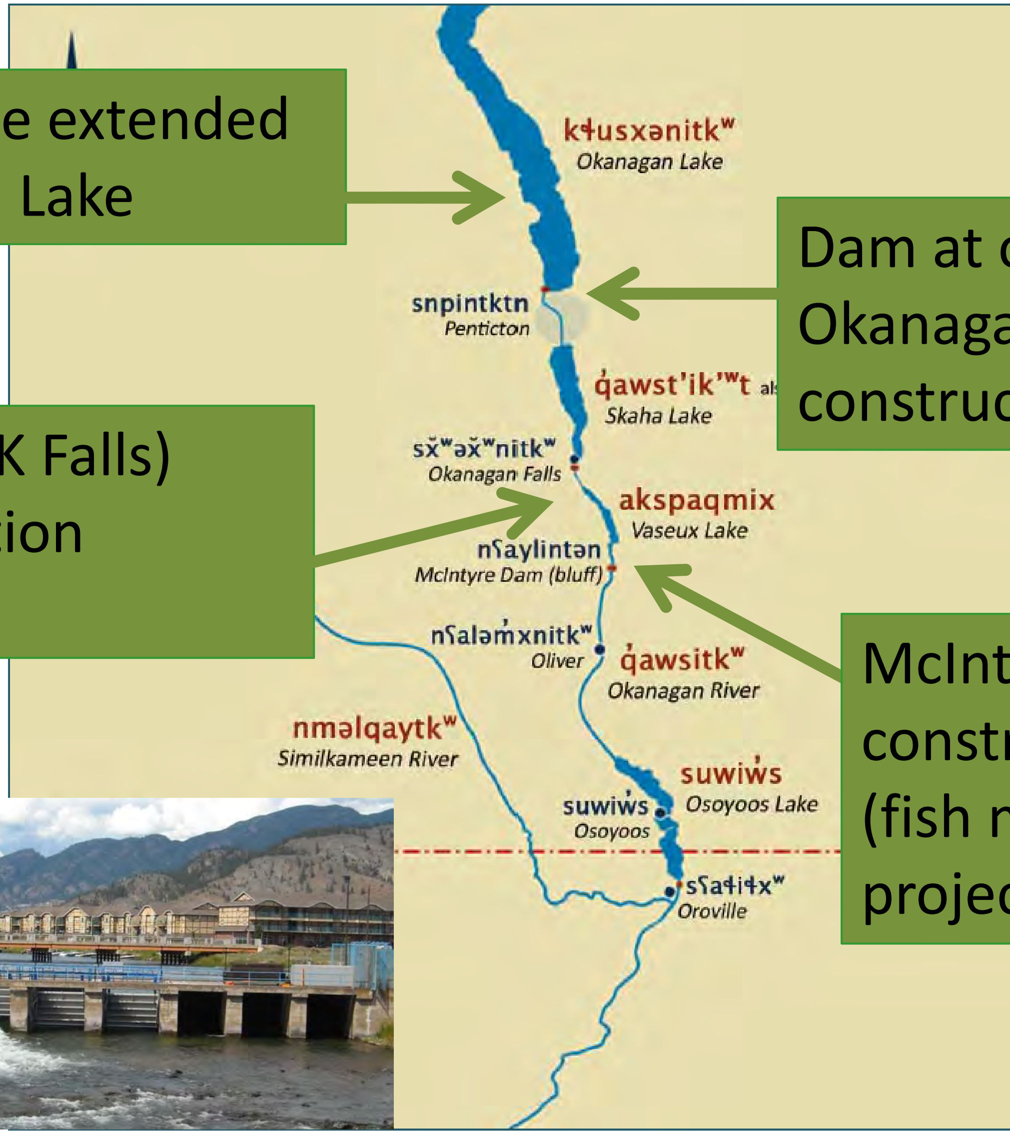
Historical Range of Okanagan Sockeye

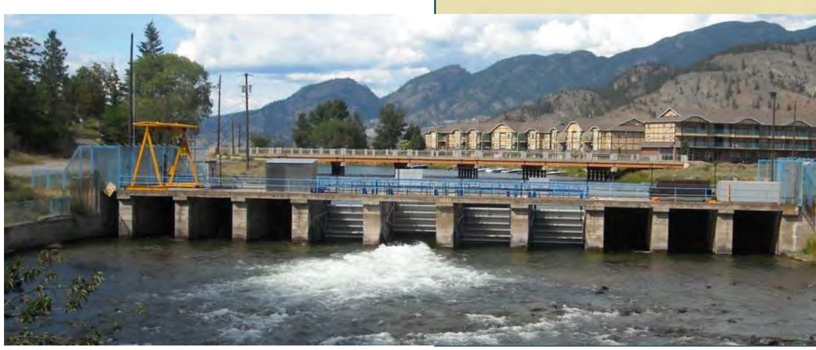
Historical range extended into Okanagan Lake

Dam at outlet of Okanagan Lake constructed in 1914

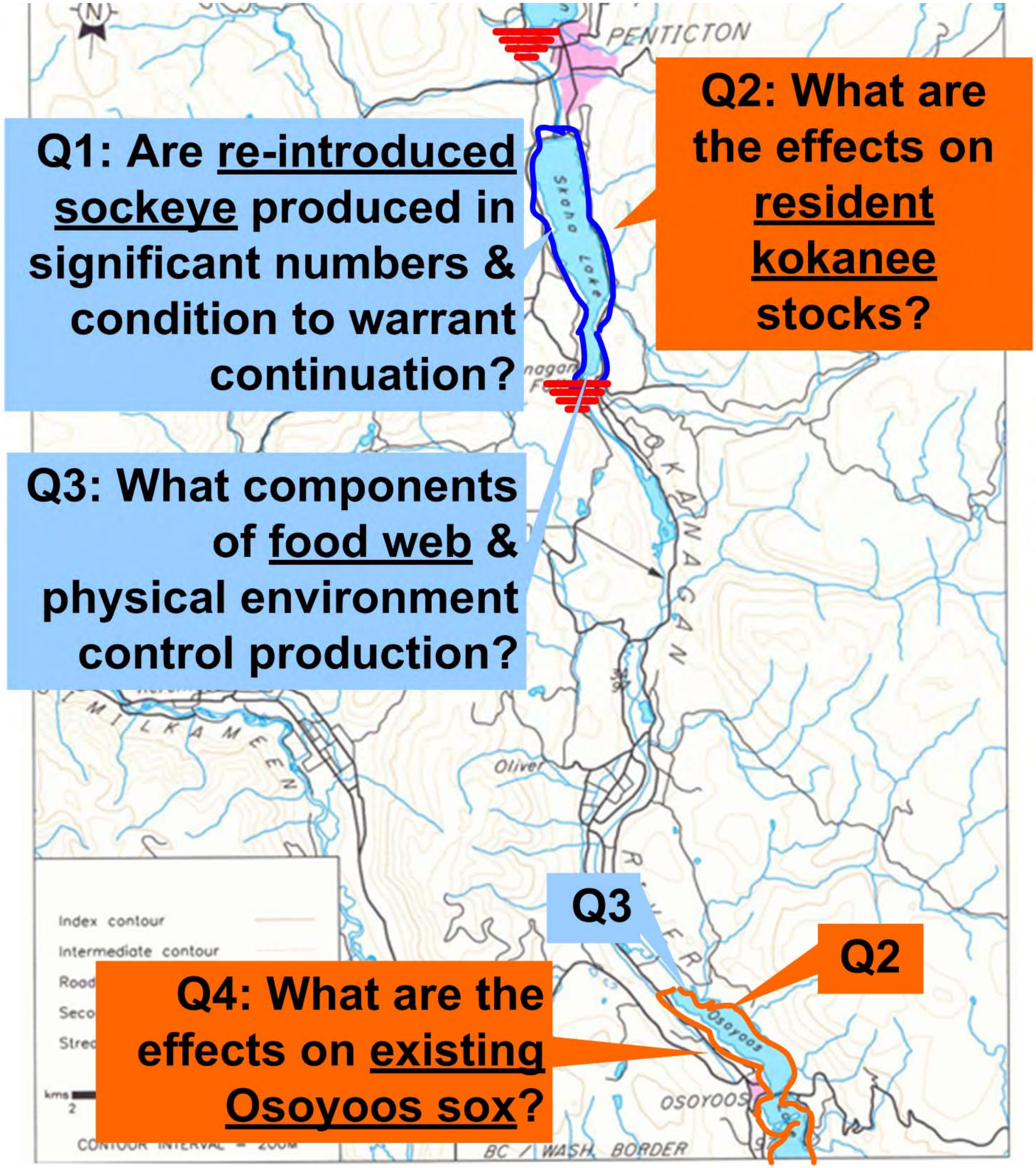
Skaha Dam (OK Falls) current migration project

McIntyre Dam constructed in 1921 (fish migration project, 2009)





Design: Big Questions



OUR JOURNEY

Project History

(1997)	Concept outlined to reintroduce sockeye into Okanagan Lake
(1998)	ONA and Canadian agencies agreed to investigate feasibility study
(2000)	Terms of reference adopted between Canadian tripartite www.obtwg.ca
(2000 – 2003)	Pre-feasibility risk assessments (disease, life cycle model, habitat, invasive)
(2003)	Test adult sockeye collection, egg fertilization and incubation methods
(2004)	First sockeye salmon release (June) at Penticton Channel.
(2004 –today)	Implementation, annual peer review, outreach, communications
(2009)	Fish passage at McIntyre Dam
(2010)	Sockeye and Chinook volitionally pass upstream of Skaha Dam (hi flows)
(2012)	Agencies agree (not if, but how many into Skaha)
(2012)	Largest recorded harvest in Osoyoos Lake (60,000)
(2014)	**Largest total run to date (>450,000) & Test Skaha Fishway**
(2014)	**Spawning platforms at Penticton Channel**
(2014)	**8 Year Synthesis Review & Workshop**

Design

The Skaha Sockeye Reintroduction Program is a 12-year (2004 – 2015) adaptive management experiment designed to assess the feasibility of reintroducing sockeye salmon into their historic range, which includes Skaha Lake & Okanagan Lake.

Key **research questions** include:

1. Can reintroduced sockeye be produced in significant numbers and in ‘good’ condition to continue the program?
2. What is the effect on resident kokanee in Skaha Lake?
3. What are the key ‘drivers’ that control sockeye and kokanee production?
4. What are the effects of a hatchery population on the existing Okanagan sockeye population?

IMPLEMENT

Tested experimental treatments:

- Marked sockeye fry released into Skaha Lake (2004 – present)
- Remove fish passage barriers at McIntyre Dam (2009 – present)
- Transport adults into Skaha Lake (2005 pilot; 2011, 2012, 2013 voluntary due to high flows, **fishway 2014**)

MONITORING 2003-2011

- Juvenile and adult Sockeye and Kokanee
- Water quality
- Phytoplankton, Zooplankton,
- Mysid shrimp
- Bioenergetics = > Productivity

SOME SURVIVAL UNCERTAINTIES

Freshwater: Summer – Fall

- Low flow
- Cold water refuge
- Degraded habitat
- Poaching

Freshwater: Winter - Spring

- Low/High flows
- Predation
- Entrainment
- Degraded habitat
- Non-native species

Ocean (1 – 3 years)

- Columbia Flows
- Coastal upwelling (temp. and prey)
- Harvest
- Predation

LEARNING OUTCOMES (BY 2004-2012)

Sockeye Population Measurable Characteristics	Osoyoos (Natural)	Skaha (Hatchery)
Number of adult spawners per year	13,500 to 209,000	500 to 20,000*
Egg-to-fry survival	2 - 7%	8 - 35%
Fry-to-smolt survival	39 - 82%	10 - 44%
Smolt-to-adult survival	1 - 11%	2 - 20%
Smolt size	6 - 9 grams (65 - 100 mm)	13 - 19 grams (100 - 120 mm)
Adult size (mm)	375 - 585 mm	425 - 605 mm
Fry abundance (early summer)	1,000,000 - 10,000,000	300,000 - 1,600,000
Smolt abundance (spring)	800,000 - 7,000,000	100,000 - 200,000
Peak smolt migration	Late April - early May	Late April - early May
Peak adult migration	Mid-October	Mid-October

Attachment F

Learning Outcomes

29-30 April 2014

Eight Year Review & Workshop

(Westbank, Canada)

PEER REVIEW

Big Question: Are Skaha Sockeye produced in numbers & condition?

- Greatly increase stocking sockeye density (>2000 fry/ha Skaha, generate contrast), test extreme high vs low stocking densities
- Determine best science recommendations for spawning escapement targets: Osoyoos, Skaha, Okanagan
- Improve harvest monitoring (by origin) US-CAN
- Continue monitoring fish density, fry abundance, smolt abundance, adult spawners

Peer Review

Big Question: What components of Skaha and Osoyoos Lake foodwebs and physical environment control outcomes?

- Spawner habitat limiting factor: Improve mapping of sockeye-kokanee competition (actual vs potential)
- Spawner utilization assessments and redd viability
- Mapping/assessment gravel manipulation to Penticton channel
- Improve information of predation impacts in Skaha Lake (Whitefish and Rainbow Trout
- Monitor Osoyoos Lake nutrient loadings (N/P, Blue Green Algae, BOD)
- Continue baseline monitoring at Osoyoos + fish metrics (Skaha)

Peer Review

Big Question: Effects hatchery sockeye on abundance, productivity, and angling quality of Skaha Lake kokanee?

- Predation impacts to kokanee dynamics (whitefish, rainbow etc)
- Continue collect growth and survival data for kokanee (sockeye) at higher sockeye stocking densities
- Rigorous creel program for Skaha needed
- Improve age estimates of kokanee

PEER REVIEW

Big Question: Effects and trajectory Skaha stocking on long term genetic processes of existing natural Osoyoos Sockeye and resident Kokanee?

- Assess allele frequency, inter-annual allele frequency, heterozygosity, and Ne,
- Establish reference points for allele frequency broodstock parental mapping (F1 to F2 contribution)
- Improve HGMP on decision scenarios for PNI and pHOS (Osoyoos (integrated) and Skaha (segregated))
- Assess increased hybridization KO-SK (2003-2012) represent an annual fluctuation or an actual directional trend

Peer Review

Big Question: Extent do out-basin conditions drive year-to-year juvenile production and adult returns?

- Routinely assemble summaries of Columbia hydro system operations , estuary and ocean indicators (Hyatt and Stockwell, in prep, Cumulative impacts)
- PIT monitoring to the estuary (2013 + ongoing)
- Reference stock R/S time series comparing Okanagan (Wenatchee, Barkley, Chilko, Smith Inlet, Nass, Tahltan)
- Improve understanding of pre-spawn mortality from Wells to Okanagan spawning grounds (adults)

2014-2015 Work Plan Hatchery Targets

- Ceremony Grand Opening, 20 September
- + 450 Females (Equal # Males for Broodstock, October)
- + 1.2 million eggs (50% Skaha:50% Osoyoos), pending Skaha Lake escapement
- Two thermal marked groups (Kl cpe' lk' stim' Salmon Hatchery)
- Release early June 2015 (18:00-20:00) at Shingle Creek-Pen Channel
- + 2000 fry /ha density for Skaha Lake (2015-2016) mixed strategy natural + hatchery fry into Skaha Lake

Adult Work Plan

(Green-Operational, Yellow – Data Processing, Red – Reporting)

	2014	2015				2016			
	Fall	W	Sp	Su	Fall	W	Sp	Su	Goal(s)
Broodstock	Green	Yellow	Yellow	Red					450 females (+paired males) using Alaska sockeye culture protocol
Disease Screening	Green	Yellow	Yellow	Red					200 adults collected from the spawning grounds 1200 juveniles will be collected from Skaha (600) and Osoyoos (600)
Egg Take	Green	Yellow	Yellow	Red					1.2 million eggs
Fertilization	Green	Yellow	Yellow	Red					95% fertilization rate
Hatchery O&M	Green	Green	Green	Yellow	Red				> 80% egg to fry outplant
Lab O&M	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Red		Lab accreditation, virology, aging
Adult Sockeye-Kokanee Osoyoos	Green	Yellow	Red						timing, age-structure, and abundance
Adult Sockeye-Kokanee Skaha	Green	Yellow	Red						timing, age-structure, and abundance
Adult Skaha Spawner Distribution	Green	Yellow	Yellow	Red					enhancing broodstock management, and calibrate standardized escapmeent

Juvenile Plan

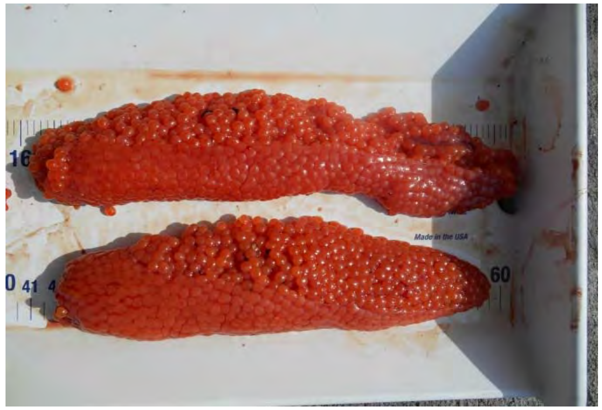
	2014	2015				2016			
	Fall	W	Sp	Su	Fall	W	Sp	Su	Goal(s)
Genetics ATS juveniles									1200 samples across season id sk-ko
SK Smolt RST Skaha Population									size/condition, peak run timing
SK Smolt RST Osoyoos Population									size/condition, peak run timing
Out Basin Monitoring - tagging									5000 + PIT, Juvenile travel times, survival, SAR
ATS Skaha & Osoyoos									Survival, Growth, Pre-Smolt abundance index
General Limnology									Juvenile lake rearing chemical-physical index
Paleolimnology YR 2 of 2									Reconstruction compare nursery lakes
Skaha & Osoyoos mysis and zooplankton									Juvenile lake rearing biological index

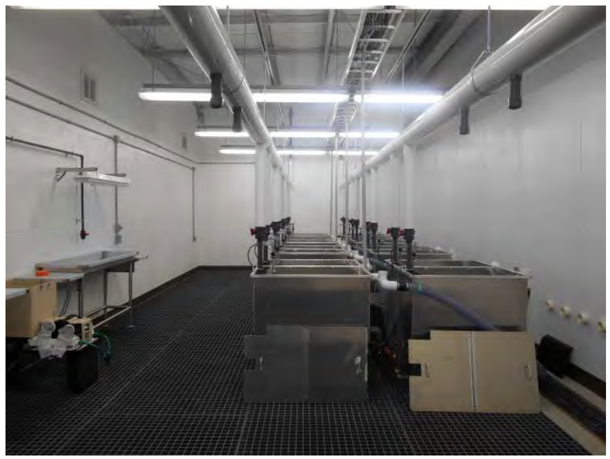
Supported Work Plan

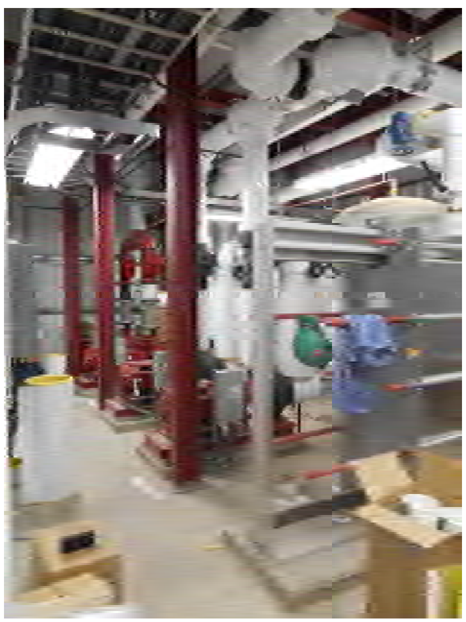
	2014	2015				2016			
	Fall	W	Sp	Su	Fall	W	Sp	Su	Goal(s)
Database management									Real time info QC, analysis, and processing
Skaha Dam fish passage monitoring									Passage effectiveness monitoring
Broodstock Collection and fry production report									Timely report
Monitoring & Evaluation report									Timely report
Project Meetings									Adaptive management, minutes, effective decisions/tracking, data sharing, conflict resolution
Project Coordinator									

Hatchery Update

Attachment F







Attachment F

Attachment F

Lim Limp't (Thank You)

Okanagan Nation Alliance

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Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	November 21, 2014
From:	Mike Schiewe, HCP Hatchery Committees Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the October 15, 2014 HCP Hatchery Committees Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees meeting was held at the Chelan PUD Fish and Wildlife Building in Wenatchee, Washington, on Wednesday, October 15, 2014, from 9:30 am to 1:00 pm. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- Chelan PUD will provide a final report on the water recirculation pilot studies at Eastbank Fish Hatchery and Chiwawa Fish Facility to the Hatchery Committees by December 2014 (Item I-A).
- Mike Tonseth will provide a revised memo clarifying standardized methods for Hatchery Monitoring and Evaluation (M&E) Plan Objective 8.3, Fecundity at Size, to the Hatchery Committees for review by December 2014 (Item I-A).
- The Washington Department of Fish and Wildlife (WDFW) will add a revised summary table to the draft 2014 Wenatchee Basin Steelhead Release Proposal and will redistribute the final revised draft to the Hatchery Committees by December 2014 (Item I-A).
- Douglas PUD will revise the HCP Hatchery Committees Chair Qualifications document to consistently identify and emphasize all duties of the position (Item II-B).
- Hatchery Committees representatives will: 1) contact qualified HCP Hatchery Committees Chair candidates to gauge interest in the position; 2) have interested candidates contact Mike Schiewe to discuss the position, as needed; and 3) obtain a résumé or curriculum vitae (CV) from interested candidates, and provide those

documents to Alene Underwood, Greg Mackey, and Tom Kahler by Friday, October 31, 2014 (Item II-B).

- The Yakama Nation (YN) will prepare a proposal for 2016 expanded acclimation in the Methow, including an explanation of pond operations, tagging, M&E, fisheries objectives, and adult management, to present during the Hatchery Committees meeting on November 19, 2014 (Item VI-A).

DECISION SUMMARY

- There were no decisions approved during today's meeting.

AGREEMENTS

- Hatchery Committees representatives present agreed to rely on Hatchery Manager judgment regarding any modification of fish release schedules that may be needed to avoid adverse impacts resulting from sediment load generated by the wild fires in the Methow basin this past summer, with the recommendation that WDFW conduct periodic fish health evaluations on fish held in potentially impacted holding ponds, and once available, review the Burned Area Emergency Response (BAER) report on the effects of the Carlton Complex Fire (Item II-A).

REVIEW ITEMS

- Kristi Geris sent an email to the Hatchery Committees on October 14, 2014, notifying them that the draft Broodstock Collection Protocols template is available for review. Comments on the draft template are due to Mike Tonseth by October 31, 2014 (Item III-A).
- Kristi Geris sent an email to the Hatchery Committees on September 4, 2014, notifying them that the draft Douglas PUD 2013 Hatchery M&E Annual Report is available for download from the HCP Hatchery Committees Extranet Site. This draft report is available for a 60-day review period with comments due to Greg Mackey no later than Monday, November 3, 2014.
- Kristi Geris sent an email to the Hatchery Committees on September 24, 2014, notifying them that the draft 2015 Douglas PUD Hatchery M&E Implementation Plan

is available for download from the HCP Hatchery Committees Extranet Site. This draft report is available for a 60-day review period with comments due to Greg Mackey no later than November 24, 2014.

FINALIZED DOCUMENTS

- The final Non-Target Taxa of Concern (NTTOC) Statement of Agreement (SOA) that was approved by the Hatchery Committees on September 17, 2014, was distributed to the Hatchery Committees by Kristi Geris on October 14, 2014.
- Kristi Geris sent an email to the Hatchery Committees on November 14, 2014, notifying them that the Final Douglas PUD 2013 Hatchery M&E Report, which was finalized following a 60-day review period that ended on November 3, 2014, is now available for download from the Hatchery Committees Extranet Site. As noted in the email, no comments were received from Hatchery Committees members on the draft report.

I. Welcome

A. Review Agenda, Review Last Meeting Action Items, Approve the September 17, 2014 Meeting Minutes (Mike Schiewe)

Mike Schiewe welcomed the Hatchery Committees and asked for any additions or changes to the agenda. The following revisions were requested:

- Bill Gale added: 1) U.S. Fish and Wildlife Service (USFWS) consultation update; and 2) water pipe replacement at Winthrop National Fish Hatchery (NFH).
- Keely Murdoch added 2016 expanded acclimation in the Methow.
- Kirk Truscott added a transfer of surplus Carson Hatchery eggs to Chief Joseph Hatchery (CJH).
- Alene Underwood added a Chelan PUD M&E hatchery activities update.

The Hatchery Committees reviewed the revised draft September 17, 2014 meeting minutes. Kristi Geris said that there are two comments to be discussed, as follows:

- Regarding Chelan PUD's revised draft 2015 Hatchery M&E Implementation Plan, Greg Mackey requested clarification on a comment that the YN made about release monitoring. Keely Murdoch clarified that she asked if a passive integrated transponder-tag detector was set up at the Chewuch Pond—not in the Chiwawa River.

- Regarding the Colville Confederated Tribes (CCT)'s discussion on the Columnaris outbreak at CJH, Kirk Truscott clarified via email that chloramine-T drip treatments were attempted to reduce mortality—not formalin drip. Kristi Geris distributed Truscott's email to the Hatchery Committees on October 14, 2014.

Bill Gale also requested, regarding National Marine Fisheries Science (NMFS)' Broodstock Collection Protocols SOA discussion, that Tom Kahler's parenthetical statement be deleted since it was not discussed during the meeting. Kristi Geris said that she will incorporate the discussed edits into the revised minutes and that all other comments and revisions received from members of the Committees have been incorporated into the revised minutes. The Hatchery Committees members present approved the draft September 17, 2014 meeting minutes, as revised. *(Note: Kirk Truscott approved the draft September 17, 2014 meeting minutes via email on October 13, 2014, as Geris distributed to the Hatchery Committees the following day.)*

Action items from the Hatchery Committees meeting on September 17, 2014, and follow-up discussions were as follows (italicized item numbers below correspond to agenda items from the meeting on September 17, 2014):

- *Chelan PUD will provide a final report on the water recirculation pilot studies at Eastbank Fish Hatchery and Chiwawa Fish Facility to the Hatchery Committees by December 2014 (Item I).*
  This action item will be carried forward.
- *Mike Tonseth will provide a revised memo clarifying standardized methods for Hatchery M&E Plan Objective 8.3, Fecundity at Size, to the Hatchery Committees for review by December 2014 (Item I).*
  This action item will be carried forward.
- *The Washington Department of Fish and Wildlife (WDFW) will add a revised summary table to the draft 2014 Wenatchee Basin Steelhead Release Proposal and will redistribute the final revised draft to the Hatchery Committees by December 2014 (Item I).*

This action item will be carried forward.

- *Mike Tonseth will coordinate with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) to develop a list of key components that are required in the annual Broodstock Collection Protocols; he will also tentatively identify components that may be removed in order to streamline the annual review and approval process (Item I).*

  This action item will be discussed during today's meeting.
- *Chelan PUD will incorporate revisions to the 2015 Chelan PUD Hatchery M&E Implementation Plan, as discussed during today's meeting, and will provide the final plan, as approved by the Hatchery Committees, to Kristi Geris for distribution to the Hatchery Committees (Item II-A).*

  Chelan PUD provided the final plan to Geris on September 24, 2014, which Geris distributed to the Hatchery Committees that same day.
- *Chelan PUD will add NMFS to the background language of the Non-Target Taxa of Concern (NTTOC) Statement of Agreement (SOA), and will provide the final SOA, as approved by the Hatchery Committees, to Kristi Geris for distribution to the Hatchery Committees (Item II-B).*

  Chelan PUD provided the final SOA to Geris on October 14, 2014, which Geris distributed to the Hatchery Committees that same day.
- *Lynn Hatcher will brief Scott Carlon (NMFS HCP Coordinating Committees Representative) on the Hatchery Committees' approval of the Broodstock Collection Protocol SOA (Item III-A).*

  Hatcher said that he discussed this with Carlon and that Carlon plans to coordinate with Ritchie Graves (NMFS). Mike Schiewe also noted that this was discussed during the last HCP Coordinating Committees and that no major concerns were raised. Schiewe added that the HCP Coordinating Committees plan to continue this discussion at their next meeting.
- *Kristi Geris will distribute to the Hatchery Committees the Hatchery Committees approved Broodstock Collection Protocols SOA, with revisions incorporated as discussed during today's meeting (Item III-A).*

  Geris distributed the approved SOA to the Hatchery Committees following the meeting on September 17, 2014.

- *Greg Mackey and Catherine Willard will evaluate Methow River environmental conditions following the wild fires and landslides that occurred earlier this summer, and their potential impacts on natural production and implications for Hatchery Program Management for discussion at the Hatchery Committees meeting on October 15, 2014 (Item IV-C).*
  This action item will be discussed during today's meeting.
- *Chelan PUD will provide electronic copies of the HCP Hatchery Committees Chair position documents to Kristi Geris for distribution to the Hatchery Committees (Item VI-B).*
  Chelan PUD provided these documents to Geris on September 18, 2014, which Geris distributed to the Hatchery Committees that same day.
- *Hatchery Committees representatives will review the HCP Hatchery Committees Chair position documents and will: 1) provide edits and comments on the documents to Alene Underwood, Greg Mackey, and Tom Kahler; 2) contact qualified candidates to gauge interest in the position; 3) inform interested candidates that they may contact Mike Schiewe to discuss the position; and 4) obtain a résumé or CV from interested candidates to discuss at the Hatchery Committees meeting on October 15, 2014 (Item VI-B).*
  This action item will be discussed during today's meeting.
- *Hatchery Committees representatives will provide recommendations on how to conduct interviews for the HCP Hatchery Committees Chair position (Item VI-B).*
  This action item will be discussed during today's meeting.
- *Alene Underwood and Kristi Geris will distribute a Doodle Poll for a meeting in early November 2014 to develop the short list of candidates to interview for the HCP Hatchery Committees Chair position (Item VI-B).*
  This action item will be discussed during today's meeting.

II. Douglas PUD

A. Methow River Conditions and Implications for Populations and Hatchery Program Management (Greg Mackey)

Greg Mackey said that a hyperlink to the BAER website was distributed to the Hatchery Committees by Kristi Geris on October 14, 2014. Mackey said that a report on the effects of the Carlton Complex Fire will eventually be posted on the website and that a report on the much smaller Mills Canyon Fire is currently available at this website. He said that the latter report provides calculations regarding increases in debris per acre due to fire and probabilities of effects to wildlife. Mackey recommended reviewing this report and the Carlton Complex Fire report, once available, to review what types of information they provide.

Catherine Willard said that she contacted former co-workers at Idaho Fish and Game and asked if they have ever modified timing of hatchery releases due to fires and they indicated that they had not. Willard said that she also asked if they looked at survival data following fires and they indicated that they had not, but anecdotally, they did not believe there were any major impacts.

Willard said that she also reviewed the timing of peak river flow in the Methow and based on the past 5 years of data, she noted river flows begin to increase in mid- to late-April and peak around May to June. She said that for the Chiwawa River, fish are released around April 16 to 22. Mackey said that for the Methow and Twisp, the typical release date target for spring Chinook salmon is around April 15, and for Methow safety-net steelhead, the release date is closer to May 1, in order to provide a few more weeks of imprinting opportunity. Willard said that these data suggest an approximate length of time that hatchery managers would have to release fish prior to peak river flow.

Mackey said that he spoke with Dave Dinsmore (Methow Hatchery Assistant Manager) and Dinsmore indicated that he and Guy Weist (Methow Hatchery Manager) have been discussing this issue, both of which also expressed concern. Mackey said that given that the Hatchery Committees have now discussed and investigated this potential issue, he suggested that the Hatchery Committees agree to defer to Hatchery Manager discretion regarding appropriate actions for releasing fish based on "on-the-ground" conditions, as is standard practice. He said that, in discussing this issue with Dinsmore, deferring to the Hatchery Manager seems to be the most pragmatic thing to do. Mackey explained further that hatchery staff would hold fish in the ponds, watch the weather, river flow, and fish behavior, and release the fish, as appropriate.

Keely Murdoch asked if the concern was about river conditions or impacts to hatchery infrastructure (e.g., clogging pond intakes). Mackey replied, both; however, he noted that the first concern is the ponds, over which hatchery staff have some control. He added that when fish are in the river, they have the opportunity to behave in ways to help them survive. He said that he does not want to take Twisp stock out of the Twisp River, precluding consideration of a different release location, so the only other option is to be prepared to release them at the most opportune time.

Bill Gale suggested considering extending the volitional release period, perhaps starting it earlier. Mike Tonseth noted that the Mid-Columbia spill programs need to be up and running prior to releasing fish to insure good fish passage conditions. He said he believes that Rock Island Dam starts spill around April 15.

Murdoch said that she is less concerned about river conditions; she noted that high muddy water can actually enhance survival. She said that things like fires, lightning, and sediment loading have always been a part of the ecosystem. She said, however, if intake screens are clogged, that is another issue. Mackey said that he is not concerned with muddy water either; rather, he is concerned about debris flow and changes in water chemistry. Murdoch noted that high elevation runoff will be a diluting factor and Mackey said that this year, he believes the risk is still higher than normal. Tonseth noted that the Tripod Fire was more intense than this year's fires and suggested reviewing about 5 years of Chewuch data following that fire. He added that he also is not so much concerned with sediment loading in the river, but rather with high sediment loading in the ponds where the fish are held. Mackey said that the Methow Hatchery should be protected from potential direct impacts because no significant fires were located upstream. He asked the Hatchery Committees if they would be supportive of his previous suggestion (i.e., defer to Hatchery Manager discretion in release timing, per usual). He added that this approach is also consistent with what Kirk Truscott recommended via email, as distributed to the Hatchery Committees by Geris on October 14, 2014. Tonseth also suggested conducting periodic fish health evaluations on fish held in the ponds and Gale recommended reviewing the BAER report to see if it provided insight into expected conditions.

Hatchery Committees representatives present agreed, regarding Methow River conditions and implications for populations and hatchery program management, to defer to Hatchery Manager discretion regarding appropriate actions for releasing fish, with the recommendation to conduct periodic fish health evaluations on fish held in potentially impacted holding ponds, and once available, review of the BAER report on the effects of the Carlton Complex Fire.

Murdoch said that Hatchery Manager actions should be based on in-hatchery (or acclimation pond) conditions—not on river conditions, as previously discussed. Gale asked if fish can be forced or crowded out of the Twisp ponds. Mackey said that dam boards are removed and fish typically exit the ponds as the water level decreases. He added that steelhead seem to be more reluctant to leave, but spring Chinook salmon tend to readily exit. Tonseth said that he believes that steelhead are more tolerant of harsher conditions than spring Chinook salmon.

Gale asked if Chelan PUD is concerned with sediment loading affecting their operations this winter. Alene Underwood said that the in-river structure at the Carlton facility is already in place and she is not anticipating any issues. Gale said that Grant PUD plans to overwinter summer Chinook there and Underwood said that Chelan PUD would defer decisions, if needed, to Grant PUD. Tonseth said that the most significant burns in the Methow were below Carlton pond and any significant material out of the Chewuch or the Twisp would be diluted by the time it reached Carlton pond. Underwood encouraged Hatchery Committees members to continue this discussion with Grant PUD during tomorrow's Priest Rapids Coordinating Committees Hatchery Sub Committee (PRCC HSC) meeting.

B. HCP Hatchery Committees Chair Position (Tom Kahler)

Tom Kahler said that after review of the HCPs, it was clear that the HCP Policy Committees need to be involved in the process of selecting the new HCP committee Chairs. He recalled that when the HCPs were approved by the Federal Energy Regulatory Commission in 2004, and the first Chair was selected, the process was led by the Mid-Columbia Coordinating Committee, chaired by Denny Rohr (DRohr and Associates) and the HCP Policy Committee. Kahler said that the HCPs state that the "Parties" will select the Chair and in the interest of also involving the Policy level, a meeting is currently being scheduled to convene signatory representatives in the HCP Policy Committee and/or HCP Coordinating Committees to discuss the process and timeline for appointing new HCP Chairs.

Keely Murdoch asked if the process will be different than what was outlined during the last Hatchery Committees meeting. Kahler said that the process may be the same and that this is what will be discussed during the joint HCP Policy and Coordinating Committees meeting. Bill Gale asked about the identity of the HCP Policy and HCP Coordinating Committees members. Kahler listed the respective members, as follows:

Signatory	HCP Coordinating Committees Representative	HCP Policy Committee Representative
Douglas PUD	Tom Kahler	Shane Bickford
Chelan PUD	Lance Keller	Keith Truscott
USFWS	Jim Craig	Jessi Gonzales
WDFW	Jeff Korth	Jim Brown
CCT	Kirk Truscott	Randy Friedlander
YN	Bob Rose	Steve Parker
NMFS	Scott Carlon	Ritchie Graves

Mike Tonseth asked when the joint meeting will take place. Kahler said that scheduling of that meeting is in progress and if adequate participation is not achievable, then the HCP Coordinating Committees will likely take the lead. Gale asked if the HCP Policy Committee could assign responsibility to the HCP Coordinating Committees and Kahler replied that they could. Tonseth asked if the HCP Coordinating Committees preferred to take lead responsibility. Kahler said that HCP Coordinating Committees members preferred HCP Policy Committee participation.

Kahler said that he hopes to stick to the original timeline, to have an interview list by sometime in November 2014 and schedule interviews in December 2014 or January 2015 at the latest. He recalled that Hatchery Committees representatives were asked to review the HCP Hatchery Committees Chair position documents and provide edits and comments on the documents to him, Greg Mackey, and Alene Underwood. Kahler said that those documents were used during the selection process for Mike Schiewe. Kahler noted that the

Qualifications document was slightly modified from the original document. Murdoch asked how it was modified. Underwood said that the document was updated based on the last 10 years of HCP work.

Gale noted that several of the Chair responsibilities are embedded in the first paragraph of the Qualifications document, while the bullets are more administrative tasks. He said that as currently written, it seems that some of the Chair qualifications may be hidden in the paragraph and he suggested reformatting the document to consistently identify and emphasize all duties of the position. Kahler said that he would revise the document as requested.

Gale asked about the purpose of the Qualifications document. Underwood said that the document serves as a guide to help identify potential candidates. Gale asked if a candidate needs to be submitted by a HCP Committee member or if the position is open for anyone to apply. He questioned if the current approach is limiting and asked if the position should be open for broader competition. Kahler said that during the first Chair selection process, the position was advertised along the entire west coast and no one of particular interest applied. He said that ultimately, the list of candidates comprised those individuals brought forward by HCP members. Underwood also noted that at this particular juncture, there may not be enough time to implement a broad-scale search. She added that if the HCP Policy members feel strongly about advertising, it can be done, but with a limited response period. Murdoch suggested putting out a Request for Qualifications. Underwood said that could be done if the Parties prefer that approach. Kahler recommended that Hatchery Committees members discuss their preferences with their respective HCP Policy Committee representatives.

Tonseth said that he has heard interest in combining the PRCC HSC and Hatchery Committees meetings. Murdoch added, perhaps not combining the meetings, but using the same facilitator. Lynn Hatcher said that he prefers a strong technical person for the Hatchery Committees Chair. Kahler noted that the HCP Tributary Committees and PRCC Habitat Sub Committee are somewhat combined, where the HCP Tributary Committees meet in the morning with Tracy Hillman (BioAnalysts, Inc.) and then there is a joint portion with the PRCC Habitat Sub Committee with Rohr and then the

PRCC Habitat Sub Committee convenes their separate meeting in the afternoon. Mackey noted that the Chair selection process for the Hatchery Committees and PRCC HSC need to stay separate because of contracting requirements, regardless of whether the same Chair is selected.

Gale and Murdoch both suggested considering Elizabeth McManus (PRCC HSC Facilitator) for the Hatchery Committees Chair position. Underwood recalled, as discussed during last month's Hatchery Committees meeting, that to bring a candidate forward for consideration, a Hatchery Committees member will need to: 1) contact the qualified candidate to gauge interest in the position; 2) inform the interested candidate that they may contact Schiewe to discuss the duties of the position; and 3) obtain a résumé or CV from interested candidates. Kahler noted that Douglas PUD prefers a strong technical person for the Hatchery Committees Chair and McManus does not have that background. Gale agreed with Kahler that a technical background is important, but he noted that it is also important to have a strong facilitation background as well. Gale said that he believes that McManus does a great job at facilitating the PRCC HSC and that he thinks there needs to be a broader pool of candidates for the Hatchery Committees Chair position.

Underwood said that in the interest of maintaining momentum, she recommended establishing a deadline for bringing forward candidates. Gale asked why Hatchery Committees members were being asked to find candidates when the HCP Policy Committee has not yet convened to establish a process. Underwood explained that this is a way to continue to make progress and provide an opportunity for Hatchery Committees input for the HCP Policy Committee to consider. Kahler assured Gale that the HCP Policy Committee is aware that the Hatchery Committees are searching for candidates.

Gale suggested briefly discussing the candidates who have already been contacted so that the same people are not approached again. The Hatchery Committees agreed and discussed the following:

Not Interested

<u>Mr. Tim Roth</u>

Gale contacted Mr. Tim Roth (retired USFWS), who has long been involved with *U.S. v Oregon*; however, Roth indicated that he was not interested in the position.

Mr. Brian Cates

Gale contacted Mr. Brian Cates (retired USFWS); however, no response was received.

Dr. Steve Schroeder

Kahler contacted Dr. Steve Schroeder (retired WDFW); however, Schroeder indicated that he was not interested in the position.

Dr. Pete Bisson

Kahler contacted Dr. Pete Bisson (Bisson Aquatic Consulting, LLC); however, Bisson indicated that he was not interested in the position.

Dr. Tracy Hillman

Tonseth asked about Dr. Tracy Hillman (BioAnalysts, Inc.). Underwood said that Hillman indicated that he likely would not have enough time to fill the position. Kahler noted that Hillman was also nominated for the Aquatic Settlement Workgroup Chair position and Kahler added that he is uncertain if there would be a conflict of interest for Hillman to chair the Hatchery Committees due to his involvement with M&E work.

Mr. Bill Muir

Kahler said that Mr. Bill Muir (retired NMFS) indicated that he was not interested in the position (but is a candidate for the HCP Coordinating Committees chair). Kahler also noted that if the Parties prefer to have the same Chair for both HCP Coordinating Committees and Hatchery Committees, this would eliminate Muir from the pool.

Dr. Chris Caudill

Kahler contacted Dr. Caudill (University of Idaho), who works with the U.S. Army Corps of Engineers (USACE) on fish-passage studies in the Federal Columbia River Power System and on the Willamette River; however, Caudill indicated that he was not interested in the position.

Interested Candidates

Dr. John Ferguson

Kahler said that his direct experience working with Dr. John Ferguson is somewhat limited. Ferguson has participated in the Rocky Reach Fish Forum (RRFF) and HCP Coordinating Committees meetings and also facilitated and presented at a Subyearling Workshop in November 2009. Kahler indicated that he was quite impressed with the way that Ferguson organized the presentations and with Ferguson's overall skills. Kahler said that phone conversations with Ferguson have been positive, as well, and that Ferguson also comes with Anchor QEA and their support services.

Kahler requested additional information about Ferguson, and Schiewe added that Ferguson was the Director of the Fish Ecology Division of NMFS' Northwest Fisheries Science Center, prior to joining Anchor QEA. Schiewe said that Ferguson has a broad fisheries background, having previously worked for the U.S. Forest Service, Bonneville Power Administration, and USACE; in the latter position he managed the Fish Passage Program for the USACE Portland District. After retiring from NMFS, Ferguson joined Anchor QEA and has worked on projects in several areas, including work on the Chehalis River in Washington, the Trinity in northern California, and the Sacramento-San Joaquin Delta.

Underwood said that her experience with Ferguson is also somewhat limited. Underwood said that he worked with an expert panel to synthesize reviews of several technical proposals and presented the findings to the RRFF. Underwood indicated that Ferguson was articulate and did a good job of synthesizing the information.

Mr. Geoff McMichael

Kahler said that Mr. Geoff McMichael has had a long career in hydropower passage research, including development and testing of, and implementation of passage studies with the Juvenile Salmon Acoustic Telemetry System (JSATS) tags. McMichael has also conducted research in the Columbia River estuary and also has worked with Hanford Reach issues for many years, which is how Kahler met McMichael (through Grant PUD's Fall Chinook Workgroup). McMichael worked for Pacific Northwest National Laboratory (PNNL) and was regularly reporting study results to the Workgroup. Prior to PNNL, McMichael worked for WDFW in the Ellensburg, Washington office, working on the Yakima Species Interactions study.

Murdoch said that McMichael lacks facilitation experience. Kahler said that McMichael may not have facilitation background, per se; however, he does have a lot of experience working with Grant PUD's Fall Chinook Workgroup, where issues have been somewhat contentious, and he handled it well.

Mr. Bryan Nordlund

Kahler said that Mr. Bryan Nordlund has a strong background in fish passage and that he has played a significant role in the HCP Coordinating Committees. Kahler said that Nordlund is generally well-prepared and is a very even-tempered person who maintains his composure under all conditions. Nordlund has teaching experience, however, Kahler indicated that he is uncertain about Nordlund's facilitation experience.

Other Possible Candidates

Mr. Tom Schadt

Underwood said that Chelan PUD has contacted Mr. Tom Schadt, who is a founding employee of Anchor QEA. Schadt has a Master of Science in Fisheries, although, he has been a bit removed over the last few years from fisheries work. Schadt facilitates extremely contentious, multi-million dollar projects and he indicated that he is reaching the time when he would like to be less involved in such big stakes negotiating. Schadt lives part-time in Leavenworth, Washington. Underwood said that Chelan PUD is planning to follow up with Schadt.

Underwood said that based on the current Doodle Poll, the first possible date for the joint HCP Policy and Coordinating Committees meeting is November 6, 2014, so she suggested an October 31, 2014 deadline to submit candidates for the Hatchery Committees Chair position. She noted that the deadline is not concrete if the HCP Policy Committee decides to change the process. Hatchery Committees representatives agreed to: 1) contact qualified HCP Hatchery Committees Chair candidates to gauge interest in the position; 2) have interested candidates contact Schiewe to discuss the position duties, as needed; and 3) obtain a résumé or CV from interested candidates, and provide those documents to Underwood, Mackey, and Kahler by Friday, October 31, 2014.

III. WDFW

A. Annual Broodstock Collection Protocols Layout (Mike Tonseth)

Mike Tonseth said that a draft Broodstock Collection Protocols template (Attachment B) was distributed to the Hatchery Committees by Kristi Geris on October 14, 2014. Tonseth said that the draft template was developed jointly between WDFW, NMFS, and USFWS, and includes all the information required in "Broodstock Collection Protocols" for inclusion in the new Biological Opinions (BiOps) and Section 7 consultations for bull trout. He said that this draft template is intended to show the basic layout and content of the new proposed structure of the annual Broodstock Collection Protocols. He said that the draft template focuses on ten elements, some of which have already been included in different programs, but have not been explicitly outlined. He also noted that most elements will be outlined in the appendices of the annual protocols. He explained the ten elements, as follows:

1. Number of Fish to be Collected: Collection numbers are outlined by program and origin.
2. Capture Methods and Locations
3. Program-specific Mating Protocols
4. Current Brood Year Juvenile Production Targets and Release Locations: Outlined in Appendix A of Attachment B.
5. Marking and Tagging: Outlined in Appendix A of Attachment B. This is intended to serve as a tool for Hatchery Staff.
6. Return-year Adult Management Plans: Outlined in Appendix B of Attachment B. These plans are specific to spring Chinook salmon and steelhead, and will include information such as what tools will be used in the event that there are surplus fish. Some programs will have more detailed plans than others. For instance, adult management plans may be more generalized descriptions for steelhead and more specific for spring Chinook salmon.
7. Site-specific Trapping Operations Plans: Outlined in Appendix C of Attachment B.

8. Columbia River Technical Advisory Committee Forecast: Outlined in Appendix D of Attachment B. This is a forecast of adult returns that is published annually to provide Hatchery Managers with an estimate of what to expect for a given year.
9. Research, Monitoring, and Evaluation (RME) Activities: Outlined in Appendix E of Attachment B. This includes appending respective annual implementation plans.
10. In-hatchery Production Management: This element has been included in the annual protocols for the past 4 years and addresses activities such as the application of ultrasound technology, length-fecundity relationships, and preventing over-collecting while also collecting adequate brood. A lot of this language is taken directly from the hatchery descriptions in the respective Hatchery and Genetic Management Plans (HGMPs).

Alene Underwood asked about the benefit of appending the annual implementation plans to the protocols. Tonseth said that this was requested by USFWS so that they could review broodstock activities in concert with proposed RME activities. Bill Gale said that this is important for understanding potential impact to bull trout, which is why he thinks Karl Halupka (USFWS) requested this.

Tonseth reviewed Attachment B, noting that the beginning of the document will largely have the same key information as in previous years, including an introduction and key changes. He said that there will also be a section that identifies any outstanding issues that may not be resolved prior to submitting the protocols to NMFS. He said that program return projections will then follow in a similar format as in the past, only with less detail. He said that each program will include a table that outlines the number of broodstock needed. He noted that the assumptions behind the calculations will no longer be included in the table, but will be available in a separate table. He said that each program will also include a weekly collection plan; Tonseth noted that WDFW has already been preparing these plans, but that they were not previously included in the annual protocols. He said that at the end of section for each program, there will be placeholder for additional information that may be outside of the norm, but worthy to note for that year.

Tonseth said that this new template may take a few years to fully develop and that he would like Hatchery Committees' feedback, including suggestions on any other information to include. Underwood suggested including a list of appendices and Greg Mackey suggested including a full table of contents.

Gale asked about the M&E activities that will be included in the annual protocols. He asked, for example, if details of the Wenatchee Steelhead Reproductive Success Study will be included. Tonseth said that no, in this case, a reference would be added rather than including the entire study.

Lynn Hatcher said that this new template addresses what NMFS wanted. Tonseth noted that the ten elements in the protocols are also outlined in the Broodstock Collection Protocols section of the Section 10 BiOps.

Mackey said that this is a good start, but he would also like the document to the likelihood of meeting broodstock collection targets, with probabilities of over- or under-collecting brood. Different programs have different risk averse sensitivities and such information will allow managers to make more informed decisions on broodstock collection. Mike Schiewe asked if Mackey was suggesting appending to the protocols his estimation of broodstock numbers calculations that he presented to the Hatchery Committees in February 2013. Mackey said that is an option. Tonseth said that he is concerned with including that type of information in the protocols, because with fish runs, assumptions could be off in any given year and hatchery staff may interpret those data incorrectly. Mackey said that is why a more probabilistic approach should be used—it explicitly addresses the uncertainty in the broodstock collection targets.

Tonseth asked that Hatchery Committees members submit comments on the draft template to him by October 31, 2014.

IV. NMFS

A. HGMP Update (Lynn Hatcher)

Lynn Hatcher said that Amilee Wilson (NMFS) and Craig Busack discussed broodstock collection for 2015 during a conference call that was held yesterday, October 14, 2014; however, Hatcher said that he was unable to attend the call. Hatcher said that a NMFS/USFWS BiOp Coordination Meeting was held on September 25, 2014. He then reviewed HGMP updates, as described in the following sections.

Wenatchee Spring Chinook Salmon

NMFS is reinitiating the existing BiOp with a target completion date of December 31, 2014. Discussions during yesterday's conference call regarding how the status of USFWS' review of the three alternatives may have impacted this target completion date.

Leavenworth Spring Chinook Salmon

This target completion date is December 31, 2014. The Wild Fish Conservancy litigation may influence that date.

Wenatchee Steelhead

Wilson was waiting on the final Annual Broodstock Collection Protocols SOA to complete the BiOp and permit. The process seems to be on track to meet the target completion date of October 31, 2014. *(Note: the Hatchery Committees approved the SOA on September 17, and the HCP Coordinating Committees approved the SOA on October 28, 2014.)*

Okanogan Spring Chinook Salmon

Busack has finished drafting this BiOp, but additional review is still required. Busack is planning to meet the target completion date of October 31, 2014, in the interest of transferring the Section 10(j) fish to the Okanogan River.

Winthrop Safety-Net and Methow Conservation Spring Chinook Salmon

Chelan PUD's spring Chinook salmon conservation program will be combined with the Methow Hatchery and Winthrop NFH consultation. The target completion date is March 31, 2015. Mike Tonseth asked if a sufficiency letter was sent to Chelan PUD for their HGMP and he asked if the HGMP was published in the Federal Register. Hatcher said that he is uncertain; Busack just indicated that the BiOps would be combined. Alene Underwood said that she does not believe Busack has taken action yet. Hatcher said that he will verify this with Busack. Keely Murdoch asked if acclimation is covered under the 1196 extension and Underwood replied that it is.

Methow Steelhead

A Fishery and Adult Management Plan is still needed. The target completion date is December 31, 2014. Hatcher added, however, that he is uncertain how this deadline will be met considering that an Environmental Assessment (EA) would need to be completed by October 31, 2014, and then public review, edits, and a final BiOp would need to be completed by the end of December.

Okanogan Safety-net

The target completion date is December 31, 2014. A reduced production alternative is being added to the draft EA, as requested by NMFS attorneys, which is requiring additional time to complete. Kirk Truscott noted that this program is an expansion of a locally adapted program and is included in the CCT's Hatchery Management document.

Summer and Fall Programs

These programs are the lowest priorities, with target completion dates in spring 2015.

Hatcher said that NMFS has received inquiries regarding how NMFS will handle differences in authorization. He said that NMFS is working to define this better, for example, possibly adding more permit holders and making them an authorized agent, or issuing additional permits.

Truscott said that, with regard to permit timing and the transfer of Section 10(j) fish, the CCT's cost share partners may want to consider what their position might be if the CCT need to transfer fish before the permit is issued. He asked if NMFS can provide a concurrence letter to let the CCT know that NMFS has authorized the transfer. Hatcher said that NMFS understands the CCT's position and that is why Busack is targeting the October 31, 2014 deadline. Truscott said that he appreciates that, but he noted that October 31, 2014 is soon approaching. Hatcher said that Busack has finished the BiOp, and NMFS is just waiting to hear back from legal review.

V. USFWS

A. USFWS Bull Trout Consultation Update (Bill Gale)

Bill Gale said that he spoke with Karl Halupka this morning and Halupka indicated that he received some sections of the Wenatchee BiOp and that he also sent some information to NMFS regarding broodstock alternatives. Gale said that Halupka also sent a list of questions to Amilee Wilson outlining what types of information he needs to fully evaluate and understand the BiOp. Gale said that Halupka indicated that he prepared a response to NMFS, however, the response is still under internal review. Gale said that Halupka also provided him with terms and conditions language relating to process and how the Broodstock Collection Protocols will be approved and how they fit in with consultation, which Gale indicated he will review today. Gale said that once the language is in final draft form, he will have a discussion with Wilson. Gale said that he plans to provide a USFWS consultation update at future Hatchery Committees meetings.

B. Winthrop NFH Water Pipe Replacement (Bill Gale)

Bill Gale said that about a week ago, Bob Gerwig (Winthrop NFH Fish Biologist) was acting Hatchery Manager at Winthrop NFH when he noticed cracks in the asphalt and observed what appeared to be a significant water line leak below. Gale said that the leak was narrowed down to a 21-inch pipe that provides water to C-bank. He said that over the weekend, all fish in C-bank were transferred to another rearing space, including 270,000 coho salmon, 75,000 steelhead, and 157,000 spring Chinook salmon. He said that the transfer was successful and that the fish are doing well. He added that no fish were released.

Gale said that a contractor arrived onsite on the Monday following the emergency fish transfer and excavated an area where the leaking pipe was located. He said that the pipe was originally installed in the 1940s and was leaking in four different locations. He said that the contractor plans to replace the entire line between two valve junctions (about 20 to 30 yards), which should be complete in the next 2 weeks.

VI. YN

A. 2016 Expanded Acclimation in the Methow (Keely Murdoch)

Keely Murdoch said that the YN and WDFW determined that the Goat Wall acclimation site (one of two sites in the Methow, located downstream of the mouth of the Lost River) is potentially available for use in 2016 to acclimate brood year 2014 Methow spring Chinook salmon. Accordingly, Murdoch said that the YN would like to request 25,000 Methow spring Chinook salmon for the Goat Wall site. She said that this site is more consistent with long term goals than the Mid-Valley Pond site and she added that based on the pond size, 25,000 is a reasonable request. Mike Tonseth confirmed that the site will accommodate 25,000 fish. He said that during a recent PRCC HSC conference call, Grant PUD and Douglas PUD identified some issues that need to be resolved; however, no records are available regarding those issues at this time. Tonseth said that, at this point, he would like to know what the Hatchery Committees need from the YN and WDFW to make a decision.

Lynn Hatcher said that from NMFS' perspective, if any of the proposed actions are outside of the current permit, Hatchery Committees approval will need to be obtained and possibly additional paperwork if the action is brand new. Mike Schiewe asked if there is a timeline. Tonseth said Hatchery Committees approval should be obtained by December 2014 and that would be sufficient time to arrange for marking. Murdoch asked what information needs to be included in a SOA. Tom Kahler asked about the concerns from the PRCC HSC conference call. Murdoch said that NMFS had a concern regarding percent hatchery-origin spawner (pHOS) responsibilities. Kahler said that he thinks that concerns over accounting for pHOS responsibility will be addressed by marking. Mackey said that marking will not allow adult management actions in real-time to control pHOS specific to certain release groups; rather, marking would only allow estimation of pHOS and contribution to pHOS of various release groups retrospectively. Tonseth noted that at this point, homing fidelity to the hatchery is unknown because Methow Hatchery has never attempted to capture all fish that may home to the volunteer trap, and he added that program changes can be made following a retrospective analysis. Mackey said that he would like this one-year effort to be a longer-term commitment, such as 5-year, that is consistent over time with proper assessment so that parameters and objectives can be uniformly evaluated, as opposed to changing annually. Murdoch agreed. Tonseth said that he believes there should be caution because this is an untested area and added that options need to be available in case there are complications (e.g., disease). Mackey noted that there are really two separate objectives that need to be evaluated: 1) pond operations including survival in the pond; and 2) fish performance once they leave the pond, including smolt-to-adult ratios, homing, and escapement to the target spawning reach(es).

Bill Gale asked how this acclimation proposal folds into existing consultation and he noted how Craig Busack indicated that this effort is not covered in the current HGMP. Murdoch said that she was surprised by Busack's comments because acclimation program placeholder language was included in the draft permits. Kahler said that the language was to cover Douglas PUD, since Douglas PUD assumed that the YN would have their own permits for rearing fish in their own ponds. Murdoch disagreed and said that the intent of that language was to cover the fish portion of Douglas PUD's program. She added, for example, for Chelan PUD's programs, the YN would be authorized agents at Rolfings Pond because the YN are not releasing more fish, rather, they are releasing the same fish that already have coverage. Kahler said that Douglas PUD has custodial responsibility and permit coverage for fish at their facility; however, at release, Douglas PUD no longer has custodial or permit responsibility for those fish. He said that likewise responsibility ends at the point of relinquishing fish to another party. In the case of relinquishing fish to the YN, the custodial and permit-coverage responsibilities become the YN's. Tonseth proposed using the same approach that was used for the Wenatchee spring Chinook salmon permits relative to adult management, where roles and responsibilities were defined for a remote location, but were still covered within the same permit. Murdoch said that, somehow, this effort needs to be connected to the Bonneville Power Administration's EA for this site. Alene Underwood recalled that this was mentioned before and that this is the coho salmon EA. Gale asked if Busack needs additional information so that consultation is not delayed.

Murdoch said that the YN will prepare a proposal for expanded acclimation to begin in 2016 in the Methow to present during the Hatchery Committees meeting on November 19, 2014. Kirk Truscott requested that the proposal include an explanation of pond operations, tagging, M&E, fisheries objectives, and adult management. Murdoch agreed.

VII. CCT

A. Transfer of Surplus Carson Hatchery Eggs to CJH (Kirk Truscott)

Kirk Truscott recalled the recent Columnaris outbreak at CJH, which affected a large portion of the Leavenworth spring Chinook salmon broodstock, leaving only about 250,000 spring Chinook salmon eggs on station. Truscott said that there are 350,000 surplus eyed eggs at Carson that could substantially help compensate for the recent broodstock loss. He said that the CCT have discussed this internally with NMFS and have determined that this would be consistent with their BiOp. He said that the CCT are checking on a few more things, but are leaning towards accepting those eggs. Bill Gale asked if the CCT have coordinated with USFWS Fish Health. Truscott said that he plans to contact them today and that he does not anticipate any issues. He added that these eggs would be used in the 700,000 segregated harvest program. Gale asked if the fish would be adipose (ad)-clipped and coded as normal production and Truscott replied that they would be.

VIII. Chelan PUD

A. Chelan PUD M&E Hatchery Activities Update (Catherine Willard)

Catherine Willard said that Chelan PUD finished spring Chinook salmon surveys in the Wenatchee subbasin. She said that the surveys went well and that 915 redds were identified, which is greater than the 10-year average, but below last year's redd count. She suggested that this year's lower redd count (compared to last year's) is indicative of spring Chinook salmon adult management. She said that redd life will be documented until October 31, 2014. She also noted that Chelan PUD was unable to use a hexacopter during the summer surveys as originally planned, because the legislature placed a moratorium on the use of hexacopters until the Federal Aviation Administration can determine how to manage small unmanned aircraft. She said that WDFW (contractors for Chelan PUD) is also still collecting data for the observer efficiency model twice per week. Greg Mackey asked if summer Chinook salmon have been observed spawning in muddy reaches of the Methow and Willard said that she did not know, because she has not talked to BioAnalysts, who is conducting the surveys for Grant PUD this year.

IX. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees meetings are on November 19, 2014 (Douglas PUD); December 17, 2014 (Chelan PUD); and January 21, 2015 (Douglas PUD).

List of Attachments

Attachment A	List of Attendees
Attachment B	Draft Broodstock Collection Protocols Template

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Alene Underwood*	Chelan PUD
Catherine Willard*	Chelan PUD
Greg Mackey*	Douglas PUD
Tom Kahler*	Douglas PUD
Todd Pearsons†	Grant PUD
Peter Graf	Grant PUD
Lynn Hatcher*†	National Marine Fisheries Service
Bill Gale*	U.S. Fish and Wildlife Service
Matt Cooper*	U.S. Fish and Wildlife Service
Mike Tonseth*	Washington Department of Fish and Wildlife
Charlie Snow†	Washington Department of Fish and Wildlife
Kirk Truscott*†	Colville Confederated Tribes
Keely Murdoch*	Yakama Nation

Notes:

* Denotes Hatchery Committees member or alternate

† Joined by phone

Draft Broodstock Collection Protocol – Template – For HC and HSC Discussion

Introduction – Standard format as in previous protocols.

Key Changes – Bullet point for important changes from previous years or new elements which may be introduced – similar to previous protocols.

Spring Chinook Return Projections

Wenatchee River: To Tumwater Dam

Table x. Age-4 and age-5 class return projection for wild and hatchery spring Chinook to Tumwater Dam during 2014. Estimates were generated by a recently developed model (WDFW unpublished data).

	Chiwawa Basin			Nason Cr. Basin			Wenatchee Basin to Tumwater Dam		
	Age-4	Age-5	Total	Age-4	Age-5	Total	Age-4	Age-5	Total
Estimated wild return	466	149	**615**	177	56	**233**	706	225	**931**
Estimated hatchery return	1,623	12	**1,635**				2,166	166	**2,332**
Total	2,089	161	**2,250**	177	56	**233**	**2,872**	**391**	**3,263**

Additional text will be included here specific broodstock collection methodology.

Table X. Number of broodstock needed for the combined Wenatchee spring Chinook production obligation of 367,969 smolts, collection location, and mating strategy.

Program	Production target	Number of Adults Hatchery	Number of Adults Wild	**Total**	Collection location	Mating protocol
Chiwawa Conservation	144,026		37F/37M	**74**	Chiwawa Weir	2x2 factorial
Nason Conservation	125,000		32F/32M	**64**	Nason Creek	2x2 factorial
Nason Safety net	98,670	33F/33M		**66**	Tumwater Dam	1:1
Total	**367,969**	**66**	**138**	**204**		

Table x. Weekly collection target of natural and hatchery origin adult spring Chinook for Nason Creek and Chiwawa River programs in 2015. –To be developed.

	Week Beginning	Total
	Natural Origin	
Females		
Males		
	Hatchery Origin	
Female		
Male		
Total		

Placeholder for any additional information related to adult handling/sorting that may not have been captured in the sections above.

Appendix A

Current Brood Year Juvenile Production Targets, Marking Methods, Release Locations

Brood Year	Production Group	Program Size	Marks/Tags	Additional Tags	Release Location	Release Year
Summer Chinook						
2015	Methow SUC 1+	200,000	Ad +CWT		Methow River at CAF	2017
2015	Wells SUC 0+	480,000	Ad + CWT		CR at Wells Dam	2016
2015	Wells SUC 1+	320,000	Ad + CWT		CR at Wells Dam	2017
2015	Chelan Falls SUC 1+	576,000	Ad + CWT		CR at Chelan Falls AF	2017
2015	Wenatchee SUC 1+	500,001	Ad + CWT		Wenatchee R. at DAF	2017
Spring Chinook						
2015	Methow SPC	83,249	CWT only	5K PIT	Methow R. at MFH	2017
2015	Methow SPC	50,000	CWT only	5K PIT	Methow R. at MVP	2017
2015	Methow SPC	60,516	CWT only		Chewuch R. at CAF	2017
2015	Twisp SPC	30,000	CWT only		Twisp R. at TAF	2017
Fall Chinook						
Steelhead						

Appendix B

Return Year adult Management Plans

Additional work to be completed on this section. Adult management plans will only include spring Chinook and steelhead.

At a gross scale, adult management plans will include all actions that *may* be taken within the current run year to address surplus hatchery fish (if any). At the time of submission for this document, spring Chinook will probably be the only group where a reasonable pre-season for cast may be available to lay out what the expected surplus is, how many can expected to be removed through each action, etc.

Example:

Table 1. Age-4 and age-5 class return projection for wild and hatchery spring Chinook to Tumwater Dam during 2014. Estimates were generated by recently developed run prediction and pre-spawn mortality models (WDFW unpublished data).

	Chiwawa Basin[1]			Nason Cr. Basin[1]			Wenatchee Basin to Tumwater Dam[2]		
	Age-4	Age-5	Total	Age-4	Age-5	Total	Age-4	Age-5	Total
Estimated wild return	466	149	**615**	177	56	**233**	706	225	**931**
Estimated hatchery return	1,623	12	**1,635**				2,166	166	**2,332**
Total	2,089	161	**2,250**	177	56	**233**	**2,872**	**391**	**3,263**

[1] Reflects NOR estimates to Tumwater Dam and has not been adjusted for pre-spawn mortality.
[2] Wenatchee Basin to Tumwater Dam total includes NORs to the White, Little Wenatchee, and Chiwawa rivers and Nason Creek.

Absent conservation fisheries or adult removal at Tumwater Dam (TWD), the expected number of age- and age-5 Hatchery Origin Returns (HOR) for the upper Wenatchee River Basin as a whole is estimated to be approximately 2.5 times the expected number of Natural Origin Returns (NORs; 3.8 times the number of NOR's in the Chiwawa River). The combined HO and NO returns will represent about 3.3 times the number of adults needed to meet the interim Chiwawa run escapement to TWD of 900 fish indicating a disproportion number of hatchery origin spring Chinook will be on the spawning grounds in the fall of 2014. The conservation fishery is estimated to remove about 157 HO Chiwawa adults (Table 3) which will require additional adult management to occur at TWD.

Additional Adult Management

2014 adult management actions are intended to provide for near 100% removal of age-3 hatchery males (jacks) and up to about 50% of the age-4 and age-5 hatchery origin adults (about 302 males and 515 females according to current models, Table 2). In addition to the conservation fishery, approximately 204 adults will be removed at TWD and retained for brood stock to support meeting the combined Grant and Chelan PUD Wenatchee spring Chinook obligation, an undeterminable number will be removed through implementation of the conservation fishery (because this fishery has not existed before, angler effort/success/impacts cannot yet be evaluated, or estimated), the balance will be surplused at TWD and used for tribal and/or food bank disbursements or nutrient enhancement projects (Table 3).

Table 2. Run escapement and spawning escapement of Chiwawa River hatchery and natural origin fish to Tumwater Dam and the Chiwawa River in 2014. Estimates are based upon new run prediction and pre-spawn mortality models.

	To Tumwater Dam		To Chiwawa River		Adults surplused at TWD[3]	Total Chiwawa spawners
	Wild	Hatchery	Wild[1]	Hatchery[2]		
Females[4]	326	1,030	268	209	515	**477**
Males[4]	289	605	234	123	302	**357**
Sub-total	615	1,635	502	332	817	**834[5]**
Pre-spawn survival			0.929	0.407		
Expected PNI						**0.715**
Expected pHOS						**0.398**

[1] Wild broodstock needs of 74 wild NO fish (32 females/32 males) for the Chiwawa conservation program have already been accounted for in this total as well as pre-spawn mortality.
[2] Adjusted for pre-spawn mortality.
[3] Does not include all age-3 hatchery "jacks" removed during adult management activities at TWD and through the conservation fishery.
[4] Age-4 and age-5 fish only. Gender proportions were made based upon a 5-year average sex ration for hatchery and wild fish of the same age class.
[5] This should result in approximately 477 redds in the Chiwawa Basin under the assumption that each female produces only one redd.

Table 3. Estimated returns of Icicle hatchery, Chiwawa hatchery, and Chiwawa wild adults and estimated number of adults removed through adult management activities in the Wenatchee Basin in 2014.

	Estimated Returns			
	Icicle	Chiwawa HO	Chiwawa NO	Total
Estimated return	6,000	2,332	615	8,947
% of return	0.66	0.27	0.07	
Harvest at2% take limit[1]	426	157	12[2]	595
	Estimated Chiwawa Hatchery Fish Removed			
	Fishery	Broodstock	TWD removal	Total
Number of HO adults removed by method[3]	157	204	456	817

[1] For Wenatchee River fishery area only. Does not include Icicle River fishery harvest.
[2] While included as harvest, it is NO incidental hooking mortality associated with HO fish removal.
[3] Only includes age-4 and age-5 adults

Appendix C

Site Specific Trapping Operation Plans

Tumwater Dam

For 2014, WDFW and the District are proposing the following plan (A summary of activities by month for Tumwater Dam is summarized in Table 1):

1) **Real-time monitoring and trap operations:** Throughout all trapping activities described in this plan, the two PIT tag antennae arrays within the Tumwater Dam ladder (weir 15 and 18, see Appendix 2), will be monitored by WDFW and detections of previously PIT tagged fish will be evaluated to determine the median passage time of fish between first detection at weir 15 and last detection at weir 15 or weir 18. Median passage estimates will be updated with every 10 PIT-tagged fish encountering weir 15. If the median passage time is greater than 48 hours, trapping will cease and fish will be allowed to exit via the ladder (i.e., bypass the trap). If trapping has been stopped, PIT tag passage monitoring will continue and trapping will resume if and when the median passage time is less than 24 hours. In summary, real-time PIT tag monitoring will occur both when the trap is operational and when fish are bypassed. This will provide an opportunity to evaluate trapping effects versus baseline passage rates through the ladder for future operations.

2) **Improved Fish Handling Efficiency**: Several infrastructure improvements at Tumwater allow WDFW and other operators to cycle through sampled fish more quickly. These improvements consist of an additional holding tank and an improved conveyance system between the trap and holding tank. The facility improvements and additional staffing by WDFW (3 operators instead of 2) during peak spring Chinook and sockeye passage (i.e. June 1 and July 15), will ensure that the trapping denil is operated constantly allowing unimpeded passage through the trap. Historically, the trapping denil has been periodically shut down while fish are being processed.

3) **Enhanced effort for Tumwater trapping operations from June 1 and July 15**: The Tumwater trap will be operated in an active-manned trapping condition (the ladder bypass will not be used however, fish may still ascend the denil [steep pass] unimpeded). The trap will be checked a minimum of 1x per day. More frequent trap checks will be made as fish numbers increase. Between June 16 and July 15 the Tumwater trap will be actively manned 24 hours/day 7 days/week utilizing two- three person crews (two people will sample fish and the third will maintain operation of the steep pass so that it will not be closed to passage). This represents an additional person to keep the denil operating constantly.

4) **Enhanced effort and limited Tumwater trapping operations from July 16 to August 31**: The trap will be operated 3 days/week for up to 16 hours/day (not to exceed 48 hours per week) to support broodstock collection activities for summer Chinook and sockeye

run composition sampling (CRITFC) and sockeye spawner escapement PIT tagging. Video enumeration and full passage will occur when trapping is not occurring.

5) **Planned Tumwater trapping operations from September 1 until mid-December:** The trap will return to a 24 hours/7day/week manned or unmanned active trapping for steelhead and Coho broodstock collection and adult steelhead management. During this time period bull trout are rare and spring Chinook are not present at Tumwater. For this trapping period, real-time monitoring will continue to be implemented.

6) **Limitation in staffing or other unforeseen problems**: If WDFW staff are not available to operate the trapping facility (according to this plan) for any reason, then full passage will be allowed (fish will be allowed to bypass the trap and exit the ladder directly), until staff are able to return.

7) **Unforeseen scenarios and in season observations**: If during the trapping period, observations from field staff warrant reconsideration of any part of the plan as described above, WDFW and the District will alert the Hatchery Committee and work cooperatively with the Services to determine whether changes are needed to further minimize incidental take or otherwise ensure that take is maintained at the manner and extent previously approved by the Services

Table 1. Summary of broodstock collection, spawner escapement tagging, adult management, run composition sampling, and reproductive success activities anticipated to be conducted at Tumwater Dam in 2014. Blue denotes steelhead, brown spring Chinook, orange sockeye, pink summer Chinook, and green Coho.

Activity	Month											
	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
Steelhead RSS[1]		15 Feb				15 June						
SHD pHOS mgt[2]		15 Feb				15 June			1 Sep			15 Dec
Su. SHD BS collection[3]									1 Sep		15 Nov	
Su. SHD Spawner Esc. tagging[4]		15 Feb				15 June			1 Sep			15 Dec
Spring Chinook RSS[5]					1 May		15 Jul					
Sp Chinook run comp[6]					1 May		15 Jul					
Sp Chinook pHOS mgt[7]					1 May		15 Jul					
LNFH Sp Chin stray mgt[8]					1 May		15 Jul					
Sockeye run comp[9]							15 Jul	15 Aug				
Sockeye spawner esc tagging[10]							15 Jul	15 Aug				
Su. Chin BS collection[11]							1 Jul		15 Sep			
Coho BS collection[12]									1 Sep		15 Nov	

[1] The steelhead RSS for adult collections will terminate with the end of the 2011 brood in June 2011.

[2] Adult management of the 2011 brood will end in June 2011. However it is anticipated that adult management will occur for the 2012 brood beginning 1 September or earlier if conducted in conjunction with broodstock collection activities at Tumwater Dam for other species.
[3] Summer steelhead broodstock collection will be prioritized at Dryden Dam traps. However if broodstock objectives cannot be met at Dryden then trapping may occur at Tumwater concurrent with other activities.
[4] SHD spawner composition tagging at Tumwater Dam will run concurrent with SHD adult management and other (broodstock) activities at Tumwater Dam.
[5] The spring Chinook RSS will run from 1 May through about 15 July or at such time or at such time the sockeye return develops at Tumwater Dam.
[6] Spring Chinook run composition sampling will run concurrent with the RSS.
[7] Spring Chinook pHOS management will end in July consistent with the arrival of the sockeye return and run concurrent with RSS activities.
[8] Removal of Leavenworth NFH spring Chinook strays at Tumwater Dam will run concurrent with the RSS.
[9] Sockeye run composition sampling will occur at Tumwater Dam beginning no earlier than 15 July. Trapping at Tumwater Dam for run composition sampling will follow a 3d/week, 16hrs/d (48 hrs/week) trapping schedule consistent with permit 1347.
[10] Sockeye spawner escapement sampling will occur at Tumwater Dam beginning no earlier than 15 July. Trapping at Tumwater Dam for spawner escapement tagging will follow a 3d/week, 16hrs/d (48 hrs/week) trapping schedule consistent with permit 1347.
[11] Summer Chinook broodstock collection will prioritized at Dryden Dam. However if broodstock objectives cannot be met at Dryden Dam then trapping may occur at Tumwater Dam. Trapping at Tumwater Dam for summer Chinook broodstock will follow a 3d/week 16hr/day (48 hrs/week) trapping schedule and may run concurrent with other broodstock collection, run sampling, or adult management activities.
[12] Coho trapping will be conducted at both Dryden and Tumwater Dams. Trapping at Tumwater Dam for Coho broodstock will follow a 3d/week 16hr/day (48 hrs/week) trapping schedule and may run concurrent with other broodstock collection, run sampling, or adult management activities.

Wells Dam Ladder and Hatchery Volunteer Traps

For 2014, WDFW and the District are proposing the following plan (A summary of activities by month for the Wells Dam East/West ladder and Wells FH volunteer traps is summarized in Table 2): Additional text to be inserted here

Table 2. Summary of broodstock collection, spawner escapement tagging, adult management, run composition sampling, and reproductive success activities anticipated to be conducted at Wells Dam in 2014. Blue denotes steelhead, brown spring Chinook, orange sockeye, pink summer Chinook, and green Coho.

Activity	Month											
	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
East/West Ladders												
Su. SHD BS collection[3]									1 Sep		15 Nov	
Su. SHD Spawner Esc. tagging[4]		15 Feb				15 June			1 Sep			15 Dec
Sp Chinook BS collection					1 May		15 Jul					
Sp Chinook run comp[6]					1 May		15 Jul					
Su. Chin BS collection[11]							1 Jul		15 Sep			
Coho BS collection[12]									1 Sep		15 Nov	
Wells Volunteer Trap												
Su. SHD BS collection[3]									1 Sep		15 Nov	
SHD pHOS mgt[2]		15 Feb				15 June			1 Sep			15 Dec
Su. Chin BS collection[11]							1 Jul		15 Sep			
Su. Chin Surplussing												

Methow Hatchery Volunteer and Twisp Weir Traps

For 2014, WDFW and the District are proposing the following plan (A summary of activities by month for Methow Hatchery volunteer trap and the Twisp Weir is summarized in Table 3): Additional text to be inserted here.

Table 3. Summary of broodstock collection, spawner escapement tagging, adult management, run composition sampling, and reproductive success activities anticipated to be conducted at Methow Hatchery and Twisp Weir in 2014. Blue denotes steelhead, brown spring Chinook, orange sockeye, pink summer Chinook, and green Coho.

Activity	Month											
	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
Methow Hatchery												
SHD pHOS mgt									1 Sep		15 Nov	
Sp Chinook BS collection					1 May		15 Jul					
Sp Chinook run comp[6]					1 May		15 Jul					
Twisp Weir												
Steelhead RSS[1]		15 Feb				15 June						
Su. SHD BS collection[3]									1 Sep		15 Nov	
SHD pHOS mgt[2]		15 Feb				15 June			1 Sep			15 Dec
Sp Chinook BS collection					1 May		15 Jul					
Coho BS collection												

Appendix D

Columbia River TAC Forecast

Appendix A

Columbia River Mouth Fish Returns Actual and Forecasts**

			2013 Forecast	2013 Return	2014 Forecast
Spring Chinook	**Total Spring Chinook**		**225,000**	**195,200**	**308,000**
	Willamette		59,800	47,300	58,700
	Sandy		6,100	5,700	5,500
	Cowlitz*		5,500	9,500	7,800
	Kalama*		700	1,000	500
	Lewis*		1,600	1,600	1,100
	Select Areas		9,900	7,000	7,400
	Lower River total		**83,600**	**72,100**	**81,000**
	Wind*		3,000	3,600	8,500
	Drano Lake*		4,900	7,300	13,100
	Klickitat*		2,200	1,800	2,500
	Yakima*		7,300	7,100	9,100
	Upper Columbia	Total	14,300	18,000	24,100
	Upper Columbia	*Wild*	*1,600*	*3,600*	*3,700*
	Snake River Spring/Summer	Total	58,200	67,300	125,000
	Snake River	*Wild*	*18,900*	*21,900*	*42,200*
	Upriver Total		**141,400**	**123,100**	**227,000**
Summer Chinook	**Upper Columbia**	**Total**	**73,500**	**67,600**	**67,500**
Sockeye	Wenatchee		44,600	36,000	63,400
	Okanogan		134,500	149,000	282,500
	Snake River	*Wild*	*1,250*	*1,100*	*1,200*
	Total Sockeye		**180,500**	**186,100**	**347,100**
Steelhead					
Winter	Wild winter steelhead	Wild	15,700	15,600	16,100
Upriver Summer (to Bonneville Dam)	Upriver Skamania Index	**Total**	**16,600**	**5,800**	**8,600**
		Wild	*5,300*	*1,700*	*2,300*
	Group A-run Index	**Total**	**291,000**	**214,100**	**241,400**
	Wild		*83,500*	*90,500*	*82,400*
	Group B-run Index	**Total**	**31,600**	**11,500**	**31,000**
		Wild	*7,900*	*2,900*	*6,500*
	Total Upriver Steelhead	**Total**	**339,200**	**231,400**	**281,000**
		Wild	*96,700*	*95,100*	*91,200*

*Return to tributary mouth **Totals may not sum due to rounding 26-Feb-14

Appendix E

Annual RM&E Implementation Plans

Each of the respective PUD's RM&E implementation plans will be appended here. Since these plans are developed and approved the fall prior to the start of the activities the subsequent year – no additional work is needed other than cut-and-paste.

Appendix F

DRAFT
Hatchery Production Management Plan

The following management plan is intended to provide life-stage-appropriate management options for Upper Columbia River (UCR) PUD salmon and steelhead mitigation programs. Consistent, significant over-production or under-production risks the PUD's not meeting the production objectives required by FERC and overages in excess of 110% of program release goals violates the terms and conditions set forth for the implementation of programs under ESA and poses potentially significant ecological risks to natural origin salmon communities.
Under RCW 77.95.210 (Appendix A) as established by House Bill 1286, the Washington Department of Fish and Wildlife has limited latitude in disposing of salmon and steelhead eggs/fry/fish. While this RCW speaks more specifically to the sale of fish and/or eggs WDFW takes a broader application of this statute to include any surplus fish and/or eggs irrespective of being sold or transferred.
We propose implementing specific measures during the different life-history stages to both improve the accuracy of production levels and make adjustments if over-production occurs. These measures include (1) Improved Fecundity Estimates, (2) Adult Collection Adjustments, (3) Within-Hatchery Program Adjustments, and (4) Culling.

<u>Improved Fecundity Estimates</u>

A) Develop broodstock collection protocols based upon the most recent 5-year mean in-hatchery performance values for female to spawn, fecundity, green egg to eye, and green egg to release.
B) Use portable ultrasound units to confirm gender of broodstock collected (broodstock collection protocols assume a 1:1 male-to-female ratio). Ultrasonography, when used by properly trained staff will ensure the 1:1 assumption is met (or that the female equivalents needed to meet production objective are collected). Spawning matrices can be developed such that if broodstock for any given program are male limited sufficient gametes are available to spawn with the females.

<u>Adult Collection Adjustments</u>

C) Make in-season adjustments to adult collections based upon a fecundity-at-length regression model for each population/program and origin composition needs (hatchery/wild). This method is intended to make in-season allowances for the age structure of the return (i.e. age-5 fish are larger and therefore more fecund than age-4 fish), but will also make allowances for age-4 fish that experienced more growth through better ocean conditions compared to an age-5 fish that reared in poorer ocean conditions.

<u>Within-Hatchery Program Adjustments</u>

D) At the eyed egg inventory (first trued inventory), after adjustments have been made for culling to meet BKD management objectives, the over production will be managed in one or more of the following actions as approved by the HCP-HC:

    - Voluntary cooperative salmon culture programs under the supervision of the department under chapter 77.100 RCW;
    - Regional fisheries enhancement group salmon culture programs under the supervision of the department under this chapter;
    - Salmon culture programs requested by lead entities and approved by the salmon funding recovery board under chapter 77.85 RCW;
    - Hatcheries of federally approved tribes in Washington to whom eggs are moved, not sold, under the interlocal cooperation act, chapter 39.34 RCW; and
    - Governmental hatcheries in Washington, Oregon, and Idaho; or
    - Culling for diseases such as BKD and IHN, consistent with the Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State; or
    - Distribution to approved organizations/projects for research.

E) At tagging (second inventory correction) fish will be tagged up to 110% of production level at that life stage. If the balance of the population combined with the tagged population amounts to more than 110% of the total release number allowed by Section 10 permits then the excess will be distributed in one or more of the following actions as approved by the HCP-HC:

- Voluntary cooperative salmon culture programs under the supervision of the department under chapter 77.100 RCW;
- Regional fisheries enhancement group salmon culture programs under the supervision of the department under this chapter;
- Salmon culture programs requested by lead entities and approved by the salmon funding recovery board under chapter 77.85 RCW;
- Hatcheries of federally approved tribes in Washington to whom eggs are moved, not sold, under the interlocal cooperation act, chapter 39.34 RCW; and
- Transfer to another resource manager program such as CCT, YN, or USFWS program;
- Governmental hatcheries in Washington, Oregon, and Idaho;
- Placement of fish into a resident fishery (lake) zone, provided disease risks are within acceptable guidelines; or
- Culling for diseases such as BKD and IHN, consistent with the Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State; or
- Distribution to approved organizations/projects for research.

F) In the event that a production overage occurs after the above actions have been implemented or considered, and deemed non viable for fish health reasons in accordance with agency aquaculture disease control regulations (i.e. either a pathogen is detected in a population that may pose jeopardy to the remaining population or other programs if retained or could introduce a pathogen to a watershed where it had not previously been detected) then culling of those fish may be considered.

All, provisions, distributions, or transfers shall be consistent with the department's egg transfer and aquaculture disease control regulations as now existing or hereafter amended. Prior to department determination that eggs of a salmon stock are surplus and available for sale, the department shall assess the productivity of each watershed that is suitable for receiving eggs.

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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	January 22, 2015
From:	Mike Schiewe, HCP Hatchery Committees Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the November 19, 2014 HCP Hatchery Committees Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees meeting was held at Douglas PUD headquarters in East Wenatchee, Washington, on Wednesday, November 19, 2014, from 9:30 am to 11:30 am. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- Chelan PUD will provide a draft report on the water recirculation pilot studies conducted at Eastbank Fish Hatchery and Chiwawa Fish Facility to the Hatchery Committees by December 17, 2014; the draft report will be discussed during the Hatchery Committees meeting on January 21, 2015 (Item I).
- Mike Tonseth will provide a revised memo clarifying standardized methods for Hatchery Monitoring and Evaluation (M&E) Plan Objective 8.3, Fecundity at Size, to the Hatchery Committees for review by December 17, 2014; the revised memo will be discussed during the Hatchery Committees meeting on January 21, 2015 (Item I).
- The Washington Department of Fish and Wildlife (WDFW) will add a revised summary table to the draft 2014 Wenatchee Basin Steelhead Release Proposal, and will redistribute the final revised draft to the Hatchery Committees by December 17, 2014; the final revised draft proposal will be discussed during the Hatchery Committees meeting on January 21, 2015 (Item I).
- The Yakama Nation (YN) will provide a revised draft Upper Methow Spring Chinook Acclimation Proposal to Kristi Geris for distribution to the Hatchery Committees by December 3, 2014; the Hatchery Committees will submit suggested edits and comments on the revised draft proposal by December 17, 2014; and the YN will redistribute a final revised draft proposal to the Hatchery Committees at least 10 days prior to the Hatchery Committees meeting on January 21, 2015 (Item II-A). *(Note:*

The YN provided a revised draft proposal to Geris on December 3, 2014, which she distributed to the Hatchery Committees that same day.)

- **The Hatchery Committees meeting scheduled for December 17, 2014, has been canceled (Item VI-A).**

DECISION SUMMARY

- There were no decisions approved during today's meeting.

AGREEMENTS

- Hatchery Committees representatives present agreed to cancel the Hatchery Committees meeting scheduled for December 17, 2014, due to conflicting schedules and lack of agenda items (Item VI-A).

REVIEW ITEMS

- Kristi Geris sent an email to the Hatchery Committees on September 24, 2014, notifying them that the draft 2015 Douglas PUD Hatchery M&E Implementation Plan is available for download from the HCP Hatchery Committees Extranet Site. This draft report is available for a 60-day review period with comments due to Greg Mackey no later than November 24, 2014 (Item IV-B).
- Kristi Geris sent an email to the Hatchery Committees on December 3, 2014, notifying them that the revised draft Upper Methow Spring Chinook Acclimation Proposal is available for review. Comments on the draft proposal are due to Keely Murdoch by December 17, 2014 (Item II-A).

FINALIZED DOCUMENTS

- There are no documents that have been recently finalized.

I. Welcome

A. Review Agenda, Review Last Meeting Action Items, Approve the October 15, 2014 Meeting Minutes (Mike Schiewe)

Mike Schiewe welcomed the Hatchery Committees and asked for any additions or changes to the agenda. No additions or changes were requested.

The Hatchery Committees reviewed the revised draft October 15, 2014 meeting minutes. Kristi Geris said that there are five items to be discussed, as follows:

- Regarding the Finalized Documents section, Geris indicated that she added that the Douglas PUD 2013 Hatchery M&E Report was finalized following a 60-day review period that ended on November 3, 2014, as distributed to the Hatchery Committees on November 14, 2014. She also included that, as noted in the email, no comments were received from Hatchery Committees members on the draft report.
- Regarding the HCP Hatchery Committees Chair position discussion, Alene Underwood requested confirmation of the identity of the WDFW HCP Policy representative. Mike Tonseth said that Jim Brown, WDFW Region 2 Director, is the representative.
- Regarding U.S. Fish and Wildlife Service's (USFWS') bull trout consultation update, Greg Mackey requested clarification on which Wenatchee Biological Opinion (BiOp) was being referenced. Tonseth said that the BiOp includes steelhead and spring and summer Chinook salmon, and suggested leaving the language as written.
- Regarding the YN's discussion on 2016 expanded acclimation in the Methow, Tom Kahler requested clarification of whether the proposed expanded acclimation was for 2016 only, or for multiple years. Keely Murdoch said that the goal is for the program to continue beyond 1 year, and suggested revising the statement to indicate "to begin in 2016."

Geris said that she will incorporate the discussed edits into the revised minutes and that all other comments and revisions received from members of the Committees have been incorporated into the revised minutes. The Hatchery Committees members present approved the draft October 15, 2014 meeting minutes, as revised. *(Note: Lynn Hatcher provided the National Marine Fisheries Service's [NMFS'] approval of the October 15, 2014 meeting minutes via email on November 17, 2014.)*

Action items from the Hatchery Committees meeting on October 15, 2014, and follow-up discussions were as follows (italicized item numbers below correspond to agenda items from the meeting on October 15, 2014):

- *Chelan PUD will provide a final report on the water recirculation pilot studies at Eastbank Fish Hatchery and Chiwawa Fish Facility to the Hatchery Committees by December 2014 (Item I-A).*
  Chelan PUD will provide a draft report to the Hatchery Committees by December 17, 2014, which will be discussed during the Hatchery Committees meeting on January 21, 2015.
- *Tonseth will provide a revised memo clarifying standardized methods for Hatchery M&E Plan Objective 8.3, Fecundity at Size, to the Hatchery Committees for review by December 2014 (Item I-A).*
  Tonseth will provide a revised memo to the Hatchery Committees for review by December 17, 2014, which will be discussed during the Hatchery Committees meeting on January 21, 2015.
- *WDFW will add a revised summary table to the draft 2014 Wenatchee Basin Steelhead Release Proposal and will redistribute the final revised draft to the Hatchery Committees by December 2014 (Item I-A).*
  WDFW will redistribute the final revised draft proposal to the Hatchery Committees by December 17, 2014, which will be discussed during the Hatchery Committees meeting on January 21, 2015.
- *Douglas PUD will revise the HCP Hatchery Committees Chair Qualifications document to consistently identify and emphasize all duties of the position (Item II-B).*
  This will be discussed during today's meeting.
- *Hatchery Committees representatives will: 1) contact qualified HCP Hatchery Committees Chair candidates to gauge interest in the position; 2) have interested candidates contact Mike Schiewe to discuss the position, as needed; and 3) obtain a résumé or curriculum vitae (CV) from interested candidates, and provide those documents to Underwood, Greg Mackey, and Kahler by Friday, October 31, 2014 (Item II-B).*
  This action item was completed.
- *The YN will prepare a proposal for 2016 expanded acclimation in the Methow, including an explanation of pond operations, tagging, M&E, fisheries objectives, and adult management, to present during the Hatchery Committees meeting on November 19, 2014 (Item VI-A).*
  This will be discussed during today's meeting.

II. YN

A. Draft Upper Methow Spring Chinook Acclimation Proposal (Keely Murdoch)

Keely Murdoch said that Cory Kamphaus (YN) was not able to attend today's meeting; however, he will be attending tomorrow's Priest Rapids Coordinating Committee Hatchery Subcommittee (PRCC HSC) meeting. Murdoch said that she would still like to introduce the draft proposal today, and continue discussions tomorrow, as needed. She also asked that site-specific and permitting process questions be saved for Kamphaus to address during tomorrow's PRCC HSC meeting.

Murdoch reviewed the draft Upper Methow Spring Chinook Acclimation Proposal (Attachment B), which was distributed to the Hatchery Committees by Kristi Geris on November 17, 2014. Murdoch said that the draft proposal focuses on Goat Wall Pond; however, is not titled as such so as to not limit acclimation only to that location. She summarized that the YN is proposing to acclimate and release 25,000 spring Chinook at Goat Wall Acclimation Pond beginning in 2016. She reviewed the goals and objectives as described in Section 2.0 on page 3 of Attachment B, noting that Objective 4 will include monitoring activities such as smolt-to-adult ratios (SARs), in-pond survival, and release-to-McNary Dam survival rates, among other things. She noted that Table 4 on page 5 of Attachment B assumes no adult management. She further explained that Table 4 estimates expected adult returns and proportionate natural influence (PNI) using a retrospective analysis of SARs and natural-origin recruit (NOR) spawning escapement. She also noted that the percent hatchery-origin spawners (pHOS) goal is based on NOR run size, and that the green and red shading represent pHOS values consistent with and exceeding allowable values, respectively. She said that Table 4 indicates that 25,000 spring Chinook salmon released upstream alone is not enough to drive pHOS values above the draft NMFS targets; however, Table 4 also does not account for other fish on the spawning grounds. She said that Table 5 on page 6 of Attachment B is the same as Table 4, only Table 5 assumes that 43% of the release group returns to the hatchery. She said that 43% was determined based on the last 5-year report results of average stray rate for fish raised at Methow Fish Hatchery (FH) and short-term acclimated at the Chewuch Acclimation Facility. She said that this was the closest empirical value that she could find, and added that this value might be higher for fish releases at Goat Wall because fish pass directly by the hatchery ladder. She also added that if

Hatchery Committees members have other suggestions regarding how to analyze these data, the YN are open to suggestions.

Regarding the tendency for fish to home to their natal hatchery, Greg Mackey asked Matt Cooper about hatchery returns at Winthrop National Fish Hatchery (NFH). Cooper said that over the past few years, of the PIT-tagged Winthrop NFH origin adult spring Chinook salmon detected at Wells Dam, up to about 90% have been subsequently detected at the Spring Creek Pond (SCP) array, which is located in the Winthrop NFH back channel downstream of the hatchery ladder, and up to about 80% have been subsequently detected within the Winthrop NFH holding pond. He added that construction of the new adult holding ponds at Winthrop NFH in 2012 has improved the capture and removal of Winthrop NFH adults from the Methow River. *(Note: Cooper later clarified via email that subsequent detections at the SCP array and within the hatchery holding pond have ranged from 68 to 98% and 33 to 84%, respectively, from 2010 to 2013 covering a few years prior and post construction of the Winthrop NFH holding ponds.)* Mackey said achievement of pHOS targets may not be altered substantially unless the return rate from Goat Wall Pond is somewhat different than the hatchery returns.

Mackey said that another consideration is the potential tension between moving hatchery fish upstream, while also meeting pHOS metrics. He said that he is less concerned with pHOS in the aggregate of all spawning reaches, but that he is still concerned about where spawning occurs. Tom Kahler noted that Goat Wall Pond is in the upper Methow River above Weiman Bridge, which often goes dry, so fish will likely spawn below the bridge. Murdoch noted that spawners may access the area above the bridge before it goes dry.

Murdoch reviewed the proposed M&E activities as described in Section 5.0, starting on page 6 of Attachment B. She said that the proposed M&E activities largely rely on unique coded wire tags (CWTs), and also on data collected during spawning ground surveys. She noted that PIT-tagging will be funded by this project, including an on-station control group. She said that adaptive management is also planned as described in Section 6.0 on page 8 of Attachment B, and that the YN plan to provide annual reports to the Hatchery Committees summarizing annual activities and results.

Truscott raised additional questions and requested clarifications, as follows:

- **Section 1.0** (page 1): Truscott suggested omitting the reference to supporting treaty fishing rights, and just concentrate on benefits to Endangered Species Act-listed species recovery. Mackey added that this production is for conservation, so treaty fishing rights have no bearing. Murdoch agreed and said that she will remove the reference.
- **Section 1.2** (page 2): Truscott requested an explanation of the scientific background behind the third paragraph. Murdoch clarified that the third paragraph is not a statement of truth; rather, it explains what the YN would like to accomplish. Truscott indicated that he misinterpreted the paragraph.
- **Section 3.0** (page 3): Truscott suggested identifying which ponds would be used for acclimation. Murdoch said that the YN purposely wrote this section to be vague in order to avoid limiting which ponds may be considered; however, Early Winters Pond was included as an example.
- **Table 4** (page 5): Truscott asked if the basin-wide pHOS targets are based on total run escapement or abundance of NORs as outlined in the current permit. Murdoch clarified that those targets are based on NOR run size as outlined in the current permit. She added that Mackey also proposed an alternative approach for determining the targets, which may be incorporated. Truscott said that the 128 Methow NOR escapement for return-year 2006 seems inconsistent with the NOR target. Murdoch explained that Table 4 is an abbreviated version of a more detailed spreadsheet, which includes details such as Twisp and Chewuch escapement. She said that she can add those columns back into Table 4, which will better correlate the values in the table. Mike Tonseth suggested correcting the proportion of natural-origin fish in hatchery broodstock (pNOB) values so that other probabilities could be more accurately calculated. Mackey added that for most years, according to the table, PNI is high anyway (above 0.67). Tonseth suggested analyzing the 10-year pNOB for the program, but Murdoch said that will change because the program is smaller. Tonseth suggested estimating the average NOR contribution and proportionally comparing it to a hypothetical mean pNOB. Truscott also suggested using the years that NORs were collected at Wells Dam, and evaluating the NOR run size to obtain a capture efficiency, and then retrospectively applying the capture efficiency to determine how many NORs could have been collected.

Murdoch noted that the Bonneville Power Administration changed the name of this project to "Upper Columbia Spring Chinook and Steelhead Acclimation Project," which will be used now instead of "Expanded Acclimation." Mackey asked about the end date for this project, and Murdoch said that she is uncertain whether the project will be funded following the end of the Columbia River Fish Accords funding period in 2017.

Mackey noted that this proposal presents an opportunity for the Hatchery Committees to employ an adaptive management framework. He said that on a broader scale, the management goal is to utilize the best tools available, and know how they work in order to make sound decisions. He said that ideally, the more options ("tools") that are tested at once, the more opportunities there are to identify management strategies that are effective in a shorter period of time; however, with this proposal, there are only two options (i.e., Goat Wall and Methow FH) and considering additional management strategies may be helpful. He suggested clearly identifying the goal(s) for the two management options, and comparing the two on an equal basis as to their effectiveness in reaching the goal(s). He said that based on that evaluation, it can be determined which option works better (and should be implemented), and which is less successful (and should potentially be ended or modified).

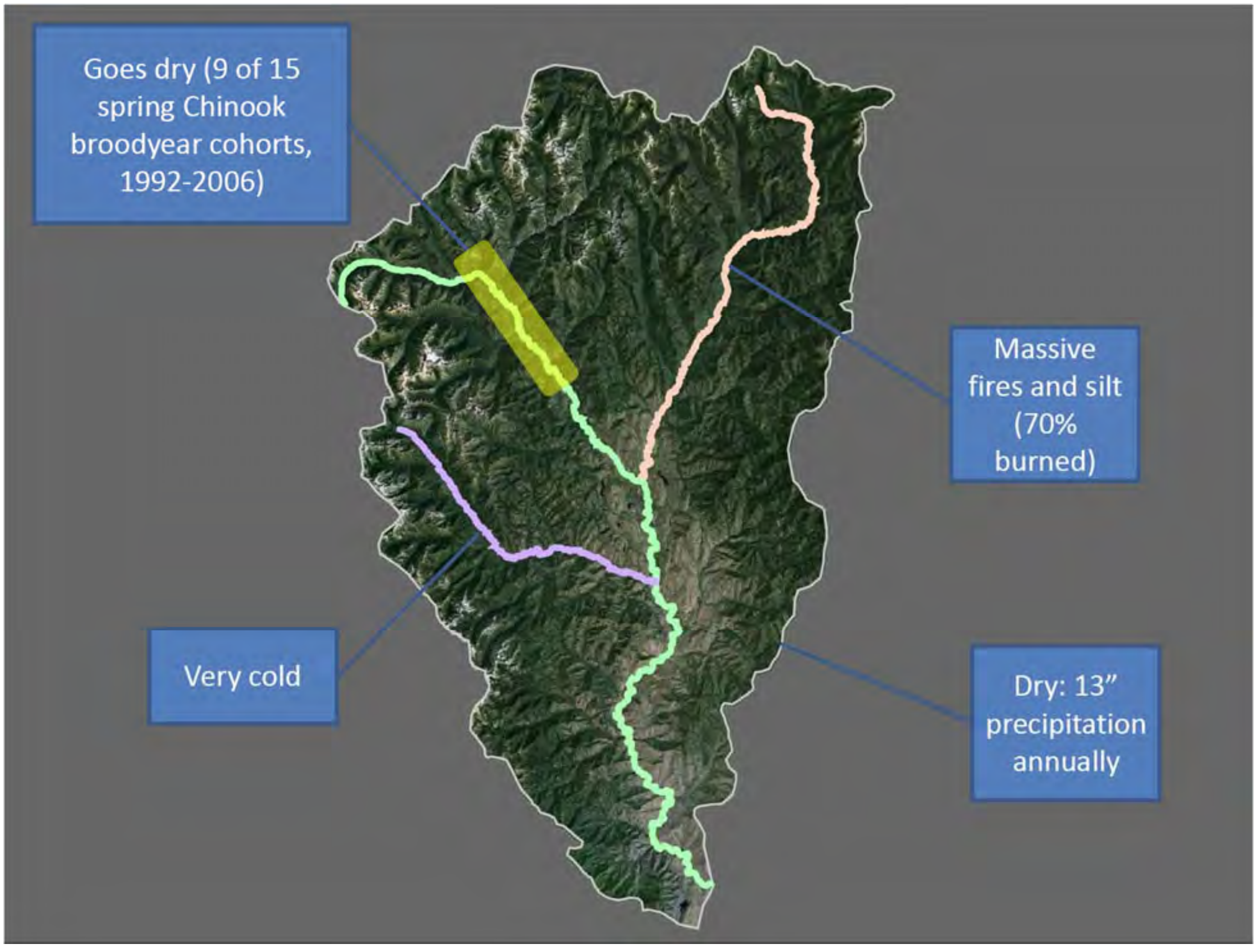
Mackey said that he incorporated these adaptive management ideas into the draft Upper Methow Spring Chinook Acclimation Proposal, and Geris distributed the edited draft proposal (Attachment C) to the Hatchery Committees prior to the meeting on November 19, 2014. Mackey recalled the adaptive management presentation that he provided to the Hatchery Committees about 2 years ago, and said that these same elements are included in the edited proposal. He recommended outlining everything in detail, as depicted in Attachment C and as described further below:

- **State goals:** state what is to be achieved so that it can be tested to determine whether it has been achieved
- **State management options**
- **State uncertain states of nature:** state what is unknown
- **Develop hypotheses:** for each management action *(note: "On-Station" = Methow FH in Attachment C*)

- **Implement the action:** it is important to define the years that actions will take place in order to run a power analysis (i.e., #7.g. in Attachment C); also, methods should be held as constant as possible (for all locations)
- **Develop response criteria for each individual hypothesis:** Certain response criteria may cancel each other out *(note: “<” = less than, and “<<” = dramatically less than in Attachment C)*
- **Conduct overall performance assessment**

Mackey reviewed the project timeframe, as depicted in a table on page 9 of Attachment C. He noted that 3-salt fish will return in 2023. Mike Schiewe asked, based on this table, if Mackey is suggesting a 5-year run before making a decision. Mackey replied that this is a difficult decision because the project is both a study and also a management action, but agreed that a 5 year release term seems reasonable but would need to be considered in the context of being able to detect a difference among treatments. Murdoch suggested that by 2020, although all of the adult return data will not yet be available, there may be some idea of a path forward based on juvenile data.

Mackey reviewed a graphic depicting the Methow Basin (see below). He said that the yellow shaded area is the area (approximately) that goes dry. He added that the area dried up in about 9 of the past 15 brood year cohorts; however, natural fish do use this area. Because fish, including spring Chinook salmon, commonly get stranded in this area, he questioned how many fish should purposely be put into this reach. Schiewe asked if this area drying up is a natural occurrence. Kahler said that it is natural, and explained that the area is a glacial valley where glacial outwash deposited about 200 to 400 feet deep upstream of a bedrock sill at Weeman Bridge. He added that the water goes subsurface where the outwash is deposited then resurfaces as it approaches the bedrock sill.



Mackey said that he would like to see an adaptive management framework incorporated into more management actions under the Hatchery Committees, and that this proposal is a good opportunity to start. Murdoch suggested incorporating the details in an appendix of this proposal.

Mackey asked if the carrying capacity of the area could be estimated based on recovery planning goals. Murdoch said that she had not considered recovery planning goals, but had checked with WDFW regarding whether they had created carrying capacity estimates; she said WDFW had not. She said that she also contacted Casey Baldwin (Colville Confederated Tribes [CCT]) regarding the Ecosystem Diagnosis and Treatment (EDT) work in the Methow Basin; however, Baldwin recommended not using those results because they are outdated and not appropriate for this purpose. Tonseth said that 2,000 fish is the interim recovery planning minimum target. Mackey asked about using results of redd surveys to apportion a carrying capacity or recovery target number to various parts of the basin. Tonseth cautioned about making assumptions that NOR females seek the highest quality habitat, and he said that there would likely be stratification. He noted, however, that results from the Wenatchee Relative Reproductive Success Study indicated that NOR female progeny move up into areas of higher quality habitat, and suggested using NOR females as a measure of what to expect as far as stratification in the basin.

Schiewe said that this discussion will continue during tomorrow's PRCC HSC meeting. He agreed with Mackey that this project seems to be a good opportunity to roll the proposed adaptive management framework into a program. He suggested, however, that while developing specific objectives is important, leaving some flexibility for those objectives that may not be initially considered is also important. He asked if the broodstock for this project have already been collected, and Tonseth replied that they have (currently eyed eggs). Schiewe asked if there were any time constraints with regard to this proposal. Mackey said that just the CWT tagging needed to be coordinated, and Tonseth confirmed that this was complete.

Murdoch said that the YN will provide a revised draft Upper Methow Spring Chinook Acclimation Proposal to Geris for distribution to the Hatchery Committees by December 3, 2014; the Hatchery Committees will submit suggested edits and comments on the revised draft proposal by December 17, 2014; and the YN will redistribute a final revised draft proposal to the Hatchery Committees at least 10 days prior to the Hatchery Committees meeting on January 21, 2015. *(Note: The YN provided a revised draft proposal to Geris on December 3, 2014, which she distributed to the Hatchery Committees that same day.)*

III. Douglas PUD and Chelan PUD

A. HCP Hatchery Committees Chair Position (Tom Kahler and Alene Underwood)

Tom Kahler said that since the last Hatchery Committees meeting on October 15, 2014, there have been two joint HCP Policy and Coordinating Committees meetings. He said that on November 6, 2014, the HCP Policy and Coordinating Committees identified which HCP signatory representatives would select the HCP Chairs for the Hatchery and Coordinating Committees. He said that Douglas PUD, Chelan PUD, NMFS, and the YN indicated that their HCP Policy Committees representatives will make their selection, and the CCT, USFWS, and WDFW indicated their HCP Coordinating Committees representatives will make their selection. Kahler said that the HCP Policy and Coordinating Committees also approved a ranking system for narrowing the HCP Chair candidate lists to a "short list" for interviews, which was modeled after the Douglas PUD Aquatic Settlement Work Group Chair selection process. Kahler further explained that each Party ranked the candidates first to last for filling the Chair positions, and submitted those rankings to Kristi Geris, whom compiled the lists to generate aggregate scores, with the lowest scores equaling the most preferred candidates.

Kahler said that the HCP Policy and Coordinating Committees met again on November 18, 2014, to review the combined rankings and identify candidates to interview for each Committee, and to also determine interview dates and process. Kahler said that for the Hatchery Committees, candidates selected for an interview include Ms. Elizabeth McManus (Ross Strategic), Dr. John Ferguson (Anchor QEA), and Mr. Tom Schadt (Anchor QEA). Kahler said that for the HCP Policy and Coordinating Committees, candidates selected for an interview include Dr. Tracy Hillman (BioAnalysts), Dr. John Ferguson (Anchor QEA), and Mr. Tom Schadt (Anchor QEA). Kahler said that this morning, prior to the meeting, he confirmed interviews with all candidates scheduled on December 17, 2014. Mike Tonseth asked if all six interviews will be conducted on December 17, 2014, and Kahler replied that they will. Kahler added that because Schadt and Ferguson will interview for both Committees, there will really only be four interviews, but two may last longer than the others. Kirk Truscott said that the HCP Policy and Coordinating Committees are still formulating interview questions, which are due December 2, 2014. Kahler added that the HCP Policy and Coordinating Committees will then meet again on December 3, 2014, to finalize the questions and discuss how the interviews will be conducted.

IV. Douglas PUD

A. Twisp River Juvenile Fish Assessment Update (Greg Mackey)

Greg Mackey said that during September and October 2014, Douglas PUD, in coordination with Charlie Snow (WDFW) and his WDFW crew, conducted pilot juvenile fish sampling in the Twisp River. He said that data are still being compiled, so no results are yet available. He said that the pilot effort involved electroshocking 50 randomly selected sites in the Twisp River. Most of the sites were done as single-pass sites, with six sites sampled as three-pass depletions. He said that sites in the Twisp were 100 meters long and sites in the tributaries were 50 meters long. He said that one purpose of this pilot effort was to determine what level of staffing is needed to effectively complete this type of sampling. The sampling was designed to yield two separate population estimates: one derived through expansion of fish densities to the entire Twisp basin, and the other based on a mark-recapture method. He said that the pilot effort utilized two 5-person crews—each crew consisted of 3 staff electrofishing and 2 staff with fish workup and tagging. He said that with two 5-person crews, sampling 50 sites required a little more than 1 week to complete. He said all spring Chinook and steelhead (*O. mykiss*) that were of adequate size to tag (greater than 65 millimeters) were PIT-tagged. About 1 week later, the sampling crews returned for a second round of sampling as the second "recapture" part of the mark-recapture estimate. The second round of sites was a separately chosen random set of sites. However, by chance, several sites overlapped with sites already sampled in the first round. He added that close to 50 sites were sampled during the second round of sampling. At this point he was uncertain exactly how many fish were PIT-tagged, although he said that about 2,900 PIT-tags were recorded in the reader files; but, these include some repeat hits.

Mackey said that these PIT-tagged fish will provide two different juvenile population estimates, estimates of survival to Rocky Reach Dam of emigrants, and based on an extrapolation for the survival model, an estimate of how many smolts left the system. He added that some hatchery-origin juvenile steelhead were also encountered, which can be used to estimate numbers of residual steelhead in the system, and several bull trout were also encountered. He said that regarding the bull trout encountered, Douglas PUD is coordinating with USFWS.

Mackey said that very few fish were actually in the middle of the Twisp River. He added that almost all fish were found in very shallow water among rocks and puddles on the side of the river or under woody debris; therefore, he concluded that snorkel surveying at that time of year would provide very inaccurate estimates. He said that Todd Pearsons (Grant PUD) indicated that he had observed this in other systems, as well. Kirk Truscott asked where the bull trout were encountered. Mackey replied that bull trout were encountered throughout the entire system; however, the vast majority were encountered upstream of the Mystery Campground area where the river is quite a bit smaller, with encounters very rare in the lower Twisp. He said that Douglas PUD will discuss this further with the Hatchery Committees as these data become available.

B. Draft Douglas PUD 2015 Hatchery M&E Implementation Plan (Greg Mackey)

Greg Mackey said that Kristi Geris sent an email to the Hatchery Committees on September 24, 2014, notifying them that the draft 2015 Douglas PUD Hatchery M&E Implementation Plan is available for download from the HCP Hatchery Committees Extranet Site. This draft report is available for a 60-day review period with comments due to Mackey no later than November 24, 2014. Mackey noted that the plan is similar to last year's.

V. USFWS

A. USFWS Bull Trout Consultation Update (Matt Cooper)

Matt Cooper said that Bill Gale indicated that he had no consultation updates to provide; however, if something comes up, he will notify the Hatchery Committees via email. Mike Tonseth noted during the NMFS/USFWS BiOp Coordination Meeting last week, USFWS committed to have a draft Wenatchee BiOp by the end of November 2014. Greg Mackey also noted that Amilee Wilson (NMFS) sent out the supplemental Environmental Assessment (EA) under the National Environmental Protection Act for Wells steelhead; however, that EA did not include the Okanogan.

VI. HCP Administration

A. Next Meetings

Mike Schiewe said that the HCP Policy and Coordinating Committees indicated that they had a challenging time setting dates for the HCP Chair interviews, and that the only date that would work is December 17, 2014, which is the next scheduled Hatchery Committees meeting. Schiewe said that he did not foresee any upcoming time-sensitive issues, and suggested canceling the meeting or convening by conference call, if needed. Hatchery Committees representatives present agreed to cancel the Hatchery Committees meeting scheduled for December 17, 2014, due to conflicting schedules and lack of agenda items.

The next scheduled Hatchery Committees meetings are on January 21, 2015 (Douglas PUD); February 18, 2015 (Chelan PUD); and March 18, 2015 (Douglas PUD).

List of Attachments

Attachment A	List of Attendees
Attachment B	Draft Upper Methow Spring Chinook Acclimation Proposal
Attachment C	Draft Upper Methow Spring Chinook Acclimation Proposal – Douglas PUD edits

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Alene Underwood*	Chelan PUD
Catherine Willard*	Chelan PUD
Greg Mackey*	Douglas PUD
Tom Kahler*	Douglas PUD
Todd Pearsons†	Grant PUD
Matt Cooper*	U.S. Fish and Wildlife Service
Mike Tonseth*	Washington Department of Fish and Wildlife
Jayson Wahls	Washington Department of Fish and Wildlife
Kirk Truscott*	Colville Confederated Tribes
Keely Murdoch*	Yakama Nation

Notes:

* Denotes Hatchery Committees member or alternate

† Joined by phone

Upper Methow Spring Chinook Acclimation Proposal

Upper Columbia Spring Chinook and Steelhead Acclimation Project (BPA Project #200900100)

13 November 2014

Prepared by Keely Murdoch, Yakama Nation Fisheries Resource Management
Prepared for the Wells Dam HCP Hatchery Committee and the PRCC Hatchery Sub-Committee

1.0 Background

1.1 YN's Expanded Acclimation Project

YN's Upper Columbia Spring Chinook and Steelhead Acclimation Project (formerly known as the Expanded Acclimation Project) is based on the premise that acclimating salmon and steelhead in a manner that mimics natural systems can increase the effectiveness of integrated (conservation) hatchery programs and can be used to improve the Viable Salmonid Population (VSP) status of ESA listed spring Chinook and steelhead.

The Columbia River Basin Fish Accords (MOA) recognize that hatchery actions can provide important benefits to ESA listed species and to the Tribes, supporting treaty fishing rights. This Project seeks to improve the efficacy of current supplementation programs by providing additional short-term acclimation sites with the purpose of improving the spawning distribution and/or homing fidelity, which may contribute to improved productivity and survival.

The concept of acclimating salmon smolts in 'natural' ponds has been thoroughly tested over the last decade as part of YN's coho restoration project in the Wenatchee and Methow Rivers. The coho restoration project has demonstrated both high survival rates (juvenile and adults) as well as adult returns with SARs comparable or higher than established supplementation programs in the Upper Columbia (YN 2010). More recently YN has demonstrated that the technique of short term acclimation and co-mingling species is a viable method of acclimating smolts (Kamphaus 2011). However adult return data (SARs, etc.) from the comingled releases are still being collected and are not yet available.

Beginning in 2014, as a result of the HCP No-Net-Impact (NNI) recalculation, smolt release numbers from most conservation hatchery programs in the Methow and Wenatchee basins will be significantly reduced. Because of this reduction, we believe it is crucially important that each program be operated in a manner which maximizes efficacy of the supplementation effort, which includes acclimating and release smolts in locations where they will return to high quality spawning and rearing habitat.

1.2 Methow Spring Chinook

Spring Chinook that are released from the Methow FH and WNFH have a spawning distribution significantly different than that of natural origin fish (Figure 1; Murdoch et al., 2011).

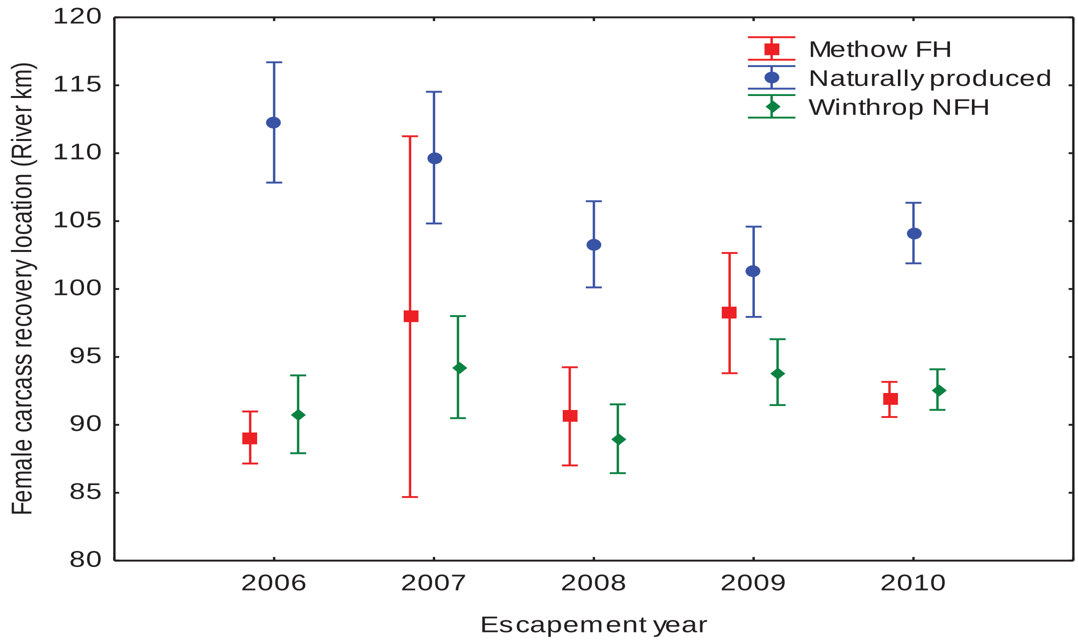


Figure 1. Mean spawner distribution based on carcass recovery of hatchery and natural origin spring Chinook in the Methow River (Murdoch et al., 2011)

The skewed spawning distribution along with high densities of hatchery fish may be a contributing factor to the low productivity observed in the Methow River. We believe that the difference in spawner distribution can be directly attributed to hatchery spring Chinook imprinting and homing to Winthrop NFH (Rkm 81) and Methow FH (Rkm 85) from which the fish are reared and released.

The fundamental assumption behind the theory of supplementation is that hatchery fish returning to the spawning grounds are 'reproductively similar' to naturally produced fish; inherent in the supplementation strategy is that hatchery and naturally produced fish are intended to spawn together and in similar locations. If supplemented fish are not fully integrated into the naturally produced spawning population, the goals of supplementation may not be achieved (Hays et al., 2007). For this reason Objective 5 within the Monitoring and Evaluation plan for PUD Hatchery Programs (Hillman et al., 2013) is focused on ensuring that hatchery and natural origin fish have equal run timing, spawn timing, and spawning distribution.

Despite reductions in release numbers of spring Chinook and steelhead from CCPUD, DCPUD, and GCPUD supplementation programs (in 2014), we have no reason to expect improvements in the distribution of hatchery origin spawners, only the number on the spawning grounds. We believe that if Objective 5 is not currently met (as is the case in the upper Methow River), it is unlikely that the future spawning distribution of hatchery fish will change unless changes to the acclimation release strategy are made.

2.0 Goals and Objectives

Upper Methow Project Goal: Use short term acclimation in natural pond(s) to encourage hatchery origin spring Chinook recruitment to habitat areas such that the distribution of hatchery and natural origin spring Chinook is equal.

Near-term Objectives:

1. To evaluate if spawner distribution of spring Chinook in the Methow Basin can be changed through short term spring acclimation
2. To evaluate what proportion of short term acclimated spring Chinook will still home back and return to the Methow Fish Hatchery (FH)
3. To determine appropriate numbers of hatchery spring Chinook to release in the upper Methow River to achieve PNI/PHOS goals.
4. To monitor project performance indicators and where appropriate, compare performance indicators to an on-station reference group.

3.0 Project Proposal

To encourage hatchery origin spring Chinook adults to distribute farther upstream, YN proposes to acclimate 25,000 Chinook pre-smolts from Methow Fish Hatchery at YN's Goat Wall acclimation site beginning in spring 2016. If other ponds in the upper Methow Basin become available, they too may be considered for acclimation (e.g. Early Winters Pond).

3.1 Goat Wall Acclimation Site

The Goat Wall acclimation site is accessed through privately owned property and consists of a watered slough located downstream from the Lost River. Water to the pond is supplied through a diversion on Gate Creek and through natural groundwater seepage (Cold Creek). A temporary seine net system would be used to contain hatchery spring Chinook during the acclimation period. The Lost River Rd provides access to the site and is plowed during the winter. The site has a capacity to hold up to 30,000 fish at 16 fish per pound at densities less than 0.06 lbs/cft/in

3.1.3 Fish Transportation Procedures

Spring Chinook pre-smolts would be transported in March (preferably by WDFW tanker truck) from Methow FH to the Goat Wall location. Current fish-transport procedures include crowding and loading into distribution trucks via a fish pump. Water will be tempered as appropriate. Fish are tempered to within 3°C of the receiving water prior to release. Loading densities may range from 0.3 to 0.5 pounds of fish per gallon of water.

3.1.4 Fish Condition, Growth, and Health Monitoring

A pre-transfer fish health examination will be conducted by WDFW fish health specialists. Once in the acclimation site, fish will be monitored daily by staff for signs of disease symptoms (lethargic behavior, skin coloration, visible lesions, caudal fungus, etc.) through visual observations, feeding behavior and monitoring of daily mortality trends. Additionally, staff will collect data from a random sample of approximately 100 fish on a weekly basis. Weekly sampling will include a general assessment of fish condition, stage of smoltification, fish length and fish weight so that growth rates and condition factors maybe be assessed. A fish health specialist will be contacted if any disease symptoms are noted. If required, YN staff under the direction of the fish health specialist will provide treatment for disease.

3.1.5 Release

Spring Chinook would be released as close as possible to the agreed upon size target (15 fpp). Targets are subject to change at the discretion of the HCP Hatchery Committees. Spring Chinook will be volitionally released from the acclimation site into the Methow River in mid-to-late April. Release typically occurs when > 90% of the acclimated group is displaying visual signs of smoltification (identified by transitional and/or smolt stage), target fpp is met and releasing into favorable river conditions (high water events).

4.0 Adult Return Rates and Adult Management

Historic adult return rates from the Methow Fish Hatchery can be found in Table 2 below.

Table 1. Brood year, number of smolts released, adult returns, and SAR (%) from the Chewuch Acclimation Pond 1992-2010 (data source: Snow et al. 2012).

Brood Year	Smolt Released	Adult Returns	SAR (%)
1993	210,849	192	0.091
1994	4,477	1	0.022
1995	28,878	122	0.422
1996	202,947	500	0.247
1997	332,484	821	0.247
1998	435,670	2,300	0.528
1999	180,775	145	0.080
2000	266,392	852	0.320
2001	130,787	508	0.388
2002	181,235	599	0.331
2003	48,831	57	0.117
2004	65,146	316	0.485
2005	156,633	328	0.209
2006	**211,717**	**1,714**	**0.810**
2007	**119,407**	**515**	**0.431**
Mean	**171,749**	**598**	**0.315**

Based on the mean SARs (%) from previous releases, we would expect an average of 78 adults to return to the Methow River from a release of 60,516 smolts (Table 3).

Table 2. Anticipated number of returning spring Chinook adults from a release size of 60,516 at the Chewuch Acclimation Pond.

Target Number of Smolts	Anticipated Number of Adults Returned		
	Maximum SAR	Mean SAR	Minimum SAR
Upper Methow: Goat Wall Pond (25,000)	203 (0.81%)	78 (0.35%)	5 (0.02%)

The historic SARs for hatchery fish (Table 2) along with historic estimates of natural origin spawners in the Methow River can be used to provide a retrospective analysis of what we may be able to expect for PNI and pHOS metrics given the release of 25,000 in the Upper Methow and assuming no adult removal. This retrospective analysis provides insight into what PNI values could be in the future (Table 4). Based on this analysis, it is clear that even in the absence of adult management, numbers of fish proposed for acclimation in the upper Methow alone will not result in exceedance of the sliding scale of allowable pHOS presented in the DRAFT Methow Spring Chinook Section 10 Permit (NMFS, In Prep). However, it is unrealistic to expect that fish released as part of this project would be the only fish on the spawning grounds. Similarly, it is also unrealistic to expect that spring Chinook released from this project would not be attracted back to the Methow FH and would not be removed in adult management activities.

Table 3. Forecast of adult returns and PNI using a retrospective analysis of SARs and NOR spawning escapement. This analysis assumes ALL returning hatchery fish spawn in the Methow River and are NOT removed during adult management activities.

Return Year	Methow NOR Escapement	Hatchery SAR[a]	Hypothetical Hatchery Return	Hypothetical Proportion of Run		Target Basin-wide PHOS[b]	PNI (pNOB = 1)
				Hatchery	Natural		
2000	611	.0025	62	0.09	0.91	0.20	0.92
2001	594	.0028	71	0.11	0.89	0.10	0.90
2002	86	.0053	132	0.61	0.39	0.40	0.62
2003	8	.0008	20	0.71	0.29	Anything	0.58
2004	199	.0032	80	0.29	0.71	0.40	0.78
2005	221	.0039	97	0.31	0.69	0.30	0.77
2006	128	.0033	83	0.39	0.61	0.40	0.72
2007	152	.0012	30	0.16	0.84	Anything	0.86
2008	172	.0049	121	0.41	0.59	Anything	0.71
2009	261	.0021	52	0.17	0.83	0.30	0.85
2010	290	.0081	203	0.41	0.59	0.30	0.71
2011	432	.0032	29	0.15	0.85	Anything	0.87
Mean	**262**	**.0035**	**88**	**0.32**	**0.68**		**0.77**

a. For the purposes of this exercise hatchery SARs were matched with return year NORs based on a 4-year age class return

b. Green shading represents pHOS values with those allowed in the Draft Methow Spring Chinook BiOp. Red shading represents pHOS values exceeding those allowed in the Draft Methow Spring Chinook BiOp.

Data from spring Chinook reared at the Methow FH and short term acclimated in the Chewuch Acclimation Pond (AP) indicates that on average 43% will 'stray' back to the Methow River (Murdoch et al., 2011), presumably due to attraction back to the Methow FH where they were reared. In some years this figure has been as high as 88%. Table 5 presents the same data as Table 5 but assumes that 43% of the spring Chinook acclimated at the goat wall pond will be attracted back to the Methow FH and removed from the spawning population during adult management activities.

Table 5. Forecast of adult returns and PNI using a retrospective analysis of SARs and NOR spawning escapement. This analysis assumes 57% of returning hatchery fish spawn in the Methow River and 43% are removed during adult management activities.

Return Year	Methow NOR Escap.	Hatchery SAR[a]	Hypothetical Hatchery Return	% HORs removed at MFH	Hypothetical HORS to spawn	Hypothetical Proportion of Run		Target Basin-wide PHOS[b]	PNI (pNOB = 1)
						Hatchery	Natural		
2000	611	.0025	62	43%	27	0.04	0.91	0.20	0.96
2001	594	.0028	71	43%	31	0.05	0.89	0.10	0.95
2002	86	.0053	132	43%	57	0.40	0.39	0.40	0.72
2003	8	.0008	20	43%	9	0.52	0.29	Anything	0.66
2004	199	.0032	80	43%	34	0.15	0.71	0.40	0.87
2005	221	.0039	97	43%	42	0.16	0.69	0.30	0.86
2006	128	.0033	83	43%	36	0.22	0.61	0.40	0.82
2007	152	.0012	30	43%	13	0.08	0.84	Anything	0.93
2008	172	.0049	121	43%	52	0.23	0.59	Anything	0.81
2009	261	.0021	52	43%	22	0.08	0.83	0.30	0.93
2010	290	.0081	203	43%	87	0.23	0.59	0.30	0.81
2011	432	.0032	29	43%	12	0.03	0.85	Anything	0.97
Mean	**262**	**.0035**	**88**		**35**	**0.18**	**0.68**		**0.86**

Based on the analysis presented in Table 5, we expect an acclimated release of 25,000 spring Chinook smolts from Goat Wall to result in an increase of spring Chinook using habitat areas in the upper Methow while making anticipated pHOS and/or PNI targets achievable.

5.0 Monitoring and Evaluation

Being able to address near term objectives described in Section 2.0 is key to being able to adaptively manage the program, and to better understand what appropriate release numbers in the Upper Methow will be.

Objective 1: To evaluate if the spawning distribution of spring Chinook in the Methow Basin can be changed through short term spring acclimation

To accomplish Objective 1, all spring Chinook acclimated and released from Goat Wall will be marked with a unique CWT. Methods for collecting spawner location data based on carcass recovery and analytical details can be found in the Monitoring and Evaluation Plan for PUD Hatchery Programs: 2013 Update (Hillman et al., 2013). All spawning ground, carcass recovery data and CWT extraction and reading will be completed by WDFW during implementation of the PUDs regular M&E activities (Objective 5 in Hillman et al., 2013). Objective 2: To evaluate what proportion of short term acclimated spring Chinook will still home back to Methow Fish Hatchery

As described above all spring Chinook acclimated at Goat Wall will be marked with a unique CWT tag. CWT recovery necessary to meet objective 2 will occur at Methow FH by WDFW during spawning and adult management activities as normal to meet reporting and M&E objectives described in Hillman et al 2013.

Objective 3: To determine appropriate numbers of hatchery spring Chinook to release in the upper Methow based upon PNI/PHOS goals.

Currently, spring Chinook carrying capacity estimates do not exist (either empirical or modeled) for spring Chinook in the upper Methow (A. Murdoch, WDFW, pers. Comm.; Casey Baldwin, CCT, pers. comm.) In the absences of a capacity estimate to base spawner escapement goals from and ultimately gauge reach specific release numbers, YN's Upper Columbia Spring Chinook and Steelhead Acclimation Project focus on release numbers which will not exceed will look pHOS/PNI guidelines currently included in the Methow spring Chinook DRAFT section-10 permit (NMFS, In Prep). Any changes in permit requirements when the final section-10 permit becomes available will be incorporated into this proposal. The modeling presented in Table 5 (Section 4.0 above) illustrates that a release of 25,000 spring Chinook in the upper Methow is unlikely to pose a risk to permit requirements. Nonetheless, since this release will receive a unique CWT, contribution of this release towards pHOS in the Methow Basin will be evaluated.

Objective 4: To monitor project performance indicators and where appropriate, compare performance indicators to an on-station reference group.

Fish Condition and Growth

To monitor fish growth, condition and stage of smoltification a random sample of 100 smolts will be sampled weekly. Weekly sampling will include a general assessment of fish condition, visual assessment of smoltification, fish length and fish weight so that growth rates and condition factors may be assessed.

Release Monitoring and In-Pond Survival

Up to 7,000 spring Chinook within the site will be PIT tagged by YN. YN will design and install a PIT tag detection system at the sloughs' outlet to determine out-migration timing as well as produce an estimate of in-pond survival (following the volitional release and downstream migration). Additionally, daily predator observations will be recorded so that YN can respond in real-time to increased predation.

Tagging-to-McNary and Release-to-McNary survival rates. Tagging-to-McNary and Release-to-McNary survival rates will also be measured using PIT tag detection. Survival estimates for both tagging and release will use Cormack-Jolly-Seber estimates with associated standard errors for both survival and detection probabilities (Columbia River DART). These survival rates will be compared to like metrics from the Methow FH on-station release.

Smolt-to-Adult survival

Smolt-to-Adult Return (SAR) rates will be calculated using the unique CWT for each acclimated release. SARs are typically reported in the PUD annual M&E report. SARs for the acclimated release can be compared to the on-station release by brood year.

6.0 Summary and Adaptive Management

It is clear that for a supplementation program to be effective hatchery origin fish must spawn with natural origin fish and have access to available spawning habitat. Concrete-to-concrete hatchery management at best is unlikely to result in a supplementation program which will be effective in increasing the abundance of natural origin fish. At worst, a concrete-to-concrete hatchery program using natural origin broodstock may mine the natural origin component of the population. Acclimating fish in the natural environment, rather than releasing them from a hatchery, is one way to encourage fish to access available habitats alongside the natural origin returns. However, there are unknowns that need to be addressed to better understand the extent to which we can improve hatchery spawner distribution and how best to integrate hatchery spawners within the current management paradigm which requires extensive adult management. This acclimation proposal sets forth a frame work to test some of these uncertainties while actively managing adult returns on the spawning grounds.

7.0 Literature Cited.

Hays, S., T. Hillman, T. Kahler, R. Langshaw, B. Lenz, A. Murdoch, K. Murdoch, and C. Peven. 2007. Analytical Framework for Monitoring and Evaluating PUD Hatchery Programs. *Prepared for:* Habitat Conservation Plans Hatchery Committees.

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Hillman, T., T. Kahler, G. Mackey, J. Murauskas, A. Murdoch, K. Murdoch, T. Pearsons, and M. Tonseth. 2013. Monitoring and Evaluation Plan for PUD Hatchery Programs: 2013 Update. *Prepared for:* HCP and PRCC Hatchery Committees.

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Upper Methow Spring Chinook Acclimation Proposal

Upper Columbia Spring Chinook and Steelhead Acclimation Project (BPA Project #200900100)

13 November 2014

Prepared by Keely Murdoch, Yakama Nation Fisheries Resource Management
Prepared for the Wells Dam HCP Hatchery Committee and the PRCC Hatchery Sub-Committee

1.0 Background

1.1 YN's Expanded Acclimation Project

YN's Upper Columbia Spring Chinook and Steelhead Acclimation Project (formerly known as the Expanded Acclimation Project) is based on the premise that acclimating salmon and steelhead in a manner that mimics natural systems can increase the effectiveness of integrated (conservation) hatchery programs and can be used to improve the Viable Salmonid Population (VSP) status of ESA listed spring Chinook and steelhead.

The Columbia River Basin Fish Accords (MOA) recognize that hatchery actions can provide important benefits to ESA listed species and to the Tribes, supporting treaty fishing rights. This Project seeks to improve the efficacy of current supplementation programs by providing additional short-term acclimation sites with the purpose of improving the spawning distribution and/or homing fidelity of hatchery fish, which may contribute to improved productivity and survival.

The concept of acclimating salmon smolts in 'natural' ponds has been thoroughly tested over the last decade as part of YN's coho restoration project in the Wenatchee and Methow Rivers. The coho restoration project has demonstrated both high survival rates (juvenile and adults) as well as adult returns with SARs comparable or higher than established supplementation programs in the Upper Columbia (YN 2010). More recently YN has demonstrated that the technique of short term acclimation and co-mingling species is a viable method of acclimating smolts (Kamphaus 2011). However adult return data (SARs, etc.) from the comingled releases are still being collected and are not yet available.

Beginning in 2014, as a result of the HCP No-Net-Impact (NNI) recalculation, smolt release numbers from most conservation hatchery programs in the Methow and Wenatchee basins will be significantly reduced.   Because of this reduction, we believe it is crucially important that each program be operated in a manner which maximizes efficacy of the supplementation effort, which includes acclimating and release smolts in locations where they will return to high quality spawning and rearing habitat.

1.2 Methow Spring Chinook

Spring Chinook that are released from the Methow FH and WNFH have a spawning distribution significantly different than that of natural origin fish (Figure 1; Murdoch et al., 2011).

Commented [GM1]: This is an inappropriate analysis. As we have pointed out before, using a measure of central tendency is not an appropriate method of analysis for these data. I don't disagree with the goals of acclimation, but using this analysis is not informative and is misleading.

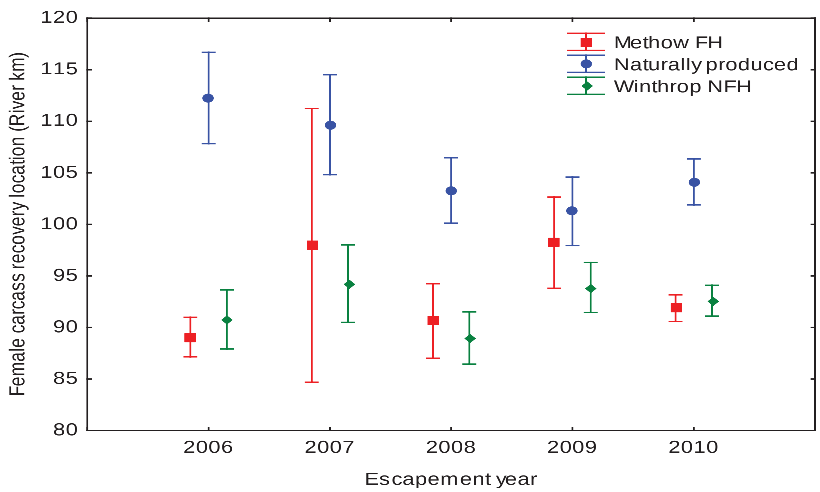

Figure 1. Mean spawner distribution based on carcass recovery of hatchery and natural origin spring Chinook in the Methow River (Murdoch et al., 2011)

The skewed spawning distribution along with high densities of hatchery fish may be a contributing factor to the low productivity observed in the Methow River. We believe that the difference in spawner distribution can be directly attributed to hatchery spring Chinook imprinting and homing to Winthrop NFH (Rkm 81) and Methow FH (Rkm 85) from which the fish are reared and released.

Commented [GM2]: This is true, but the real question is: How many end up in the target reaches? The skewed distribution is not necessarily a problem and could be a benefit in keeping the numbers of hatchery fish in the upper reaches at more appropriate levels.

The fundamental assumption behind the theory of supplementation is that hatchery fish returning to the spawning grounds are 'reproductively similar' to naturally produced fish; inherent in the supplementation strategy is that hatchery and naturally produced fish are intended to spawn together and in similar locations. If supplemented fish are not fully integrated into the naturally produced spawning population, the goals of supplementation may not be achieved (Hays et al., 2007). For this reason Objective 5 within the Monitoring and Evaluation plan for PUD Hatchery Programs (Hillman et al., 2013) is focused on ensuring that hatchery and natural origin fish have similar run timing, spawn timing, and spawning distribution.

Deleted: equal

Despite reductions in release numbers of spring Chinook and steelhead from CCPUD, DCPUD, and GCPUD supplementation programs (in 2014), we have no reason to expect improvements in the distribution of hatchery origin spawners, only the number on the spawning grounds. We believe that if Objective 5 is not currently met (as is the case in the upper Methow River), it is unlikely that the future spawning distribution of hatchery fish will change unless changes to the acclimation release strategy are made.

2.0 Goals and Objectives

Commented [GM3]: Let's set this up a bit more explicitly under an adaptive management framework

Upper Methow Project Goal: Use short term acclimation in natural pond(s) to encourage hatchery origin spring Chinook recruitment to habitat areas such that the distribution of hatchery and natural origin spring Chinook is equal.

Near-term Objectives:

1. To evaluate if spawner distribution of spring Chinook in the Methow Basin can be changed through short term spring acclimation
2. To evaluate what proportion of short term acclimated spring Chinook will still home back and return to the Methow Fish Hatchery (FH)
3. To determine appropriate numbers of hatchery spring Chinook to release in the upper Methow River to achieve PNI and/or pHOS goals.
4. To monitor project performance indicators and where appropriate, compare performance indicators to an on-station reference group.

Adaptive Management Framework

1. Management Context: Spring Chinook are produced under the Wells HCP and Priest Rapids Settlement Agreement at Methow Hatchery to be released in the Methow River. Annually, up to ~134,000 fish total are available for the Methow River releases.
2. Goal: Rebuild and Recover Methow Spring Chinook (Wells HCP)
3. Management Objectives for the Methow River:
    a. Achieve spawning escapement numbers for each reach of the Methow (aggregate numbers of spawners that are spatially informative can be applied).
        i. Need to establish escapement goals for reaches.
    b. Meet pHOS target for each reach (an aggregate pHOS that is spatially informative can be applied).
        i. Need to establish proportion of hatchery spawners to wild spawners
    c. Maximize freshwater productivity of spring Chinook in the Methow River
4. Management Options:
    a. Release fish from Methow Hatchery (on-station release)
    b. Release fish from Goat Wall Pond (remote acclimation site)
    c. Drop plant fish in the Goat Wall Pond reach(es)
5. Uncertain states of nature:

a. Carrying capacity of spring chinook in the Methow River is uncertain, but there are existing estimates and methods to estimate carrying capacity.
    i. Spawning habitat limited? If the Methow River is spawning limited, increasing the number of spawners above the spawning capacity is unlikely to increase freshwater production.
    ii. Rearing habitat limited? If Methow River is rearing limited, how many spawners (I.e., females) are needed to fully see the habitat?
    iii. Reproductive effectiveness of hatchery fish relative to wild fish. If the reproductive effectiveness of hatchery fish is different from wild fish, then the number of hatchery spawners must be adjusted accordingly.
    iv. Genetic risk of hatchery fish crossing with wild fish. How many hatchery fish crossing wild fish pose a significant genetic risk?
    v. Risk of reducing the opportunity for wild x wild crosses in nature. Higher ratios of hatchery:wild spawners reduces the probability of wild x wild spawning events.
    vi. Homing and straying: Fish attempt to home to their natal location using cues acquired during egg-fry period imprinting, parr movements imprinting, smolt imprinting. The influence of each of these periods on where fish home specifically in the Methow River is uncertain.
    vii. Stochastic processes – notably, river runs dry from the Lost River area downstream 10-15 miles in some years during spawning and incubation periods. Fish homing to these reaches are likely to be more prone to reproductive failure on some years than fish homing to other reaches that remain watered in dry years.

6. Management Options Hypotheses:
    a. Pre-Release Survival
        i. Goat Wall = On-Station
        ii. Goat Wall < On-Station
        iii. Goat Wall > On-Station
    b. Post-Release Survival to Rocky reach
        i. Goat Wall = On-Station
        ii. Goat Wall < On-Station
        iii. Goat Wall > On-Station
    c. Post-Release Survival to Returning Adult
        i. Goat Wall = On-Station
        ii. Goat Wall < On-Station
        iii. Goat Wall > On-Station
    d. Return Rate to Goat Wall target reaches (target reach/straying)
        i. Goat Wall = On-Station
        ii. Goat Wall < On-Station
        iii. Goat Wall > On-Station

e. Achieve Hatchery Origin Female Spawner Escapement Target Numbers to Goat Wall reaches
    i. Goat Wall = Target
    ii. Goat Wall < Target
    iii. Goat Wall > Target
    iv. On-Station = Target
    v. On-Station < Target
    vi. On-Station > Target
f. Achieve Hatchery Origin Male Spawner Escapement Target Numbers to Goat Wall reaches
    i. Goat Wall = Target
    ii. Goat Wall < Target
    iii. Goat Wall > Target
    iv. On-Station = Target
    v. On-Station < Target
    vi. On-Station > Target
g. Overall Return Performance: P(Pre-Release Survival) * P(Post-Release Survival) * P(returning to target reach)
    i. Goat Wall = On-Station
    ii. Goat Wall < On-Station
    iii. Goat Wall > On-Station
h. Likelihood of contributing to recovery
    i. Increase in fry production -Not assessed under this plan
    ii. Increase in parr production -Not assessed under this plan
    iii. Increase in smolt production -Not assessed under this plan
    iv. Increase in wild adult returns -Not assessed under this plan

7. Implement Action (need a power analysis still)
    a. Acclimate and release 25,000 Methow Hatchery smolts in Goat Wall pond (approximately March-April)
    b. Acclimate and release 109,000 Methow Hatchery smolts at Methow Hatchery Pond 13 (April release).
    c. All Goat Wall fish will carry a CWT code specific to the release site and release year.
    d. All Methow Hatchery fish will carry a CWT code(s) specific to the release site and release year.
    e. Goat Wall fish will be marked with 7,000 PIT tags
    f. Methow Hatchery fish will be marked with 7,000 PIT tags
    g. Acclimation will take place in spring 2016, 2017, 2018, 2019, 2020.
    h. Acclimation numbers and methods will be held constant except to correct obvious in-pond survival issues. Need escape clause here or elsewhere…

i. Assessments will be performed on an annual basis, but full assessment of the project will take place after all adult returns have been assessed.
j. The program may be terminated as determined by the Hatchery Committee.

8. Evaluation

Response criteria by individual hypothesis.

Hypothesis	Result	Response
Pre-Release Survival	= On-Station	Continue Acclimation
Pre-Release Survival	< On-Station	Assess and change practices if needed
Pre-Release Survival	<< On-Station	Discontinue acclimation or change practices
Pre-Release Survival	> On-Station	Continue Acclimation
Pre-Release Survival	>> On-Station	Continue Acclimation; consider expanding
Survival to Rocky Reach	= On-Station	Continue Acclimation
Survival to Rocky Reach	< On-Station	Assess and change practices if needed
Survival to Rocky Reach	<< On-Station	Discontinue acclimation or change practices
Survival to Rocky Reach	> On-Station	Continue Acclimation
Survival to Rocky Reach	>> On-Station	Continue Acclimation; consider expanding
Survival to Returning Adult	= On-Station	Continue Acclimation
Survival to Returning Adult	< On-Station	Assess and change practices if needed
Survival to Returning Adult	<< On-Station	Discontinue acclimation or change practices
Survival to Returning Adult	> On-Station	Continue Acclimation
Survival to Returning Adult	>> On-Station	Continue Acclimation; consider expanding
Return Rate to Target Reach	= On-Station	Continue Acclimation
Return Rate to Target Reach	< On-Station	Assess and change practices if needed
Return Rate to Target Reach	<< On-Station	Discontinue acclimation or change practices
Return Rate to Target Reach	> On-Station	Continue Acclimation
Return Rate to Target Reach	>> On-Station	Continue Acclimation; consider expanding
H Female Spawners	= Target	Continue Acclimation
H Female Spawners	< Target	Assess and change practices if needed
H Female Spawners	<< Target	Discontinue acclimation or change practices
H Female Spawners	> Target	Continue Acclimation; consider reducing release numbers
H Female Spawners	>> Target	Reduce release numbers
H Male Spawners	= Target	Continue Acclimation
H Male Spawners	< Target	Assess and change practices if needed
H Male Spawners	<< Target	Assess and change practices if needed
H Male Spawners	> Target	Continue Acclimation; consider reducing release numbers
H Male Spawners	>> Target	Reduce release numbers; change rearing practice
Overall Return Performance	= On-Station	Continue Acclimation
Overall Return Performance	< On-Station	Assess and change practices if needed
Overall Return Performance	<< On-Station	Discontinue acclimation
Overall Return Performance	> On-Station	Continue Acclimation
Overall Return Performance	>> On-Station	Continue Acclimation; consider expanding

Attachment C

Response criteria integrated across three critical hypotheses

Pre-Release Survival	Post-Release Survival	H Females to Target Reach	Response
=	=	=	Continue remote acclimation.
=	<	=	Continue remote acclimation; assess if SAR can be improved
=	>	=	Continue remote acclimation; assess if homing to target reaches can be improved
=	=	<	Assess if homing can be improved. Discontinue if homing cannot be improved.
=	=	>	Continue remote acclimation. Consider expanding remote acclimation if freshwater productivity warrants it.
=	>	>	Continue remote acclimation. Consider expanding remote acclimation if freshwater productivity warrants it.
=	>	<	Continue remote acclimation; assess if homing to target reaches can be improved
=	<	<	Discontinue remote acclimation unless SAR and homing can be improved
=	<	>	Continue remote acclimation; assess if SAR can be improved
<	=	=	Continue remote acclimation; assess if in-pond survival can be improved
<	<	=	Continue remote acclimation; assess if in-pond survival and SAR can be improved
<	>	=	Continue remote acclimation; assess if in-pond survival and homing can be improved
<	=	<	Discontinue remote acclimation unless in-pond survival and homing can be improved
<	=	>	Continue remote acclimation; assess if in-pond survival can be improved
<	>	>	Continue remote acclimation; assess if in-pond survival can be improved
<	>	<	Discontinue remote acclimation unless in-pond survival and homing can be improved
<	<	<	Discontinue remote acclimation
<	<	>	Discontinue remote acclimation unless in-pond survival and homing can be improved
>	=	=	Continue remote acclimation; assess if in-pond survival and SAR can be improved
>	<	=	Continue remote acclimation; assess if SAR can be improved
>	>	=	Continue remote acclimation; assess if homing can be improved
>	=	<	Discontinue remote acclimation unless homing can be improved
>	=	>	Continue remote acclimation. Consider expanding remote acclimation if freshwater productivity warrants it.
>	>	>	Continue remote acclimation. Consider expanding remote acclimation if freshwater productivity warrants it.
>	>	<	Discontinue remote acclimation unless homing can be improved
>	<	<	Discontinue remote acclimation unless SAR and homing can be improved
>	<	>	Continue remote acclimation, assess if SAR can be improved

Overall Performance Assessment

$P_{(\text{Pre-Release Survival})} = P_1$

$P_{(\text{Post-Release Survival})} = P_2$

$P_{(\text{returning to target reach})} = P_3$

Overall Performance = $P_1 * P_2 * P_3 = O_i$

If: $O_{\text{Goat Wall}} = O_{\text{On-Station}}$ then continue remote acclimation

$O_{\text{Goat Wall}} > O_{\text{On-Station}}$ then continue remote acclimation

$O_{\text{Goat Wall}} < O_{\text{On-Station}}$ then discontinue remote acclimation

Additional factors to consider:

1. Use data to assess pHOS and PNI and to estimate release numbers needed for seeding and pHOS.
2. Assess ability of capturing hatchery fish for broodstock and adult management.
3. Assess the spatial distributions of Goat Wall and On-Station releases toward optimizing spatial distribution of hatchery spawners.

3.0 Project Proposal

To encourage hatchery origin spring Chinook adults to distribute farther upstream, YN proposes to acclimate 25,000 Chinook pre-smolts from Methow Fish Hatchery at YN's Goat Wall acclimation site beginning in spring 2016. If other ponds in the upper Methow Basin become available, they too may be considered for acclimation (e.g. Early Winters Pond).

Project Timeframe

Release would occur in 2015-2019. In-pond and in-hatchery assessment would also occur in those years. Field assessment would occur in 2016-2023.

	1	2	3	4	5	6	7	8
	2016	2017	2018	2019	2020	2021	2022	2023
Release	25,000	25,000	25,000	25,000	25,000			
1-Salt Adults								
2-Salt Adults								
3-Salt Adults								

3.1 Goat Wall Acclimation Site

The Goat Wall acclimation site is accessed through privately owned property and consists of a watered slough located downstream from the Lost River. Water to the pond is supplied through a diversion on Gate Creek and through natural groundwater seepage (Cold Creek). A temporary seine net system would be used to contain hatchery spring Chinook during the acclimation period. The Lost River Rd provides access to the site and is plowed during the winter. The site has a capacity to hold up to 30,000 fish at 16 fish per pound at densities less than 0.06 lbs/cft/in

3.1.3 Fish Transportation Procedures

Spring Chinook pre-smolts would be transported in March (preferably by WDFW tanker truck) from Methow FH to the Goat Wall location. Current fish-transport procedures include crowding and loading into distribution trucks via a fish pump. Water will be tempered as appropriate. Fish are tempered to within 3°C of the receiving water prior to release. Loading densities may range from 0.3 to 0.5 pounds of fish per gallon of water.

3.1.4 Fish Condition, Growth, and Health Monitoring

A pre-transfer fish health examination will be conducted by WDFW fish health specialists. Once in the acclimation site, fish will be monitored daily by staff for signs of disease symptoms (lethargic behavior, skin coloration, visible lesions, caudal fungus, etc.) through visual observations, feeding behavior and monitoring of daily mortality trends. Additionally, staff will collect data from a random sample of approximately 100 fish on a weekly basis. Weekly sampling will include a general assessment of fish condition, stage of smoltification, fish length and fish weight so that growth rates and condition factors maybe be assessed. A fish health specialist will be contacted if any disease symptoms are noted. If required, YN staff under the direction of the fish health specialist will provide treatment for disease.

3.1.5 Release

Spring Chinook would be released as close as possible to the agreed upon size target (15 fpp). Targets are subject to change at the discretion of the HCP Hatchery Committees. Spring Chinook will be volitionally released from the acclimation site into the Methow River in mid-to-late April. Release typically occurs when > 90% of the acclimated group is displaying visual signs of smoltification (identified by transitional and/or smolt stage), target fpp is met and releasing into favorable river conditions (high water events).

4.0 Adult Return Rates and Adult Management

Historic adult return rates from the Methow Fish Hatchery can be found in Table 2 below.

Table 1. Brood year, number of smolts released, adult returns, and SAR (%) from the Chewuch Acclimation Pond 1992-2010 (data source: Snow et al. 2012).

Brood Year	Smolt Released	Adult Returns	SAR (%)
1993	210,849	192	0.091
1994	4,477	1	0.022
1995	28,878	122	0.422

1996	202,947	500	0.247
1997	332,484	821	0.247
1998	435,670	2,300	0.528
1999	180,775	145	0.080
2000	266,392	852	0.320
2001	130,787	508	0.388
2002	181,235	599	0.331
2003	48,831	57	0.117
2004	65,146	316	0.485
2005	156,633	328	0.209
2006	**211,717**	**1,714**	**0.810**
2007	**119,407**	**515**	**0.431**
Mean	**171,749**	**598**	**0.315**

Based on the mean SARs (%) from previous releases, we would expect an average of 78 adults to return to the Methow River from a release of 60,516 smolts (Table 3).

Table 2. Anticipated number of returning spring Chinook adults from a release size of 60,516 at the Chewuch Acclimation Pond.

Target Number of Smolts	**Anticipated Number of Adults Returned**		
	Maximum SAR	**Mean SAR**	**Minimum SAR**
Upper Methow: Goat Wall Pond (25,000)	203 (0.81%)	78 (0.35%)	5 (0.02%)

The historic SARs for hatchery fish (Table 2) along with historic estimates of natural origin spawners in the Methow River can be used to provide a retrospective analysis of what we may be able to expect for PNI and pHOS metrics given the release of 25,000 in the Upper Methow and assuming no adult removal. This retrospective analysis provides insight into what PNI values could be in the future (Table 4). Based on this analysis, it is clear that even in the absence of adult management, numbers of fish proposed for acclimation in the upper Methow alone will not result in exceedance of the sliding scale of allowable pHOS presented in the DRAFT Methow Spring Chinook Section 10 Permit (NMFS, In Prep). However, it is unrealistic to expect that fish released as part of this project would be the only fish on the spawning grounds. Similarly, it is also unrealistic to expect that spring Chinook released from this project would not be attracted back to the Methow FH and would not be removed in adult management activities.

Table 3. Forecast of adult returns and PNI using a retrospective analysis of SARs and NOR spawning escapement. This analysis assumes ALL returning hatchery fish spawn in the Methow River and are NOT removed during adult management activities.

Return Year	**Methow NOR Escapement**	**Hatchery SAR[a]**	**Hypothetical Hatchery Return**	**Hypothetical Proportion of Run**		**Target Basin-wide PHOS[b]**	**PNI (pNOB = 1)**
				Hatchery	**Natural**		

2000	611	.0025	62	0.09	0.91	0.20	0.92
2001	594	.0028	71	0.11	0.89	0.10	0.90
2002	86	.0053	132	0.61	0.39	0.40	0.62
2003	8	.0008	20	0.71	0.29	Anything	0.58
2004	199	.0032	80	0.29	0.71	0.40	0.78
2005	221	.0039	97	0.31	0.69	0.30	0.77
2006	128	.0033	83	0.39	0.61	0.40	0.72
2007	152	.0012	30	0.16	0.84	Anything	0.86
2008	172	.0049	121	0.41	0.59	Anything	0.71
2009	261	.0021	52	0.17	0.83	0.30	0.85
2010	290	.0081	203	0.41	0.59	0.30	0.71
2011	432	.0032	29	0.15	0.85	Anything	0.87
Mean	**262**	**.0035**	**88**	**0.32**	**0.68**		**0.77**

a. For the purposes of this exercise hatchery SARs were matched with return year NORs based on a 4-year age class return

b. Green shading represents pHOS values with those allowed in the Draft Methow Spring Chinook BiOp. Red shading represents pHOS values exceeding those allowed in the Draft Methow Spring Chinook BiOp.

Data from spring Chinook reared at the Methow FH and short term acclimated in the Chewuch Acclimation Pond (AP) indicates that on average 43% will 'stray' back to the Methow River (Murdoch et al., 2011), presumably due to attraction back to the Methow FH where they were reared. In some years this figure has been as high as 88%. Table 5 presents the same data as Table 5 but assumes that 43% of the spring Chinook acclimated at the Goat Wall pond will be attracted back to the Methow FH and removed from the spawning population during adult management activities.

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Table 5. Forecast of adult returns and PNI using a retrospective analysis of SARs and NOR spawning escapement. This analysis assumes 57% of returning hatchery fish spawn in the Methow River and 43% are removed during adult management activities.

Return Year	Methow NOR Escap.	Hatchery SAR[a]	Hypothetical Hatchery Return	% HORs removed at MFH	Hypothetical HORS to spawn	Hypothetical Proportion of Run		Target Basin-wide PHOS[b]	PNI (pNOB = 1)
						Hatchery	Natural		
2000	611	.0025	62	43%	27	0.04	0.91	0.20	0.96
2001	594	.0028	71	43%	31	0.05	0.89	0.10	0.95
2002	86	.0053	132	43%	57	0.40	0.39	0.40	0.72
2003	8	.0008	20	43%	9	0.52	0.29	Anything	0.66
2004	199	.0032	80	43%	34	0.15	0.71	0.40	0.87
2005	221	.0039	97	43%	42	0.16	0.69	0.30	0.86
2006	128	.0033	83	43%	36	0.22	0.61	0.40	0.82
2007	152	.0012	30	43%	13	0.08	0.84	Anything	0.93
2008	172	.0049	121	43%	52	0.23	0.59	Anything	0.81
2009	261	.0021	52	43%	22	0.08	0.83	0.30	0.93
2010	290	.0081	203	43%	87	0.23	0.59	0.30	0.81
2011	432	.0032	29	43%	12	0.03	0.85	Anything	0.97
Mean	**262**	**.0035**	**88**		**35**	**0.18**	**0.68**		**0.86**

Based on the analysis presented in Table 5, we expect an acclimated release of 25,000 spring Chinook smolts from Goat Wall to result in an increase of spring Chinook using habitat areas in the upper Methow while making anticipated pHOS and/or PNI targets achievable.

5.0 Monitoring and Evaluation

Being able to address near term objectives described in Section 2.0 is key to being able to adaptively manage the program, and to better understand what appropriate release numbers in the Upper Methow will be.

Objective 1: To evaluate if the spawning distribution of spring Chinook in the Methow Basin can be changed through short term spring acclimation

To accomplish Objective 1, all spring Chinook acclimated and released from Goat Wall will be marked with a unique CWT. Methods for collecting spawner location data based on carcass recovery and analytical details can be found in the Monitoring and Evaluation Plan for PUD Hatchery Programs: 2013 Update (Hillman et al., 2013). All spawning ground, carcass recovery data and CWT extraction and reading will be completed by WDFW during implementation of the PUDs regular M&E activities (Objective 5 in Hillman et al., 2013). Objective 2: To evaluate what proportion of short term acclimated spring Chinook will still home back to Methow Fish Hatchery

As described above all spring Chinook acclimated at Goat Wall will be marked with a unique CWT tag. CWT recovery necessary to meet objective 2 will occur at Methow FH by WDFW during spawning and adult management activities as normal to meet reporting and M&E objectives described in Hillman et al 2013.

Objective 3: To determine appropriate numbers of hatchery spring Chinook to release in the upper Methow based upon PNI/PHOS goals.

Currently, spring Chinook carrying capacity estimates do not exist (either empirical or modeled) for spring Chinook in the upper Methow (A. Murdoch, WDFW, pers. Comm.; Casey Baldwin, CCT, pers. comm.) In the absences of a capacity estimate to base spawner escapement goals from and ultimately gauge reach specific release numbers, YN's Upper Columbia Spring Chinook and Steelhead Acclimation Project focus on release numbers which will not exceed will look pHOS/PNI guidelines currently included in the Methow spring Chinook DRAFT section-10 permit (NMFS, In Prep). Any changes in permit requirements when the final section-10 permit becomes available will be incorporated into this proposal. The modeling presented in Table 5 (Section 4.0 above) illustrates that a release of 25,000 spring Chinook in the upper Methow is unlikely to pose a risk to permit requirements. Nonetheless, since this release will receive a unique CWT, contribution of this release towards pHOS in the Methow Basin will be evaluated.

Objective 4: To monitor project performance indicators and where appropriate, compare performance indicators to an on-station reference group.

Fish Condition and Growth

To monitor fish growth, condition and stage of smoltification a random sample of 100 smolts will be sampled weekly. Weekly sampling will include a general assessment of fish condition, visual assessment of smoltification, fish length and fish weight so that growth rates and condition factors may be assessed.

Release Monitoring and In-Pond Survival

Up to 7,000 spring Chinook within the site will be PIT tagged by YN. YN will design and install a PIT tag detection system at the sloughs' outlet to determine out-migration timing as well as produce an estimate of in-pond survival (following the volitional release and downstream migration). Additionally, daily predator observations will be recorded so that YN can respond in real-time to increased predation.

Tagging-to-McNary and Release-to-McNary survival rates. Tagging-to-McNary and Release-to-McNary survival rates will also be measured using PIT tag detection. Survival estimates for both tagging and release will use Cormack-Jolly-Seber estimates with associated standard errors for both survival and detection probabilities (Columbia River DART). These survival rates will be compared to like metrics from the Methow FH on-station release.

Smolt-to-Adult survival

Smolt-to-Adult Return (SAR) rates will be calculated using the unique CWT for each acclimated release. SARs are typically reported in the PUD annual M&E report. SARs for the acclimated release can be compared to the on-station release by brood year.

6.0 Summary and Adaptive Management

It is clear that for a supplementation program to be effective hatchery origin fish must spawn with natural origin fish and have access to available spawning habitat. Concrete-to-concrete hatchery management at best is unlikely to result in a supplementation program which will be effective in increasing the abundance of natural origin fish. At worst, a concrete-to-concrete hatchery program using natural origin broodstock may mine the natural origin component of the population. Acclimating fish in the natural environment, rather than releasing them from a hatchery, is one way to encourage fish to access available habitats alongside the natural origin returns. However, there are unknowns that need to be addressed to better understand the extent to which we can improve hatchery spawner distribution and how best to integrate hatchery spawners within the current management paradigm which requires extensive adult management. This acclimation proposal sets forth a frame work to test some of these uncertainties while actively managing adult returns on the spawning grounds.

7.0 Literature Cited.

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APPENDIX C
HABITAT CONSERVATION PLAN
TRIBUTARY COMMITTEES
2014 MEETING MINUTES

Wells, Rocky Reach, and Rock Island HCP
Tributary Committees Notes
9 January 2014

Members Present: Dale Bambrick (NOAA Fisheries), Lee Carlson (Yakama Nation), Jeremy Cram (WDFW), Chris Fisher (Colville Tribes), Steve Hays (Chelan PUD), Tom Kahler (Douglas PUD), Kate Terrell (USFWS), and Tracy Hillman (Committees Chair).

Others Present: Becky Gallaher (Tributary Project Coordinator), Justin Yeager (NOAA Fisheries), and Jeff Osborn (Chelan PUD).

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met in the Chelan PUD First Floor Conference Room in Wenatchee, Washington, on Thursday, 9 January 2014 from 10:00 am to 12:15 pm.

Dale Bambrick introduced Justin Yeager, who may replace Dale on the Committees if Dale finds that his workload will not allow him to participate on the Tributary Committees in the future.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting and the Committees adopted the proposed agenda.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 15 November 2013 meeting notes with edits from Chris Fisher.

III. Monthly Update on Ongoing Projects

Becky Gallaher gave an update on funded projects. Most are progressing well or had no salient activity in the past month.

- Nason Creek Upper White Pine Reconnection – Chelan PUD Powerline Reconnection Alternatives Analysis – The sponsor (Chelan County Natural Resources Department; CCNRD) did not provide an update on the project. Jeff Osborn noted that CCNRD will be meeting with Bonneville Power Administration (BPA) to review the letter of agreement from Chelan PUD to move power lines and to ensure that the project is feasible.
- Chewuch River Instream Passage Project – The project is complete and the sponsor (Trout Unlimited) will submit a final report soon.
- Nutrient Enhancement Assessment Project – The sponsor (Cascade Columbia Fisheries Enhancement Group; CCFEG) noted that Ecology has postponed their decision to grant the Administrative Order for the nutrient work in the Chiwawa River basin until January or February. If they receive the permit, they may acquire up to 50,000 lbs of analogs at no cost through the RFEG/WDFW surplus hatchery salmon contract. If they receive these analogs, the costs will drop significantly ($70,000/year) for the Chiwawa nutrient enhancement project.
- Large Wood Atonement Project – The sponsor (CCFEG) held a conference call on 9 December with the U.S. Fish and Wildlife Service, Natural Systems Design (engineering firm), and Gravity

Environmental to discuss logistics and timing for summer 2014 construction. The project is moving forward with construction this summer.

- Nason Creek Lower White Pine Alcove Acquisition Project – This project is complete and the Rocky Reach Tributary Committee received a final report from the sponsor (Chelan-Douglas Land Trust). The sponsor noted that the primary challenge with this project was coordination among the landowners. They thanked the Committee for their contribution to the project and their willingness to increase the grant to meet a higher valuation on one of the properties.
- Silver Protection Project – The sponsor (WDFW) provided no update on the project. Kate Terrell said that the project is moving forward. She noted that discussions are taking place that will try to keep the uplands in the tax base.
- Coulter Creek Barrier Replacement Project – The project sponsor (CCNRD) provided no update on this project.
- Wenatchee Levee Removal and Riparian Restoration Project – The project sponsor (CCNRD) noted that they began the cultural resource process for the riparian restoration portion of the project. A Centennial Grant funds the cultural resource investigation and is the source of funds for riparian restoration. Kate Terrell asked why the sponsor did not complete the cultural resource investigation (SHiPO 106) earlier (before removing the levee). Following the meeting, Becky Gallaher shared Kate's question with the project sponsor. CCNRD responded that because they did not disturb the original ground surface during the removal of the levee, they did not need to do a cultural resources investigation for this portion of the project. They stated that the material removed was fill material, which was less than 50 years old, and the ground surface was not disturbed. Therefore, they believe they did not need a cultural resources survey for the levee removal portion of the project.
- Upper Beaver Habitat Improvement Channel Restoration Project – The project sponsor (Methow Salmon Recovery Foundation; MSRF) coordinated the removal of the pre-project fish screen and infrastructure from the decommissioned section of the Batie Ditch. They re-purposed the fish screen paddle wheel and associated bits to the new facility. They left the measuring weir and screen box at the site for the WDFW screen shop to salvage at their convenience. MSRF has been monitoring icing at the new diversion and throughout the reconstructed channel on a weekly basis. As the ice breaks up, the creek will likely scour and mobilize material from both the floodplain and constructed channel. MSRF provided the Rocky Reach and Wells Tributary Committees with a description of the work accomplished, challenges, and photos of the project site.
- Lower Foster Creek Steelhead Habitat Enhancement Project – Becky Gallaher said that Jason Lundgren (CCFEG) spoke with Foster Creek Conservation District regarding this project. Apparently, the Conservation District Board has concerns working on federal property and they do not believe there is enough money in the budget to do the design/build project. CCFEG indicated that they would like to take on the project if they have enough resources. The Wells Committee directed Tracy Hillman to send a letter to the Conservation District indicating that the Committee will not enter into a contract with the District on this project.
- Twisp River-Poorman Creek Wetland Habitat Acquisition – The Sponsor (MSRF) submitted a proposed budget amendment to the Wells Tributary Committee. **The Committee reviewed the budget amendment request and concluded that they cannot approve a budget amendment for a project that has changed significantly from its original scope**. The Committee originally agreed to help fund an acquisition project, which has since merged with another project and morphed into a conservation easement. The budget modification indicated that $54,350 would be used to purchase irrigation efficiencies. This money was to be used to help purchase the property.

Not only is this a large departure from the original use of the money, but there was no information provided that allows the Committees to evaluate costs and benefits of the irrigation efficiencies. In addition, the Committee noticed that the cost of the conservation easement ($313,650) is greater than the value of the acquisition. There was no explanation of why this was so. Finally, it does not appear that the Committee's appraiser was used to determine the value of the conservation easement. Although most of the cost of the conservation easement was covered by RCO, it appeared that the modified budget was requesting Wells Plan Species Account funds to help cover the costs of transaction fees and professional services associated with the appraisal. The Committee indicated that they would not approve these budget items, because their appraiser was not used to evaluate the value of the easements. Because the project has changed significantly and is no longer an acquisition project, which the Committee agreed to help fund, the Wells Committee elected to terminate the Twisp River-Poorman Creek Wetland Habitat Acquisition Project. However, the Committee indicated that they would review a new proposal seeking money to help fund habitat enhancements on the properties. In this case, the sponsor may submit the proposal out of phase of the annual General Salmon Habitat Program funding cycle.

- Shingle Creek Fish Passage Project – Chris Fisher reported that there were some issues with coordination between the Okanagan Nation Alliance (ONA) and the contractor (Westhills) that delayed the project. He indicated that the dam will be removed and a series of vortex weirs will be installed to stabilize the channel and to create a series of riffles. The engineer may need to re-stake the locations for the vortex weirs. Construction work is scheduled to begin during summer 2014. Re-vegetation work will occur during autumn 2014.
- Methow/Chewuch Shallow Groundwater Monitoring Project – Water-level logger data collected during the pump test was processed and has been sent to Gina McCoy (WDFW) for analysis. Water-level loggers continue to collect data.
- Silver Side Channel Design Project – The project sponsor (CCFEG) collaborated with the USFWS and WDFW in the development of a Request for Proposals (RFP) for engineering. The RFP was sent to eight firms on 23 December 2013.
- Twisp to Carlton Reach Assessment Project – The project sponsor (CCFEG) continues to coordinate with the Bureau of Reclamation on data collection and the development of an RFP. The sponsor expects to send out the RFP this week.

IV. Review of Policies and Procedures Documents

Tracy Hillman asked if the Committees had any changes or edits to the Policies and Procedures for Funding Projects and the Tributary Committee Operating Procedures documents. After reviewing the documents, members had no changes to the Policies and Procedures or the Operating Procedures. However, they did discuss the option of opening the General Salmon Habitat Program (GSHP) to receive proposals at any time. Currently, the schedule for the GSHP is coordinated with the Salmon Recovery Funding Board (SRFB) process. Thus, GSHP pre-proposals are received in early May and final proposals are received in late June. The proposed change would allow project sponsors to submit GSHP proposals at any time during the year. The Committees would continue to coordinate with the SRFB process because sponsors often include Plan Species Account Funds as cost shares in SRFB proposals. The Committees directed Tracy Hillman to provide the Committees with draft language to the Policies and Procedures document for their review during the February meeting.

V. Decision Items Approved in December

Tracy Hillman indicated that because the Committees reviewed several decision items in December but did not meet formally in December, he would review those decision items so they are captured in meeting notes.

Wenatchee Levee Removal and Riparian Restoration Budget Amendment

In November, the Rock Island Tributary Committee received a budget amendment request from Chelan County Natural Resources Department on the *Wenatchee Levee Removal and Riparian Restoration Project*. The sponsor requested that $7,000 be moved from contract labor to sponsor salaries and benefits. The Committee was unable to approve the amendment request at that time because the Committee needed more information on why additional funds are needed for sponsor salaries and benefits. Following the November meeting, the sponsor informed the Committee that the additional funds were needed to help navigate the Water Conservancy Board process and to insure the landowner can replace any potential lost water from another source. After consideration, **the Rock Island Tributary Committee denied the budget amendment**. The Committee believed the landowner should be working with an expert in water law to inform the decision. The Committee was also concerned that the purpose of further investigation is to avoid the water owner from relinquishing any portion of his existing water right. One of the reasons the Committee funds conversion from inefficient gravity systems to more efficient well systems is to free up water to benefit fish. In this case, it appeared the landowner intended to retain ownership of water previously lost to conveyance.

Methow/Chewuch Groundwater Monitoring Scope Change and Budget Amendment

In November, the Wells Tributary Committee received a scope change and budget amendment request from the Cascade Columbia Fisheries Enhancement Group on the *Methow/Chewuch Shallow Groundwater Monitoring Project*. The sponsor would like to conduct a pump-drawdown test in two or three locations to measure groundwater quantity and recharge on the Burns-Garrity property. Because excavation of the test pits will require the presence of an archeologist, the sponsor would like to move $1,000 from contract labor to professional services. In November, the Committee was unable to approve the scope change and budget amendment because the Committee needed more information on the pump rate (gpm). After the sponsor provided additional information, **the Wells Tributary Committee approved the scope change and budget modification**.

Silver Protection Project Time Extension

In December, the Rocky Reach and Wells Tributary Committees received a contract extension request from WDFW on the *Silver Protection Project*. The contracts are scheduled to end on 31 December 2013. The sponsor requested that the contracts be extended to 31 December 2014. The sponsor would like additional time to explore opportunities related to ensuring the permanent preservation and enhancement of salmonid habitat on the properties. **The Rocky Reach and Wells Tributary Committees approved the contract extensions.**

Nason Creek UWP Floodplain Reconnection - PUD Powerline Reconnection Alternatives Analysis Time Extension and Scope Change

In December, the Rock Island Tributary Committee received a contract extension and scope change request from Chelan County NRD on the *Nason Creek UWP Floodplain Reconnection - PUD Powerline Reconnection Alternatives Analysis Project*. They would like to add additional tasks given that Chelan PUD supports moving the powerlines. Specifically, the sponsor would like the consultant to identify pole locations and heights of structures, provide drawings detailing typical structure geometry, provide preliminary drawings detailing expected clearing requirements, and provide preliminary plans and drawings. In addition, because the current contract will expire on 31 December 2013, they would like to extend the contract to 31 April 2014. **The Rock Island Tributary Committee approved the contract extension and scope change.**

Chewuch River Permanent Instream Flow Project Budget Amendment

In December, the Rocky Reach Tributary Committee received a budget amendment request from Trout Unlimited for the *Chewuch River Permanent Instream Flow Project*. The sponsor asked to move

$1,838.71 from "Indirect/Overhead/Administration" to "Contract Labor" because of an accounting error. **The Rocky Reach Tributary Committee approved the budget amendment.**

Mission Creek Fish Passage Project Time Extension

In December, the Rock Island Tributary Committee received a time extension request from Cascade Conservation District on the *Mission Creek Fish Passage Project*. This project was originally scheduled to be completed in 2012. However, because of fires in the Mission Creek watershed during 2012, the sponsor asked for an extension. The Committee agreed to extend the contract to 31 December 2013. Since then, the sponsor has been unable to secure the necessary permits for the project. Therefore, they requested that the contract be extended to 31 December 2014, which will give them additional time to secure the permits and complete the project. **The Rock Island Tributary Committee approved the contract extension.**

VI. Wells HCP Action Plan for 2014

Tom Kahler provided the Committees with the Draft Wells HCP Tributary Committee Action Plan for 2014. The 2014 Draft Action Plan for the Wells Tributary Committee is as follows:

Plan Species Account Annual Contribution

- $176,178 in 1998 dollars: January 2014

Annual Report – Plan Species Account Status

- Draft to Tributary Committee (TC): January 2014
- Approval Deadline: February 2014
- Period Covered: January to December 2013

2014 Funding-Round: General Salmon Habitat Program

- Request for Project Pre-proposals *To be determined* (March)
- Pre-proposal to TC *To be determined* (early May)
- Tours of Proposed Projects *To be determined* (late May)
- Project Sponsor Presentations to TC *To be determined* (early June)
- Final Project Proposals to TC *To be determined* (late June)
- RTT Project Rating Decision *To be determined* (early July)
- Supplemental Sponsor Presentations *To be determined*
- TC Final Funding Decisions *To be determined* (before Dec.)

Small Projects Program

- Project Review and Funding Decision January – December 2014

The Wells Tributary Committee approved the Wells Action Plan for 2014. The Committees will review the Rocky Reach and Rock Island 2014 Draft Action Plans in February.

VII. Information Updates

The following information updates were provided during the meeting.

1. Approved Payment Requests in December and January:

Rock Island Plan Species Account:

- $600.40 to Chelan PUD for Rock Island Tributary Committee administration and coordination during the fourth quarter of 2013.
- $72.50 to Clifton Larson Allen for financial management of the Rock Island Account.
- $653.20 to Cascade Columbia Fisheries Enhancement Group for the Wenatchee Nutrient Assessment Project.
- $2,267.83 to Cascade Columbia Fisheries Enhancement Group for the Twisp to Carlton Reach Assessment Project.

Rocky Reach Plan Species Account:

- $439.51 to Chelan PUD for Rocky Reach Tributary Committee administration and coordination during the fourth quarter of 2013.
- $72.50 to Clifton Larson Allen for financial management of the Rocky Reach Account.
- $57,240.11 to Trout Unlimited – Washington Water Project for the Chewuch River Instream Flow Project.
- $79,313.01 to Trout Unlimited – Washington Water Project for the Chewuch River Instream Flow Project.
- $5,185.53 to Cascade Columbia Fisheries Enhancement Group for the Silver Side Channel Design Project.
- $2,221.37 to the Chelan-Douglas Land Trust for the Nason Creek Lower White Pine Alcover Acquisition.

Wells Plan Species Account:

- $623.46 to Chelan PUD for Wells Tributary Committee administration and coordination during the fourth quarter of 2013.
- $15,396.39 to Trout Unlimited – Washington Water Project for the Twisp River Well Conversion Project.
- $621.71 to the Methow Conservancy for the Chewuch Beaver Restoration Project.
- $190.49 to the Methow Salmon Recovery Foundation for the Twisp River-Poorman Creek Wetland Habitat Acquisition Project.
- $132.14 to Cascade Columbia Fisheries Enhancement Group for the Methow/Chewuch Shallow Groundwater Project.

2. Tracy Hillman reported that he and Becky Gallaher completed Section 2.6 (Tributary Committees and Plan Species Accounts) for the Annual Report of Activities under the Anadromous Fish Agreement and Habitat Conservation Plan for each hydroelectric project. Members of the Committees should soon receive the draft reports for their review. The final reports will be submitted to the Federal Energy Regulatory Commission in April.
3. Tracy Hillman said that the Tributary Committees will continue to meet on the second Thursday of each month in 2014. Those meeting dates are as follows:

- Jan. 9
- Feb 13
- Mar 13
- Jul 10
- Aug 14
- Sep 11

- Apr 10
- May 8
- Jun 12
- Oct 9
- Nov 13
- Dec 11

4. Tracy Hillman reported that funds will be deposited into each of the Plan Species Accounts at the end of January. The amounts deposited will be about $680,000 into the Rock Island Account, about $330,000 into the Rocky Reach Account, and about $255,000 into the Wells. Exact amounts deposited into each account will be provided during the February meeting.
5. The Committees discussed the outcome from the recent meeting of the Okanogan County Commissioners with project sponsors. The Commissioners asked sponsors to address three questions: (1) When is enough, enough? (2) How do you measure success? and (3) What data are being used for restoration, what baseline is being used to get the rivers back to what state? Committee members who attended the meeting indicated that the meeting was useful, but there were some short comings. Overall, they agreed that the meeting was a step in the right direction and that the Commissioners should better understand the importance of habitat restoration to fish and to the local economies.

VIII. Next Steps

The next meeting of the Tributary Committees will be on Thursday, 13 February 2014 at Chelan PUD in Wenatchee.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Notes 13 February 2014

Members Present: Dale Bambrick (NOAA Fisheries), Lee Carlson (Yakama Nation), Jeremy Cram (WDFW), Chris Fisher (Colville Tribes), Steve Hays (Chelan PUD), Tom Kahler (Douglas PUD), and Tracy Hillman (Committees Chair).

Members Absent: Kate Terrell (USFWS).[1]

Others Present: Becky Gallaher (Tributary Project Coordinator), Justin Yeager (NOAA Fisheries), Jeff Osborn (Chelan PUD), Dave Duvall (Grant PUD), and Denny Rohr (PRCC Habitat Subcommittee Chair).

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met in the Chelan PUD Auditorium in Wenatchee, Washington, on Thursday, 13 February 2014 from 10:00 am to 12:00 pm.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting and the Committees adopted the proposed agenda.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 9 January 2014 meeting notes.

III. Monthly Update on Ongoing Projects

Becky Gallaher gave an update on funded projects. Most are progressing well or had no salient activity in the past month.

- Nason Creek Upper White Pine Reconnection – No new update.
- Mission Creek Fish Passage – No new update.
- Chewuch River Instream Passage Project – The project is complete and the sponsor (Trout Unlimited) will submit a final report soon.
- Nutrient Enhancement Assessment Project – Ecology has still not issued the administrative order for the Chiwawa nutrient enhancement work. However, there should be a recommendation by 13 February 2014. The recommendation will then be forwarded to the Program Management Team for a meeting on 18 March. If all goes well, a decision should be made by 25 March.
- Large Wood Atonement Project – The Sponsor (Cascade Columbia Fisheries Enhancement Group; CCFEG) and the U.S. Fish and Wildlife Service have held two conference calls with the engineering firm (Natural System Design) and the contractor (Gravity Environmental). The team is confident the approach will work. Preliminary designs should be completed by the end of February and permits will be submitted by 14 February 2014.

[1] Kate provided her vote on decision items before and after the meeting.

- Silver Protection Project – The Sponsor (WDFW) is soliciting bids for an appraisal for an 81.19-acre conservation easement (CE) on a portion of the Hill property (Silver Side Channel). The CE will ensure the option to implement habitat restoration.
- Coulter Creek Barrier Replacement Project – The project sponsor (CCNRD) provided no update on this project.
- Wenatchee Levee Removal and Riparian Restoration Project – The project sponsor (Chelan County Natural Resources Department; CCNRD) asked the Rock Island Tributary Committee if they would suspend indefinitely the Wenatchee Levee Removal and Riparian Restoration Project (see Attachment 1). Because the sponsor completed the removal of the levee, which was the primary intent of the project, the Committee elected to close the project rather than suspend the contract indefinitely. If the landowner decides to convert to an irrigation well, which will improve stream flows, then the sponsor can submit a new proposal for Committee review.
- Upper Beaver Habitat Improvement Channel Restoration Project – The project sponsor (Methow Salmon Recovery Foundation; MSRF) continued to monitor icing at the new diversion and throughout the reconstructed channel on a weekly basis. Additional monitoring was implemented along the constructed berms, and upstream and downstream from the diversion to document encroachment of ice.
- Lower Foster Creek Steelhead Habitat Enhancement Project – In January, the Wells Committee sent the Foster Creek Conservation District a letter stating that they will not enter into a contract with the District on this project. CCFEG indicated that they would like to take on the project if they have enough resources.
- Twisp River-Poorman Creek Wetland Habitat Acquisition – During the January meeting, the Wells Committee agreed to rescind the grant funding for this project because the scope had changed dramatically. The Committee invited the Sponsor (MSRF) to submit a new proposal with a revised scope of work. The sponsor indicated that they would submit the application during the 2014 SRFB/Tributary Committees funding round.
- Shingle Creek Fish Passage Project – Chris Fisher reported that the contractor (Westhills) has completed the staging of materials onsite. The engineer is on his way to the project site to make sure the contractor has staged the right materials. Construction is scheduled to begin mid-July. Re-vegetation work will occur during autumn 2014.
- Methow/Chewuch Shallow Groundwater Monitoring Project – Pressure transducers continue to record data. Results from the pump test at Burns-Garrity will be sent to the Committee soon.
- MVID Instream Flow Improvement Project – The Tributary/Sponsor Agreement is ready to be signed. Dale Bambrick and Chris Fisher noted that the Bureau of Reclamation is now involved with the design and the cost of the project has increased to about 16-18 million dollars. Dale noted that the project will not happen if the cost exceeds about 10 million dollars.
- Silver Side Channel Design Project – CCFEG (sponsor), USFWS, and WDFW are working together to select an engineering firm. They have tentatively decided on a firm, but will hold off on selecting the firm until they complete a follow-up interview.
- Twisp to Carlton Reach Assessment Project – The project sponsor (CCFEG) coordinated with the U.S. Bureau of Reclamation and the Upper Columbia Salmon Recovery Board on the RFP for conducting the reach assessment. The RFP was sent to several firms in early February.
- Similkameen RM 3.8 Project – No new update.

- Entiat Stillwaters Gray Reach Acquisition – Appraisals have been ordered for all four parcels; Bockhoven (north), Bockhoven (south), Crone, and Price. The Tributary/Sponsor Agreement is ready for signature.

IV. Review of Policies and Procedures Documents

During the last meeting, the Committees directed Tracy Hillman to provide draft language to the Policies and Procedures document for their review. The purpose of the draft language is to open the General Salmon Habitat Program (GSHP) to receive proposals at any time during the year. Currently, the schedule for the GSHP is coordinated with the Salmon Recovery Funding Board (SRFB) process. That is, GSHP draft proposals are received in early May and final proposals are received in late June. The proposed change would allow project sponsors to submit GSHP proposals at any time during the year. Tracy modified language in Sections 3.4 (The General Salmon Habitat Program), 5.1 (Draft Proposal Review), and 5.3 (Final Review). The Committees approved the edits and recommended that Tracy add additional language that indicates that the Committees will accept the Salmon Recovery Funding Board application for projects where Plan Species Account Funds are included as cost shares in SRFB proposals. For proposals submitted outside the SRFB process, project sponsors will use the Committees' GSHP application. The Committees directed Tracy and Becky to inform project sponsors of the new policy.

V. Rocky Reach and Rock Island HCP Action Plans for 2014

Becky Gallaher provided the Committees with the Draft Rocky Reach and Rock Island HCP Tributary Committees Action Plans for 2014. The 2014 Action Plan for both Rocky Reach and Rock Island Tributary Committees is as follows:

- Plan Species Account Deposit: January 2014
- GSHP Project solicitation: January through December 2014
- GSHP Project Approval: January through December 2014
- GSHP Project Implementation: Ongoing
- Small Project Review and Approval: January through December 2014
- Small Project Implementation: Ongoing

The Rocky Reach and Rock Island Tributary Committees approved the Rocky Reach and Rock Island Action Plans for 2014.

VI. Information Updates

The following information updates were provided during the meeting.

1. Approved Payment Requests in January and February:

   Rock Island Plan Species Account:

   - $1,222.80 to Cascade Columbia Fisheries Enhancement Group for the Twisp to Carlton Reach Assessment Project.

   Rocky Reach Plan Species Account:

   - $1,332.26 to Cascade Columbia Fisheries Enhancement Group for the Silver Side Channel Design Project.
   - $6,200.14 to the Methow Salmon Recovery Foundation for the Upper Beaver Habitat Improvement Channel Restoration Project.

Wells Plan Species Account:

- $814.00 to Cascade Columbia Fisheries Enhancement Group for the Methow/Chewuch Shallow Groundwater Project.
- $190.49 to the Methow Salmon Recovery Foundation for the Twisp River-Poorman Creek Wetland Habitat Acquisition Project. This was the final payment on this project.
- $6,072.53 to the Methow Salmon Recovery Foundation for the Upper Beaver Habitat Improvement Channel Restoration Project.

2. Tracy Hillman reported that Matt Shales (CCFEG) asked if he could give a presentation to the Tributary Committees on the Silver Side Channel Design and the monitoring work they have conducted on the Methow/Chewuch Shallow Groundwater Monitoring Project. The Committees agreed to have Matt present to the Committees in March.
3. Tracy Hillman reported that the PUDs deposited funds into each of the Plan Species Accounts at the end of January. Chelan PUD deposited $698,905 into the Rock Island Account and $331,015 into the Rocky Reach Account. Douglas PUD deposited $253,775 into the Wells Account. As of the end of January 2014, the unallocated balance for each account is $4,074,020 in the Rock Island Account, $1,745,241 in the Rocky Reach Account, and $1,228,313 in the Wells Account.
4. Becky Gallaher said that Mickey Fleming (CDLT) asked if the Committees cover the cost of appraisal reviews. The Committees cover the cost of the appraiser, but it was not clear if the Committees also cover the cost of the review. The Committees confirmed that they cover both the cost of the appraisal and the cost of the review.
5. Tracy Hillman and Becky Gallaher shared with the Committees the draft Upper Columbia SRFB/TC/BPA Funding Schedule (see Attachment 2). Draft proposals will be delivered to the Tributary Committees on 28 April or 2 May and the Committees will review the draft proposals during their May and June meetings (8 May and 12 June). Project tours are scheduled for 14-15 May (Methow and Okanogan) and 21-22 May (Wenatchee and Entiat). This year there will be no presentations. In the past, project sponsors gave presentations to both the Regional Technical Team (RTT) and the Tributary Committees. This year the RTT will meet on 4 June to discuss and develop detailed comments that will be sent to the sponsors. This means that the RTT will not meet on 11 June. Final proposals will be delivered to the Tributary Committees on 24 June. The Committees will make funding decisions on 10 July. This gives the Committees about three weeks to review the final proposals.

VII. Next Steps

The next meeting of the Tributary Committees will be on Thursday, 13 March 2014 at Chelan PUD in Wenatchee.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Attachment 1

Letter from CCNRD on the Wenatchee Levee Removal and Riparian Restoration Project

Chelan County Natural Resource Department
316 Washington Street, Suite 401, Wenatchee, WA 98801
Phone (509) 667-6640 Fax (509) 667-6527

RE: Wenatchee Levee Removal and Riparian Restoration Project (2012-04RI)

Dear Rock Island Tributary Committee Fund,

Chelan County Natural Resource Department (CCNRD) agrees with the Committee's recommendation that the landowner should work with an expert in water law to better inform them of current and past water use and future water needs and would like to ask the Committee to indefinitely suspend funding for this project. By allowing additional time for the landowner to better understand their water right claim and current and future water use/needs they will be able to make a more informed decision about installing an irrigation well.

The original intent of the project was to remove the 300ft long levee, restoring natural function, and restore the riparian area (see pictures below). The levee has been successfully removed and the riparian restoration will take place this spring using funding from another source. Washington Department of Fish and Wildlife (WDFW) staff have inspected the existing intake structure and determined all fish screening criteria are being met. CCNRD will provide the Committee with a final project report once the riparian restoration portion has been completed.

Please let me know if you have any questions or need additional information.

Sincerely,

Lee P Duncan

Natural Resource Specialist.

Before

After

Before

After

Before

After

Attachment 2

Proposed 2014 SRFB/GSHP/BPA Process Schedule

DRAFT UPPER COLUMBIA SRFB/TRIB/BPA 2014 FUNDING SCHEDULE				
DATE	**ACTIVITY/MILESTONE**	**PARTICIPANTS**	**LOCATION**	**FACILITATOR/ COORDINATOR**
FEBRUARY				
Feb 13	Meeting: **2014 Debrief** and 2014 Planning Meeting	Sponsors, RCO	Chelan, WA. Fire District	LE/RTT Chair
Feb 21	Meeting/WebEx Optional: **HWS training**	Sponsors	WebEx	LE
MARCH				
TBD	Meeting/Workshop: ***NEW*** **Species lifecycle workshop**	Sponsors, Monitoring Groups	Wenatchee, TBD	LE
March 12	Meeting *Optional*: ***NEW*** **RTT project preview**	Sponsors, RTT, TRIB	Wenatchee, TBD	RTT Chair
March 25	Meeting: **SRFB/TRIB/BPA Kick-Off Meeting**	LE, RTT, TRIB, BPA, Sponsors, RCO	Chelan, WA. Fire District	LE/RCO
March 26	Meeting/Webinar *Optional*: **Salmon Recovery Grants Workshop**	Sponsors, RCO	Online Webinar	RCO
March 31	**Deadline:** All projects updated in HWS	**Sponsors**	HWS	LE/WATs
APRIL				
MAY				
April 28th or May 2	**Deadline: Draft proposals due**	**Sponsors**, LE, RCO, SRP, RTT, CAC, TRIB, BPA	Prism	LE
May 14 & 15	**Meeting/Tours/Presentations**: SRFB/TRIB/BPA Project Tours ~14th Okanogan (Wed) ~15th Methow (Thur)	**Sponsors**, LE, RTT, TRIB, BPA, SRFB SRP	TBD	LE

DRAFT UPPER COLUMBIA SRFB/TRIB/BPA 2014 FUNDING SCHEDULE				
DATE	**ACTIVITY/MILESTONE**	**PARTICIPANTS**	**LOCATION**	**FACILITATOR/ COORDINATOR**
May 21 & 22	**Meeting/Tours/Presentations**: SRFB/TRIB/BPA Project Tours ~21th Wenatchee (Wed) ~22th Entiat (Thur)	**Sponsors**, LE, RTT, TRIB, BPA, SRFB SRP	TBD	LE
		JUNE		
May 28 - June 5	Action: **SRP provides comments**	SRP	Email via LE	RCO
June 4	Action: **RTT provides comments** following tours	RTT	Email via LE	RTT Chair
June 11	Meeting/**Project Discussions**: Opportunity to discuss projects with RTT if needed	**Sponsors**, RTT, CAC, LE, TRIB	RTT Meeting TBD	RTT Chair
June 12	Action: TRIB reviews draft proposals	TRIB	TRIB	TRIB
June 16	Action: RTT provides additional comments if needed	RTT	Email via LE	RTT Chair
June 20	Action: **TRIB provides comments**	TRIB	Email	TRIB
June 24, Monday	**DEADLINE: Final proposals due** for <u>Regional Review</u>	**Sponsors**, LE, RTT, CAC, TRIB, BPA	Prism	LE
		JULY		
July 9	Action: **RTT technical scoring**	RTT, CAC, LE, BPA, BOR	RTT Meeting (TBD)	RTT
July 10	Action: TRIB reviews final proposals	TRIB	TRIB	TRIB
July 20	Action: **TRIB Decisions**	TRIB	Email/Letter	TRIB
July 22 & 24	Meeting/**Presentations CAC**: Chelan CAC - August 22th Okanogan CAC - Aug 24nd	**Sponsors**, CAC, RTT, LE	Wenatchee Reclamation Dist. & River Bank, Twisp	LE

DRAFT UPPER COLUMBIA SRFB/TRIB/BPA 2014 FUNDING SCHEDULE				
DATE	**ACTIVITY/MILESTONE**	**PARTICIPANTS**	**LOCATION**	**FACILITATOR/ COORDINATOR**
July 29 & 31	Meeting: **CAC Project Rankings** Chelan CAC - August 29th Okanogan CAC - Aug 31th	CAC, LE	Wenatchee Reclamation Dist. & River Bank, Twisp	LE
AUGUST				
August 6	Meeting: joint CAC approves **Final Ranked Project List**	Joint CAC, LE	Chelan PUD, Chelan WA	LE
August 15	**Deadline: RCO PRISM upload**, Regional List	**Sponsors,** LE	Prism	LE/RCO
SEPTEMBER				
Sept 5	Deadline: Regional Submittal	LE	Email	LE
OCTOBER				
Oct 4	Action: SRP provide comments	SRP	Email via LE	SRP
Oct 15	**Deadline: Response to comments** from project sponsors to SRP	**Sponsors**, LE	Email via LE	LE
Oct 21-24	Meeting/**Presentations**: Sponsors present projects to SRP (*only projects identified*)	Select **Sponsors**, LE	Olympia, Washington	RCO
Oct 30	Action: SRP finalizes comments	SRP	Email via LE	SRP
NOVEMBER				
November	Final report by SRP to SRFB	RCO		RCO
DECEMBER				
December	Action: **SRFB Decisions**	SRFB	Olympia, WA	RCO

Acronyms
CAC- Citizen's Advisory Committee
BPA- Bonneville Power Administration
LE- Lead Entity Coordinator/Program
RCO- Recreation and Conservation Office

RTT- Upper Columbia Regional Technical Team
SRP- State Review Panel
SRFB- Salmon Recovery Funding Board
TRIB- Tributary Committee
UC- Upper Columbia Region
UCSRB- Upper Columbia Salmon Recovery Board

Timeline Legend	
Meetings	Blue
Deadlines	Red
Actions	Black

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Notes 13 March 2014

Members Present: Dale Bambrick (NOAA Fisheries), Lee Carlson (Yakama Nation), Jeremy Cram (WDFW), Chris Fisher (Colville Tribes), Steve Hays (Chelan PUD), Tom Kahler (Douglas PUD), Kate Terrell (USFWS), and Tracy Hillman (Committees Chair).

Others Present: Becky Gallaher (Tributary Project Coordinator), Justin Yeager (NOAA Fisheries), and Jeff Osborn (Chelan PUD).

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met in the Chelan PUD Auditorium in Wenatchee, Washington, on Thursday, 13 March 2014 from 10:00 am to 12:15 pm.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting and the Committees adopted the proposed agenda with the following additions:

- Review a Small Projects proposal.
- Okanagan Nation Alliance monitoring inquiry.
- Sharing of literature.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 13 February 2014 meeting notes.

III. Monthly Update on Ongoing Projects

Becky Gallaher gave an update on funded projects. Most are progressing well or had no salient activity in the past month.

- Nason Creek Upper White Pine Reconnection – No new update.
- Mission Creek Fish Passage – The sponsor (Cascadia Conservation District) has been unable to work through the permitting process with WDFW. WDFW will not issue an HPA if the sponsor includes the proposed infiltration galleries. WDFW is concerned about the potential for excess sediment delivery and flows from the burned areas in the Mission Creek drainage. In addition, WDFW is requiring a design change to the log weirs once the galleries are removed from the design. Although the landowners still have interest in moving forward with the project, the sponsor is withdrawing the request for permits and shelving the project because of a lack of engineering support and funding. The Rock Island Committee asked Jeremy Cram to investigate why WDFW is concerned about the proposed project. *Following the meeting, Jeremy reported that WDFW's primary concerns were associated with the likely failure of the infiltration gallery and the creation of fish passage barriers. The project was pitched as a passage project, but in reality, it may be more of an irrigation project. Upstream movement of juveniles was the primary concern according to the project application. WDFW thought that the HEC-RAS modeling was*

insufficient and even suggested that the proposed structures would create a passage barrier during steelhead spawning migration. The original HEC-RAS was done without the log weirs, and even with the exclusion of the weirs, the project appeared to create jumps.

- Chewuch River Instream Passage Project – The project is complete and the sponsor (Trout Unlimited) will submit a final report soon.
- Nutrient Enhancement Assessment Project – The contractor, PACE Engineering, is working on the final report, which will likely be completed in May 2014. A draft should be ready for review in April. Ecology was going to make decision on the administrative order; however, they have now said that they will not make a decision until they receive the final report.
- Large Wood Atonement Project – The engineer, Natural Systems Design, has made progress on project design and hydraulic modeling. The Sponsor (Cascade Columbia Fisheries Enhancement Group; CCFEG) expects to have preliminary designs and a flood risk memo completed the second week of March. The JARPA (with conceptual design) was submitted on 14 February and a Temporary Use Permit application was submitted to WDFW for staging on their property.
- Silver Protection Project – Because of restrictions placed on WDFW by their Director, WDFW is unable to acquire lands in Okanogan County. Therefore, WDFW would like to transition the acquisition to a conservation easement. The 25-acre acquisition would be included in the 81.19-acre conservation easement. The Rocky Reach and Wells Committees had several questions for Jeremy. For example, can the project be transferred to another conservation group that can purchase the property (e.g., Yakama Nation or Methow Conservancy)? In addition, is there an opportunity to include the house in the acquisition? This would eliminate the ten-foot buffer around the property. Jeremy will look into these issues and report back to the Committees in April.
- Coulter Creek Barrier Replacement Project – The project sponsor (Chelan County Natural Resources Department; CCNRD) provided no new update on this project.
- Wenatchee Levee Removal and Riparian Restoration Project – The project sponsor (CCNRD) asked the Rock Island Tributary Committee if they could move $5,154 from “contract labor” to “sponsor salaries and benefits.” The reason for the budget amendment is because of an overage due to landowner coordination, contractor selection and coordination, permitting, construction oversight, and surveying. After careful consideration, ***the Rock Island Tributary Committee denied the budget amendment***. Given the County’s experience in implementing restoration projects, including large, complex projects, the Committee did not understand how the sponsor could have exceeded their salaries and benefits budget by more than $5,000, especially given that one important component of the project was not implemented (i.e., conversion to a well). The Committee would have appreciated notification that the budget was likely to be exceeded long before the final invoice was to be submitted.
- Upper Beaver Habitat Improvement Channel Restoration Project – The project sponsor (Methow Salmon Recovery Foundation; MSRF) continues to monitor icing at the new diversion and throughout the reconstructed channel on a weekly basis.
- Shingle Creek Fish Passage Project – Chris Fisher reported that Wayne Cornwall (engineer) visited the project site and noted that the material staged at the site was the correct size. Construction is scheduled to begin mid-July. Re-vegetation work will occur during autumn 2014.
- Methow/Chewuch Shallow Groundwater Monitoring Project – The sponsor (CCFEG) made no field visits during this reporting period. Nevertheless, data processing is occurring. All pressure transducers continue to collect data. The sponsor indicated that they have $3,483 left in their contract labor task and asked the Wells Committee if they could use the remaining funds to hire a

hydrogeologist to do some additional data analyses. Data to be analyzed by the hydrogeologist would include piezometer data, survey and staff gauge readings at Lewisia floodplain and Burns-Garrity sites, and pit-test data. After careful consideration, ***the Wells Tributary Committee approved the budget amendment***.

- MVID Instream Flow Improvement Project – No new update.
- Silver Side Channel Design Project – The Sponsor (CCFEG), with input from WDFW and USFWS, selected Intermountain Aquatics, Inc. for engineering and design services. The USFWS conducted a site visit and collected discharge data at several locations along the side channel. As part of the contract with CCFEG, they are required to get approval from the Committee if the budgets for their subcontractors exceed $5,000. CCFEG submitted to the Rocky Reach Committee statements of work and budgets for their subcontractors (Intermountain Aquatics, Inc. and WDFW). ***The Committees gave Becky Gallaher the authority to review and approve scopes of work and budgets for subcontractors. Based on Becky's discretion, she can elevate a subcontractor's scope of work and budget to the Committees for their review and approval.*** In this case, Becky and the Committee approved the statements of work and budgets for the Silver Side Channel Design Project.
- Twisp to Carlton Reach Assessment Project – The sponsor (CCFEG) sent a request for proposals to prospective firms in February. Four firms responded with proposals. A selection committee was formed and the selection process will occur within the next few weeks.
- Similkameen RM 3.8 Project – A request for qualifications was sent to 96 firms. Two firms responded to the request. Cardno-Entrix was selected to prepare the restoration designs.
- Entiat Stillwaters Gray Reach Acquisition – No new update.

IV. Review of Policies and Procedures Documents

During the last meeting, the Committees directed Tracy Hillman to provide draft language to Section 3.4 of the Policies and Procedures document indicating that the Tributary Committees will accept Salmon Recovery Funding Board applications for projects where Plan Species Account Funds are included as cost shares in Salmon Recovery Funding Board proposals. The Committees approved the following language to Section 3.4 of the Policies and Procedures document:

- "Project Sponsors will use the General Salmon Habitat Program application. However, the Committees will accept the Salmon Recovery Funding Board application for projects where Plan Species Account Funds are included as cost shares in Salmon Recovery Funding Board proposals."

The Committees directed Tracy to inform project sponsors of the Committees new policy.

V. General Salmon Habitat Program Draft Proposal Application

Because of the new policy of the Committees to allow project sponsors to submit GSHP proposals at any time during the year, Tracy Hillman and Becky Gallaher reviewed the draft and final application forms that were used in the past. They found that there was no difference between the draft and final application forms. Therefore, they asked the Committees what they would like to see in the draft application form. Recall that a draft application is required by the Committees and is used by them to determine the appropriateness of the proposed project. This gives the project sponsor an early indication on the appropriateness of the project concept without the sponsor having to complete the entire application form.

The Committees agreed that the draft application form should include project sponsor information, project title, project summary, estimated project timeline, and estimated project budget. Details on project description are not needed in the draft application form. For restoration projects, the project summary needs to describe the objectives, location (with maps), limiting factors addressed, species and life stages effected, causal factors, watershed category and major/minor spawning area designations, description of what the project will do and how it will accomplish its objectives, and expected benefits. For protection projects, the project summary needs to describe the location and quantity of land protected (with maps), watershed category and major/minor spawning area designations, details on the habitat protected, benefits to listed and non-listed fish, birds, and mammals, identify the risks of not protecting the habitat, and landowner interest.

VI. Small Projects Program Application: Remove Collapsed Bridge from Shingle Creek

The Committees reviewed a Small Projects Program application from the Okanagan Nation Alliance (ONA) titled *Remove Collapsed Bridge from Shingle Creek*.

The purpose of this project is to stabilize and reduce channel and bank erosion by removing a collapsed logging bridge that fell into Shingle Creek about 15 km upstream from its mouth. In addition, ONA proposes to stabilize the channel and banks to reduce erosion. The total cost of the project is $10,579. The sponsor requested $9,079 from HCP Tributary Funds. Because of a lack of information, the Committees were unable to make a funding decision. They identified the following issues:

1. The sponsor needs to include photographs of the site and the collapsed bridge.
2. The budget appeared to be high for this project. The Committees would like to know if it is possible to tie this project with the Shingle Creek Dam Removal project. Doing so may help reduce the cost. Chris Fisher said that he is willing to work with ONA on finding ways to reduce the cost of the project.

The Committees directed Tracy Hillman to share these concerns with the project sponsor.

VII. Information Updates

The following information updates were provided during the meeting.

1. Approved Payment Requests in February and March:

   Rock Island Plan Species Account:

   - $135.00 to Clifton Larson Allen for last quarter administration in 2013.

   Rocky Reach Plan Species Account:

   - $135.00 to Clifton Larson Allen for last quarter administration in 2013.
   - $1,184.35 to the Okanogan Conservation District for the Similkameen RM 3.8 Design Project.

2. Last month Matt Shales (CCFEG) asked if he could give a presentation to the Tributary Committees on the Silver Side Channel Design and the monitoring work they are conducting on the Methow/Chewuch Shallow Groundwater Monitoring Project. The Committees agreed to have Matt present to the Committees. Tracy shared this information with Matt and Matt indicated that he would like to give his presentation to the Committees in May or June. This will give CCFEG time to complete the data analysis on the monitoring work and have draft designs prepared for the Silver Side Channel. The Committees agreed to have Matt present his work in May or June.
3. Chris Fisher said that he was asked by the Okanagan Nation Alliance if the Committees would be interested in funding some level of monitoring on four different restoration projects in the Upper Okanagan River basin. The first project would monitor the re-colonization of Shingle Creek after removal of the diversion dam. This work would likely include monitoring re-colonization of the

stream by anadromous fish and kokanee, and the assessment of growth rates of *O. mykiss*. The second project would use HEC-RAS modeling to measure sediment deposition within the Penticton Channel. Here the intent is to demonstrate to B.C. Ministry that sediment recruitment from tributaries (e.g., from Ellis Creek) does not reduce mainstem capacity and increase the risk of flooding. The third project is to monitor ORRI Phase II. Specifically, the goal is to use snorkeling to estimate abundance and distribution of fish within the recently opened side channel. The final project is to monitor egg-fry survival of salmonids that use the constructed spawning platforms. The intent of this project is to compare survival rates in different combinations of substrate. After discussion, the Committees directed Chris to ask ONA to provide a more detailed write-up on the four monitoring projects.

4. Tracy Hillman reminded the Committees that the Salmon Recovery Funding Board Regional Kick-Off Meeting will be held on 25 March at the Chelan Fire Hall in Chelan, WA (see Attachment 1). On 26 March, there will be an online SRFB Application Workshop. The purpose of the workshop is to provide detailed instructions on filling out the online PRISM application. Finally, Tracy noted that the exact dollar amount for the SRFB allocation to the Upper Columbia Region has not been confirmed, but will likely be similar to previous years ($1.6-$2.0 million).

5. Chris Fisher shared with the Committees his involvement with a high school class that is monitoring the physical and biological changes in a side channel that was recently reconnected to the Okanogan River. The side channel, located near the town of Okanogan, was reconnected to the mainstem at the downstream end of the side channel. Chris also shared a copy of the last lecture given by one of his college professors. Chris noted that we may not agree with everything the professor says, but he will make you think. As a final point, Chris entertained the Committees by sharing a story about students taking an ornithology lab exam.

VIII. Next Steps

The next meeting of the Tributary Committees will be on Thursday, 10 April 2014 at Chelan PUD in Wenatchee.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Attachment 1

Proposed 2014 SRFB/GSHP/BPA Process Schedule

DRAFT UPPER COLUMBIA SRFB/TRIB/BPA 2014 FUNDING SCHEDULE				
DATE	**ACTIVITY/MILESTONE**	**PARTICIPANTS**	**LOCATION**	**FACILITATOR/ COORDINATOR**
		FEBRUARY		
Feb 13	Meeting: **2014 Debrief** and 2014 Planning Meeting	Sponsors, RCO	Chelan, WA. Fire District	LE/RTT Chair
Feb 21	Meeting/WebEx Optional: **HWS training**	Sponsors	WebEx	LE
		MARCH		
TBD	Meeting/Workshop: ***NEW* Species lifecycle workshop**	Sponsors, Monitoring Groups	Wenatchee, TBD	LE
March 12	Meeting *Optional*: ***NEW* RTT project preview**	Sponsors, RTT, TRIB	Wenatchee, TBD	RTT Chair
March 25	Meeting: **SRFB/TRIB/BPA Kick-Off Meeting**	LE, RTT, TRIB, BPA, Sponsors, RCO	Chelan, WA. Fire District	LE/RCO
March 26	Meeting/Webinar *Optional*: **Salmon Recovery Grants Workshop**	Sponsors, RCO	Online Webinar	RCO
March 31	**Deadline:** All projects updated in HWS	**Sponsors**	HWS	LE/WATs
		APRIL		
		MAY		
April 28th or May 2	**Deadline: Draft proposals due**	**Sponsors**, LE, RCO, SRP, RTT, CAC, TRIB, BPA	Prism	LE
May 14 & 15	**Meeting/Tours/Presentations**: SRFB/TRIB/BPA Project Tours ~14th Okanogan (Wed) ~15th Methow (Thur)	**Sponsors**, LE, RTT, TRIB, BPA, SRFB SRP	TBD	LE

DRAFT UPPER COLUMBIA SRFB/TRIB/BPA 2014 FUNDING SCHEDULE				
DATE	**ACTIVITY/MILESTONE**	**PARTICIPANTS**	**LOCATION**	**FACILITATOR/ COORDINATOR**
May 21 & 22	**Meeting/Tours/Presentations**: SRFB/TRIB/BPA Project Tours ~21th Wenatchee (Wed) ~22th Entiat (Thur)	**Sponsors**, LE, RTT, TRIB, BPA, SRFB SRP	TBD	LE
JUNE				
May 28 - June 5	Action: **SRP provides comments**	SRP	Email via LE	RCO
June 4	Action: **RTT provides comments** following tours	RTT	Email via LE	RTT Chair
June 11	Meeting/**Project Discussions**: Opportunity to discuss projects with RTT if needed	**Sponsors**, RTT, CAC, LE, TRIB	RTT Meeting TBD	RTT Chair
June 12	Action: TRIB reviews draft proposals	TRIB	TRIB	TRIB
June 16	Action: RTT provides additional comments if needed	RTT	Email via LE	RTT Chair
June 20	Action: **TRIB provides comments**	TRIB	Email	TRIB
June 24, Monday	**DEADLINE: Final proposals due** for Regional Review	**Sponsors**, LE, RTT, CAC, TRIB, BPA	Prism	LE
JULY				
July 9	Action: **RTT technical scoring**	RTT, CAC, LE, BPA, BOR	RTT Meeting (TBD)	RTT
July 10	Action: TRIB reviews final proposals	TRIB	TRIB	TRIB
July 20	Action: **TRIB Decisions**	TRIB	Email/Letter	TRIB
July 22 & 24	Meeting/**Presentations CAC**: Chelan CAC - August 22th Okanogan CAC - Aug 24nd	**Sponsors**, CAC, RTT, LE	Wenatchee Reclamation Dist. & River Bank, Twisp	LE

DRAFT UPPER COLUMBIA SRFB/TRIB/BPA 2014 FUNDING SCHEDULE				
DATE	**ACTIVITY/MILESTONE**	**PARTICIPANTS**	**LOCATION**	**FACILITATOR/ COORDINATOR**
July 29 & 31	Meeting: **CAC Project Rankings** Chelan CAC - August 29th Okanogan CAC - Aug 31th	CAC, LE	Wenatchee Reclamation Dist. & River Bank, Twisp	LE
AUGUST				
August 6	Meeting: joint CAC approves **Final Ranked Project List**	Joint CAC, LE	Chelan PUD, Chelan WA	LE
August 15	**Deadline: RCO PRISM upload**, Regional List	**Sponsors,** LE	Prism	LE/RCO
SEPTEMBER				
Sept 5	Deadline: Regional Submittal	LE	Email	LE
OCTOBER				
Oct 4	Action: SRP provide comments	SRP	Email via LE	SRP
Oct 15	**Deadline: Response to comments** from project sponsors to SRP	**Sponsors**, LE	Email via LE	LE
Oct 21-24	Meeting/**Presentations**: Sponsors present projects to SRP (*only projects identified*)	Select **Sponsors**, LE	Olympia, Washington	RCO
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DECEMBER				
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Acronyms
CAC- Citizen's Advisory Committee
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Meetings	Blue
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Wells, Rocky Reach, and Rock Island HCP
Tributary Committees Notes
10 April 2014

Members Present: Lee Carlson (Yakama Nation), Jeremy Cram (WDFW), Chris Fisher (Colville Tribes), Steve Hays (Chelan PUD), Tom Kahler (Douglas PUD), Kate Terrell (USFWS), Justin Yeager (NOAA Fisheries), and Tracy Hillman (Committees Chair).

Others Present: Becky Gallaher (Tributary Project Coordinator) and Chas Kyger (Douglas PUD).

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met in the Chelan PUD Auditorium in Wenatchee, Washington, on Thursday, 10 April 2014 from 10:00 am to 12:30 pm.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting and the Committees adopted the proposed agenda with the following additions:

- Silver Side Channel Design Concepts.
- Shingle Creek Collapsed Bridge Proposal.
- Upper Columbia Salmon Recovery Board 2014 Life History Workshop.

Tracy Hillman shared with the Committees that the Wells, Rocky Reach, and Rock Island Annual Reports were finalized and posted on the Douglas PUD Extranet site. Members can download the reports from the site using their user name and password. Tom Kahler explained the Extranet site to the Committees and noted that he intends to load Tributary Committees' information (proposals, agendas, meeting notes, and correspondence) on the site. Currently, the site contains information for the Coordinating Committees and Hatchery Committees.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 13 March 2014 meeting notes.

III. Monthly Update on Ongoing Projects

Becky Gallaher gave an update on funded projects. Most are progressing well or had no salient activity in the past month.

- Nason Creek Upper White Pine Reconnection – No new update.
- Chewuch River Instream Flow Project – The project is complete and the sponsor (Trout Unlimited) will submit a final report soon.
- Nutrient Enhancement Assessment Project – All sampling is complete and the contractor, PACE Engineering, is working on the draft report, which will likely be ready for review by 15 April 2014. The analysis of macroinvertebrates should be completed in May.

- Large Wood Atonement Project – The Sponsor (Cascade Columbia Fisheries Enhancement Group; CCFEG) submitted their permits on 14 February. To date, the sponsor has received Section 7 concurrence and the Temporary Use Permit. They expect to have the ACOE and HPA very soon. There has been some delay in getting SEPA and Shoreline exemption from the County. Apparently Commissioner Goehner has some concerns with the project and has requested another public meeting. Kate Terrell noted that the USFWS and the design team will meet with the County Commissioners to resolve the concerns. The second draft of designs and the flood hazard memo are near completion and the sponsor will share them with the Committee when final. They have identified several sources of pilings and expect to install about 170 pilings this year. They will fly whole trees into the project site next year.
- Silver Protection Project – Because of restrictions placed on WDFW by their Director, WDFW is unable to acquire lands in Okanogan County. Therefore, WDFW would like to transition the acquisition to a conservation easement. The 25-acre acquisition would be included in the 81.19-acre conservation easement. Jeremy Cram noted that the appraisal for the conservation easement is due on 30 April. Jeremy noted that with the conservation easement, there is a gain in acres protected; however, that comes with limited grazing in specific areas outside the riparian areas. Committee members asked about the need for grazing, monitoring of grazing, enforcement of non-compliance, and the need for a conservation plan. Jeremy said he would explore these issues and report back to the Committees in May.
- Coulter Creek Barrier Replacement Project – The project sponsor (Chelan County Natural Resources Department; CCNRD) provided no new update on this project.
- Wenatchee Levee Removal and Riparian Restoration Project – The project is complete and the sponsor (CCNRD) will submit a final report soon.
- Upper Beaver Habitat Improvement Channel Restoration Project – The project sponsor (Methow Salmon Recovery Foundation; MSRF) provided no update on this project.
- Shingle Creek Fish Passage Project – Chris Fisher reported that construction is scheduled to begin mid-July. Re-vegetation work will occur during autumn 2014.
- Methow/Chewuch Shallow Groundwater Monitoring Project – The sponsor (CCFEG) made no field visits during this reporting period. The sponsor developed a scope of work and has hired Aspect Consulting to analyze the monitoring data. Because the sponsor would like to continue monitoring water levels at the Burns-Garrity and Silver Side Channel sites through 2014, they requested a time extension on the contract. After consideration, ***the Wells Tributary Committee agreed to extend the period of the contract to 31 December 2014.***
- MVID Instream Flow Improvement Project – No new update.
- Silver Side Channel Design Project – The Sponsor (CCFEG) held a kickoff meeting with WDFW, USFWS, and Intermountain Aquatics, Inc (IMA). IMA provided the design team with three concept alternatives and a first look at hydraulic analysis using shallow groundwater/surface water monitoring data and survey data collected by CCFEG and BOR. Outcomes from the meeting included identification of data gaps and a preferred concept. Next steps include refining the design with input from various stakeholders including the Tributary Committees.
- Twisp to Carlton Reach Assessment Project – The sponsor (CCFEG) hired Cardno-Entrix to complete the reach assessment. The sponsor has been coordinating with stakeholders including the Methow Conservancy, BOR, and MRC. Next steps include information gathering, data gap identification, and a kickoff meeting. Committee members interested in participating in the kickoff meeting should contact Matt Shales at CCFEG.

- Similkameen RM 3.8 Project – No new update.
- Entiat Stillwaters Gray Reach Acquisition – No new update.

IV. Silver Side Channel Design Concept

CCFEG provided the Rocky Reach Tributary Committee with a concept design for the Silver Side Channel. The concept was prepared by Intermountain Aquatics, Inc. CCFEG asked if the Committees had any comments or suggestions. After briefly reviewing the concept design, the Committee had no comments or suggestions. Kate Terrell recommended that members review the concept carefully and provide comments to CCFEG at their earliest convenience. The Committee directed Tracy Hillman to invite CCFEG (Matt Shales) to the June meeting to present the concept design and results from their monitoring work.

V. Small Projects Program Application: Remove Collapsed Bridge from Shingle Creek

Last month the Committees reviewed a Small Projects Program application from the Okanagan Nation Alliance (ONA) titled *Remove Collapsed Bridge from Shingle Creek*.

The purpose of the project was to stabilize and reduce channel and bank erosion by removing a collapsed logging bridge that fell into Shingle Creek about 15 km upstream from its mouth. In addition, ONA proposed to stabilize the channel and banks to reduce erosion. The total cost of the project was $10,579. The sponsor requested $9,079 from HCP Tributary Funds. Because of a lack of information, the Committees were unable to make a funding decision in March and requested the following information.

1. Photographs of the site and the collapsed bridge.
2. Reduce the cost of the project by possibly tying it with the Shingle Creek Dam Removal project.

Prior to the April meeting, ONA provided the Committees with additional information including photos of the site, a revised budget (Tributary Committee request = $6,693), and the signed landowner willingness form. After reviewing the original proposal and the additional information, the ***Wells Tributary Committee approved funding for this project***.

VI. Small Projects Program Application: Silver Reach Mining Impacts Evaluation/Feasibility Study

The Committees reviewed a Small Projects Program application from Trout Unlimited titled *Silver Mining Impacts Evaluation/Feasibility Study*.

The purpose of the project is to evaluate the extent to which heavy metal contamination from local mining activities at the Red Shirt Mill (RM 39.5) and the Alder Creek confluence wetland (RM 34-34.5) may affect the feasibility of restoration actions proposed in the Twisp to Carlton Reach on the Methow River. This work will supplement the Twisp to Carlton Reach Assessment and will provide practical application and guidance on how to minimize and reduce exposure risks to fish species while maximizing biological benefit. The total cost of the project is $99,430. The sponsor requested $96,355 from HCP Tributary Funds. Because of a lack of information, the Committees were unable to make a funding decision and requested responses to the following questions.

1. Did the project sponsor consider funding options under the Clean Water Act or from the Office of Columbia River? If so, why are funds from these sources not appropriate in this case?
2. Can the sponsor confirm the price of the cleanup and describe why the removal of tailings is cost prohibitive?

3. The proposal indicates that Red Shirt Mill received a hazard ranking of "1" from Ecology. If this is the highest potential threat ranking, why is Ecology not working to fix the problem?

The Committees directed Tracy Hillman to share these questions with the project sponsor.

VII. Okanogan Nation Alliance Monitoring Options

During the last meeting, ONA asked if the Committees would be interested in funding some level of monitoring on four different restoration projects in the Upper Okanagan River basin. The Committees requested that ONA provide additional information on the four projects.

Prior to the meeting, ONA provided the Committees with additional detail on the four restoration projects that they would like to monitor. Those four projects and their objectives are as follows:

1. Shingle Creek Re-Colonization Study. The objective of this study is to monitor the effects of barrier removal on ecosystem health and juvenile salmonid distribution and movement.

    Committee Response: The Committees do not want to see a proposal for this study. Because spawning surveys will be conducted in Shingle Creek, the Committees found no reason to fund additional monitoring work there.

2. Penticton Channel Monitoring Spawning Platforms. The objective of this study is to monitor the effects of the proposed spawning platforms as adaptive management for designing and construction of more platforms.

    Committee Response: The Committees would like to see a proposal for this study. The proposal should describe how ONA intends to document changes in the quantity and quality of spawning habitat in the Penticton Channel. This work should focus on quantifying spawners (redd surveys), egg retention (carcass surveys), egg-to-fry success, and habitat conditions (e.g., gravel stability, thalweg slope, fine sediment deposition, and gravel composition) within treated and untreated areas. At this time, however, the Committees are not interested in macrophytes, macroinvertebrates, water levels, or water depths and velocities measured during spawning.

3. Penticton Channel Conveyance Study. The objective of this study is to determine the effects of the current sediment transport management (dredging) in Penticton Channel by relating the flood risks to the salmon and ecosystem benefits.

    Committee Response: The Committees do not want to see a proposal for this study at this time. However, if the Provincial agency can provide assurance to ONA and the Committees that dredging will discontinue depending on the results of the study, then the Committees may be inclined to request a full proposal for the conveyance study.

4. ORRI Effectiveness Monitoring. The objective of this study is to monitor the effects (channel, hydraulic, and biological responses) of ORRI-Phase II restoration work and to continue to monitor the long-term effects of Phase I and VDS 13 restoration.

    Committee Response: The Committees see value in this effort and would like to see a proposal for this study. The proposal should include all activities associated with channel and hydraulic responses, and aquatic biological responses (save macrophytes and macroinvertebrates). That is, the monitoring of macrophytes and macroinvertebrates should not be included in the proposal.

The Committees directed Tracy Hillman to inform ONA that the Committees would like to see proposals for the spawning platforms and ORRI Phase II restoration projects.

VIII. Information Updates

The following information updates were provided during the meeting.

1. Approved Payment Requests in March and April:

   Rock Island Plan Species Account:

   - $1,110.95 to Chelan PUD for project coordination and administration during the first quarter of 2014.

   Rocky Reach Plan Species Account:

   - $1,180.50 to Chelan PUD for project coordination and administration during the first quarter of 2014.
   - $1,361.14 to the Okanogan Conservation District for the Similkameen RM 3.8 Design Project.

   Wells Plan Species Account:

   - $878.96 to Chelan PUD for project coordination and administration during the first quarter of 2014.

2. Becky Gallaher summarized for the Committees the results of the 2014 SRFB/TC/BPA Kickoff Meeting, which was held on 25 March at the Chelan Fire Hall in Chelan, WA. She noted that the project straw poll indicated that there may be 18 proposals submitted this year. Some or all of these proposals may include cost shares with the Tributary Committees. Becky said that the Committees should receive draft proposals by the end of April or early May. Tracy Hillman reminded the Committees that field trips will occur on 14-15 May in the Okanogan and Methow subbasins and on 21-22 May in the Entiat and Wenatchee subbasins.
3. Tracy Hillman reported that the Upper Columbia Salmon Recovery Board will be hosting an Upper Columbia Life History Workshop from 9:00 am to 4:00 pm on Wednesday, 16 April at the Confluence Technology Center in Wenatchee. The purpose of the workshop is to provide participants with current information about general life history patterns that have been observed across the region as well as specific information on habitat use in each of the four major subbasins. The workshop is primarily for project sponsors, monitoring program representatives and researchers, and Region Technical Team and Citizen's Advisory Committee members.

IX. Next Steps

The next meeting of the Tributary Committees will be on Thursday, 8 May 2014 at Chelan PUD in Wenatchee.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Notes 8 May 2014

Members Present: Lee Carlson (Yakama Nation), Jeremy Cram (WDFW), Chris Fisher (Colville Tribes), Steve Hays (Chelan PUD), Tom Kahler (Douglas PUD), Kate Terrell (USFWS), Justin Yeager (NOAA Fisheries), and Tracy Hillman (Committees Chair).

Others Present: Becky Gallaher (Tributary Project Coordinator).

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met in the Chelan PUD Auditorium in Wenatchee, Washington, on Thursday, 8 May 2014 from 10:00 am to 12:30 pm.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting and the Committees adopted the proposed agenda with the following addition:

- Methow Valley Irrigation District (MVID) Instream Flow Improvement Project.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 10 April 2014 meeting notes.

III. Monthly Update on Ongoing Projects

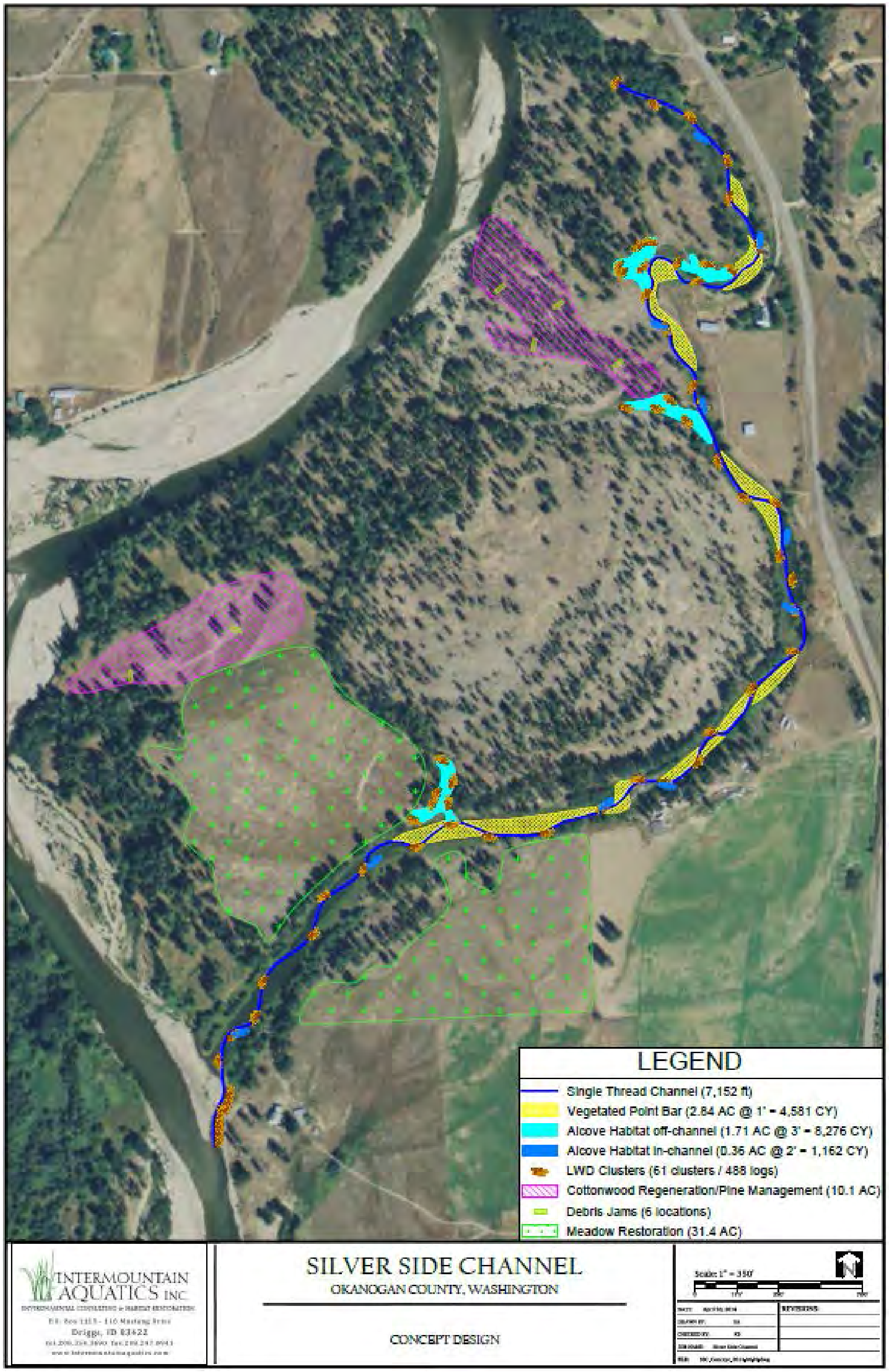
Becky Gallaher gave an update on funded projects. Most are progressing well or had no salient activity in the past month.

- Nason Creek Upper White Pine Reconnection – The 30% design has been completed for the restoration project and the sponsor (Chelan County Natural Resources Department; CCNRD) is working with stakeholders to obtain review comments that will be incorporated into the 60% design. The U.S. Bureau of Reclamation will fund the remainder of the power-line design and will also fund the final design for the restoration project. The U.S. Forest Service is proceeding with NEPA, which should be completed by the end of 2014. The sponsor has secured $780,000 from Ecology to help with construction. Becky noted that representatives from BPA will tour the project site on Monday, 12 May. Kate Terrell indicated that there are concerns that potential benefits of the project will not justify the cost as the project is currently designed. Copies of the following documents are available upon request: PUD transmission line relocation Memorandum of Understanding (MOU), preliminary 30% design drawings, and 30% design discussion items and updated construction costs memo. The Rock Island Tributary Committee asked to see the MOU. Tracy Hillman will forward the MOU to the Committee.
- Chewuch River Instream Flow Project – The project is complete and the sponsor (Trout Unlimited) will submit a final report soon.
- Nutrient Enhancement Assessment Project – PACE Engineering has completed a draft report on the Nutrient Enhancement Assessment. CWU has also completed a draft Executive Summary on

macroinvertebrate work. Based on recent communications with Ecology, the sponsor (Cascade Columbia Fisheries Enhancement Group; CCFEG) plans to discuss the Chiwawa proposal with Ecology's "fish heads group" in mid-June and program managers this fall. The draft report is available upon request. The Rock Island Tributary Committee asked to see the draft report from PACE Engineering. Tracy Hillman will forward the draft report to the Committee.

- Large Wood Atonement Project – The Sponsor (CCFEG) received the exemption letter from Chelan County on 24 April. They now have most of the permits they need to move forward with the project. They are still waiting on a waiver from the Sherriff for the non-motorized law on the White River and an Aquatic Lease permit from Department of Natural Resources. Updated preliminary designs will be available next month.
- Silver Protection Project – Jeremy Cram reported that WDFW is currently waiting for the completion of the appraisal, which should be completed and reviewed by 23 May. After the appraisal is complete, WDFW will present it to the landowner and negotiate public access and limited grazing. Committee members voiced their concern about grazing and noted that they may want to pursue an acquisition rather than a conservation easement. Acquisition would require a change in the sponsor, because WDFW is unable to acquire lands in Okanogan County. Jeremy said he will provide an update during the next meeting.
- Coulter Creek Barrier Replacement Project – The project sponsor (CCNRD) provided no new update on this project.
- Wenatchee Levee Removal and Riparian Restoration Project – The project is complete and the sponsor (CCNRD) will submit a final report soon.
- Upper Beaver Habitat Improvement Channel Restoration Project – The project sponsor (Methow Salmon Recovery Foundation; MSRF) indicated that although snowmelt in March was more rapid than in prior months, it did not result in significantly elevated flows. Minor scour and erosion was apparent in the area where work was limited to avoid archaeological concerns. Visual monitoring efforts were expanded to include timed-camera installations at three locations. The cameras will document spring melt and any adverse effects that may occur. The sponsor reinitiated coordination with WDFW to schedule installation of the paddle-wheel screen and for removal of decommissioned equipment from the old ditch. This work was to be completed in advance of system turn-on (15 April).
- Shingle Creek Fish Passage Project – Chris Fisher reported that construction is scheduled to begin 15 July. Re-vegetation work will occur during autumn 2014. He also noted that their engineer may be taking another position, which could affect the implementation schedule. However, the engineer will try to see the project through to avoid delays.
- Methow/Chewuch Shallow Groundwater Monitoring Project – The sponsor (CCFEG) downloaded monitoring data from all three sites in March. Data loggers were left in place to continue collecting data. Aspect started analyzing the data collected from the Burns-Garrity site. Next steps include QA/QC of Lewisia Floodplain data. These data will then be given to MSRF. The Wells Tributary Committee directed Tracy Hillman to invite CCFEG (Matt Shales) to the June meeting to discuss their monitoring data and to present the concept design for the Silver Side Channel Design Project.
- MVID Instream Flow Improvement Project – No new update from the project sponsor (TU).
- Silver Side Channel Design Project – On 15 April, the sponsor (CCFEG) met with representatives from WDFW to discuss details of the conservation easement, conceptual design, and restoration goals. The issue of grazing was discussed, and apparently the landowner was trying to include "light grazing" on portions of the site. CCFEG and WDFW explained the consequences of

grazing and the negative effects on project success. Next steps include development of preliminary designs. The conceptual design is shown below.



- Twisp to Carlton Reach Assessment Project – The contractor, Cardno Entrix, began gathering background information on the project. Next steps include a kickoff meeting, completing the compilation of background information, and identification of data gaps.
- Similkameen RM 3.8 Project – Chris Fisher reported that the Okanogan Conservation District selected Cardno Entrix to do the design work. They are currently working on a contract with Cardno Entrix and designs should be available for review by September or October.
- Remove Collapsed Bridge from Shingle Creek Project – The sponsor (Okanagan Nation Alliance) signed and returned the Tributary Committee/Sponsor Agreement.
- Entiat Stillwaters Gray Reach Acquisition – Appraisals have been completed on three of the four properties. The sponsor (Chelan Douglas Land Trust; CDLT) met with each of the three landowners and provided the following information:

  Bockoven South: As you know, Cascade Chelan Appraisal completed the primary appraisal with a value of $30,000. I met last week with Dr. and Mrs. Bockoven and their realtor to review the appraisal. The realtor called this morning to advise that they are willing to accept that number, despite their previous indication of a $45,000 minimum price. We had estimated $40,000, so are pleased that the appraised value came in $10,000 less, and that the landowners are agreeable. Accordingly, we will move ahead with the SRFB-required review appraisal, and the environmental assessment that is due by the end of May.

  We previously prepared a stewardship contribution calculation for all 4 parcels (Bockoven North, Bockoven South, Crone and Price).The 4 parcels total 77+ acres and the stewardship estimate was $36,000 for all 4 parcels treated as a unit. Bockoven South constitutes 32% by acreage, and the allocable portion for this property was $11,520 – a rather large chunk of the $30,000 purchase price. The landowner is baulking at making the contribution. Given that the appraisal came in $10,000 less than budgeted, I am wondering if the Tributary Committees would be willing to allocate the difference – or some part of it - to stewardship.

  Price: The appraised value of this property is only $25,000, since the landowner was not able to show right of access to the property that was assumed in the $150,000 estimate. I sent the appraisal to Mrs. Price's realtor; however, we recently learned that she had passed away in Arizona. I am waiting to hear from the realtor, but this may result in a delay until the estate is sorted out.

  As a note on both of these parcels, we will have to get approval from SRFB to acquire these two pieces without a physical access from across the Entiat River. Practical access will be from the north – by walking over our existing bridge on the Cottonwood property and through the Forest Service property.

  Bockoven North: The Bockoven's and their realtor were not at all happy with the $145,000 appraisal, but we are working on bringing them to reality. We've invited them to provide additional information about the claimed development potential of the property.

  Crone: We are still determining the potential area to be acquired based on a boundary line adjustment, so the appraisal has not yet been completed.

IV. Small Projects Program Application: Silver Reach Mining Impacts Evaluation/Feasibility Study

In April, the Committees reviewed a Small Projects Program application from Trout Unlimited titled *Silver Mining Impacts Evaluation/Feasibility Study*. The purpose of the project was to evaluate the extent to which heavy metal contamination from local mining activities at the Red Shirt Mill (RM 39.5) and the Alder Creek confluence wetland (RM 34-34.5) may affect the feasibility of restoration actions proposed in the Twisp to Carlton Reach on the Methow River. This work would supplement the Twisp to Carlton Reach Assessment and would provide practical application and guidance on how to minimize and reduce exposure risks to fish species while maximizing biological benefit. The total cost of the project was $99,430. The sponsor requested $96,355 from HCP Tributary Funds. Because of a lack of information, the Committees were unable to make a funding decision and requested additional information. Specifically, the Committees asked for responses to the following questions.

1. Did the project sponsor consider funding options under the Clean Water Act or from the Office of Columbia River? If so, why are funds from these sources not appropriate in this case?
2. Can the sponsor confirm the price of the cleanup and describe why the removal of tailings is cost prohibitive?
3. The proposal indicates that Red Shirt Mill received a hazard ranking of "1" from Ecology. If this is the highest potential threat ranking, why is Ecology not working to fix the problem?

Following the April meeting, the sponsor provided responses to the questions. In addition, Tracy Hillman reported that 39 summer Chinook redds, one spring Chinook redd, and four sockeye redds were found in the area of the Red Shirt Mill site, and 32 summer Chinook redds were observed near the Alder Creek confluence in 2013. The Committees reviewed and discussed the available information and responses and concluded that they need more time to consider the proposal. The Committees, like the sponsor, are perplexed why Ecology has not taken a larger role in this effort, given that Ecology assigned it a hazard ranking of 1. The Committees will do some investigative work, including discussing this with the USFWS toxicologist, and will reconsider the proposal during their next meeting on 12 June.

V. MVID Instream Flow Improvement Project

Chris Fisher shared with the Committees that Trout Unlimited submitted a proposal to the Priest Rapids Coordinating Committee (PRCC) seeking funds to support a portion of the MVID Instream Flow Improvement Project. The initial funding strategy was that the PRCC's NNI fund would cover about $2,000,000 of the total cost. However, it appears that the PRCC is unlikely to support such a large request. Therefore, Chris asked if the Tributary Committees would be willing to support a larger part of the request, which would then reduce the amount requested from NNI funds.

Last year, the Wells Tributary Committee approved $400,000 for this project. The total cost of the project at that time was $9,747,000. Recall that the purpose of the project is to: (1) improve instream flows in the lower 4.5 miles of the Twisp River by eliminating the MVID irrigation diversion and returning up to 11 cfs, which will be placed in permanent trust; (2) improve instream flow in the Methow River by piping a portion of the east canal and permanently trusting the saved water; (3) improve instream flow (2 cfs) and wetland and side channel habitat by restoring the natural flow in Alder Creek and permanently trusting the water; and (4) prevent fish injury and mortality associated with MVID's Twisp River pushup dam, fish screen operations, and the stranding of redds and juveniles in the MVID West Canal's intake canal and fish return channel.

After discussion, ***the Rock Island and Rocky Reach Tributary Committees agreed to contribute $600,000 to the project ($300,000 from the Rock Island Plan Species Account and $300,000 from the Rocky Reach Plan Species Account)***. Thus, in total, the Tributary Committees will contribute $1,000,000 to the project.

VI. General Salmon Habitat Program Draft Proposals

On Monday, the Committees received General Salmon Habitat Program and Salmon Recovery Funding Board draft proposals. Of the 12 draft proposals, nine requested funds from the Tributary Committees. Five draft proposals are for projects in the Methow River basin and four are for projects in the Wenatchee River basin. The Committees received no draft proposals for projects in the Entiat or Okanogan River basins. During the June meeting, the Committees will identify which draft proposals will have no chance or a low likelihood of receiving funding from the Tributary Committees.

Project tours are scheduled for 15 May in the Methow River basin and 21 May in the Wenatchee River basin. Becky Gallaher and Tracy Hillman participated on the conference call to coordinate the project tours. The Committees will meet on Thursday, 12 June to conduct their final evaluation of draft proposals.

Chris Fisher noted that he had some concerns with the Burns Garrity Floodplain Enhancement Project draft proposal. He said that based on the pump tests, it is unlikely that groundwater supply will be sufficient to support the goal of the groundwater-fed side channel. He recommended that members ask questions about this during the site visit on 15 May. Chris will not be able to attend the Methow site visit.

VII. Information Updates

The following information updates were provided during the meeting.

1. Approved Payment Requests in April and May:

   Rock Island Plan Species Account:

   - $8,472.67 to the Chelan County Treasurer for the Nason Creek UWP Reconnection – Chelan PUD Powerline Relocation Project for the period October 2013 through March 2014.
   - $225.00 to Clifton Larson Allen for Rock Island financial administration during the first quarter 2014.

   Rocky Reach Plan Species Account:

   - $7,000.00 to Cascade Chelan Appraisal for the Entiat Stillwaters Gray Reach Acquisitions.
   - $149.71 to the Okanogan Conservation District for the Similkameen RM 3.8 Design Project.
   - $225.00 to Clifton Larson Allen for Rocky Reach financial administration during the first quarter 2014.

2. Tracy Hillman and Tom Kahler gave a brief report on the sockeye salmon workshop held in Kelowna, B.C. on 29-30 April. The purpose of the workshop was to review and assess the knowledge and lessons learned after ten years of extensive work on the Skaha Experimental Sockeye Re-introduction Project. The program was designed by the Okanagan Nation Alliance, Fisheries and Oceans Canada (DFO), and Provincial fisheries managers as an adaptive management experiment that is reversible if significant negative effects are experienced by either natural Osoyoos Lake sockeye or resident Skaha Lake kokanee populations. The 12-year program is being funded by Grant and Chelan PUDs as part of their hydroelectric mitigation requirements for unavoidable sockeye losses at the Priest Rapids, Wanapum, and Rocky Reach dams on the Columbia River. Data for some of the monitoring components are co-funded by Douglas PUD and DFO as part of the ongoing Okanagan Fish/Water Management Tools program used by Douglas PUD to meet their sockeye mitigation obligations for Wells Dam.

   Tracy and Tom shared with the Committees some of the results from the limnological, sockeye, and kokanee studies conducted over the past ten years. The general conclusion from the workshop was that there is plenty of capacity for sockeye juveniles within Skaha and Osoyoos lakes. Although the Provincial fisheries managers hesitate to conclude there is no negative interaction between sockeye and kokanee, the empirical data indicate no density-dependent effects. Thus, it appears that passage will be provided at Okanagan Falls Dam. This will allow sockeye unimpeded access to Skaha Lake. As such, the Committees may see proposals seeking funds to improve the quantity and quality of sockeye spawning habitat in the Okanagan River and tributaries upstream from Skaha Lake.

VIII. Next Steps

The next meeting of the Tributary Committees will be on Thursday, 12 June at Chelan PUD in Wenatchee.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Notes 12 June 2014

Members Present: Lee Carlson (Yakama Nation), Jeremy Cram (WDFW), Chris Fisher (Colville Tribes), Steve Hays (Chelan PUD), Tom Kahler (Douglas PUD), Kate Terrell (USFWS), Justin Yeager (NOAA Fisheries), and Tracy Hillman (Committees Chair).

Others Present: Becky Gallaher (Tributary Project Coordinator), Jeff Osborn (Chelan PUD), Joe Connor (Bonneville Power Administration), and Sean Welch (Bonneville Power Administration). Jason Lundgren (Cascade Columbia Fisheries Enhancement Group) and Matt Shales (Cascade Columbia Fisheries Enhancement Group) joined the meeting for the Silver Side Channel Design and Groundwater Monitoring Presentation.

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met in the Chelan PUD Auditorium in Wenatchee, Washington, on Thursday, 12 June 2014 from 9:00 am to 1:00 pm.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting and the Committees adopted the proposed agenda with the following addition:

- Fish passage at Skaha Dam.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 8 May 2014 meeting notes with edits.

III. Monthly Update on Ongoing Projects

Tracy Hillman gave an update on funded projects. Most are progressing well or had no salient activity in the past month.

- <u>Nason Creek Upper White Pine Reconnection</u> – The Committees asked BPA if they could provide an update on this project and share any results from the recent field trip. BPA indicated that they will not be funding this project. The Bureau of Reclamation (BOR) will continue to move the project forward with funding from Ecology. BOR intends to fund the remainder of the power-line design and will also fund the final design for the restoration project. Ecology will contribute $780,000 to help with construction. The sponsor (Chelan County Natural Resources Department; CCNRD) will need additional funding, which they may seek from the Tributary Committees and/or the PRCC Habitat Subcommittee. The sponsor asked for a time extension and modification to the Scope of Work on this project. In short, the sponsor would like to extend the project timeline through the end of August so they can spend the remaining budget (~$7,800), which will be used to conduct a field review of the 30% design pole locations and to summarize all actions completed under this project agreement. After extensive consideration, the ***Rock Island Tributary Committee denied the extension and scope change***. The Committee previously modified the scope of work and provided a time extension. They want to see an end to the alternatives analysis work. The sponsor is still required under the contract to provide a final report that summarizes all actions completed under this project.

- Chewuch River Instream Flow Project – The project is complete and the sponsor (Trout Unlimited) will submit a final report soon.
- Nutrient Enhancement Assessment Project – PACE Engineering has completed a draft report on the Nutrient Enhancement Assessment and is seeking comments. Only one set of comments has been received to date. The macroinvertebrate report is final and will be incorporated into the final report. Cascade Columbia Fisheries Enhancement Group (CCFEG) will make the macroinvertebrate report available to the Committees. If Ecology approves the Chiwawa proposal, CCFEG will be eligible to receive up to 40,000 pounds of salmon carcasses for free. If this happens, the budget could be reduced by $80,000.
- Large Wood Atonement Project – The Sponsor (CCFEG) has received all regulatory permits and construction is scheduled to begin on 16 June. The Department of Natural Resources (DNR) is still working on the Aquatic Lease Agreement, but they have told the sponsor to keep moving forward with the project. A total of 84 pilings have been ordered and will arrive at the staging area on 11 June. Because flows will ultimately dictate the work window, the sponsor is planning on 4-6 weeks of pile driving and they hope to install 5+ pilings per day.
- Silver Protection Project – Jeremy Cram reported that WDFW completed the appraisal and made an offer to the landowners. The landowners will respond to the offer tomorrow (13 June).
- Coulter Creek Barrier Replacement Project – The project sponsor (CCNRD) provided no new update on this project.
- Wenatchee Levee Removal and Riparian Restoration Project – The project is complete and the Rock Island Tributary Committee received a final report from the sponsor (CCNRD).
- Upper Beaver Habitat Improvement Channel Restoration Project – The project sponsor (Methow Salmon Recovery Foundation; MSRF) indicated that upper Beaver Creek experienced flows in May that exceeded the full width capacity of the new channel in both of the no-cut zones. Excess flow activated the historic flood zone beyond the defined channel. Although floodplain activation is a primary objective of the project, the initial activation resulted in mobilization of about fifty years of downed wood and debris. This resulted in the development of several debris dams. The sponsor planted additional vegetation in the staging area between the diversion and Upper Beaver Creek Road and in the section of the canal converted into enclosed pipe. Visual monitoring and photo documentation continues at the site. In addition, the sponsor and Anchor QEA evaluated the new diversion structure to see if it is able to deliver the full instantaneous flow authorized by the water right. The evaluation demonstrated that the diversion is capable of delivering a volume of water in excess of the authorized quantity.
- Okanogan Basin Stream Discharge Monitoring – The sponsor (Colville Tribes) has contracted with the USGS to purchase the necessary monitoring equipment. The equipment was installed to monitor stream discharge in Omak and Salmon creeks. The stations are up and running with all data posted to the internet.
- Shingle Creek Fish Passage Project – Chris Fisher reported that construction is scheduled to begin 15 July. Re-vegetation work will occur during autumn 2014. He also noted that their engineer (Wayne Cornwall) has started his own business. The current thinking is to use Anchor QEA to implement and oversee the design developed by Wayne.

- Methow/Chewuch Shallow Groundwater Monitoring Project – The sponsor (CCFEG) started data QA/QC work. Aspect has provided some preliminary groundwater information, but will continue to analyze the Burns-Garrity data and provide next steps to improve data accuracy. Next steps include finalize QA/QC of the data. Matt Shales (CCFEG) provided additional information on this project (see Section IV and Attachment 1).
- MVID Instream Flow Improvement Project – No new update from the project sponsor (TU).
- Silver Side Channel Design Project – The sponsor (CCFEG) has been refining the conceptual design, including consideration of initial feedback from the field tours. Additionally, the sponsor continues to incorporate design feedback from WDFW and USFWS, and is working closely with IMA to ensure that all comments are considered. The conceptual is very close to being finalized. The sponsor is still working on identifying actions for the lower 1/3 of the side channel where the mainstem has a strong backwater influence on the side channel. Thus, the sponsor has not yet developed preliminary designs. The USFWS and CCFEG continue to collect surface and groundwater data at the project site. Next steps include development of preliminary designs.
- Twisp to Carlton Reach Assessment Project – A kick off meeting was held on 14 May with the sponsor (CCFEG), Cardno Entrix, BOR, and the Upper Columbia Salmon Recovery Board. The meeting was an important step to ensure that specific goals and objectives were met and to establish each entities role in the reach assessment process. Next steps include continuing to collect background information, identifying data gaps, and begin addressing those gaps. The sponsor also met with three landowners living within the project reach to discuss river processes and some erosion issues they have witnessed.
- Similkameen RM 3.8 Project – Chris Fisher reported that the Okanogan Conservation District is working with Cardno Entrix on the design work. They are waiting for lower flows (late July) to begin field surveys. Designs should be available for review in September or October.
- Remove Collapsed Bridge from Shingle Creek Project – No new update from the project sponsor (Okanagan Nation Alliance).
- Entiat Stillwaters Gray Reach Acquisition – Cascade Chelan Appraisal has completed appraisals for all four properties. The sponsor (Chelan Douglas Land Trust) will provide additional updates before the next meeting.

IV. Silver Side Channel Design and Groundwater Monitoring Presentation

After receiving the draft conceptual for the Silver Side Channel Design Project in May, the Committees asked if CCFEG could give a short presentation on the Silver Side Channel Design Project and on the results of their groundwater monitoring work. Matt Shales and Jason Lundgren presented their work to the Committees during the June meeting (their presentation is appended as Attachment 1).

Matt talked about all the restoration elements of the Silver Side Channel Design Project, including the use of Hancock Springs as an analog for the Silver Side Channel project. Matt showed the changes in the Silver Side Channel over time, the locations of their monitoring stations, and results of stream flow and water velocity modeling work. He indicated that the goals of the project are to increase overwinter rearing habitat, possibly increase spawning habitat (for steelhead and summer Chinook), restore floodplain and riparian function, increase thermal refugia, and increase fish food (macroinvertebrates). Matt indicated that the next steps are to develop the preliminary designs (late July) and conduct summer macroinvertebrate and fish use monitoring in the side channel.

The Committees asked CCFEG to describe how each proposed restoration element links with a specific fish life stage and how fish will respond to each proposed element. They also asked the sponsor to explain why vegetation mats and alcoves are necessary in the success of this project, and why the potential benefits of this project justify the cost.

Matt then described the groundwater monitoring they have been doing on the Silver, Lewisia, and Burns-Garrity floodplains. He showed the locations of the groundwater monitoring wells and the elevation of groundwater and its relationship to the elevation of the adjacent rivers. He noted that all the groundwater elevations track closely with the elevation of the adjacent rivers. CCFEG will provide a report to the Tributary Committees once the monitoring is complete and all the data have been analyzed.

V. Small Projects Program Application: Silver Reach Mining Impacts Evaluation/Feasibility Study

In April, the Committees reviewed a Small Projects Program application from Trout Unlimited titled *Silver Mining Impacts Evaluation/Feasibility Study*. The purpose of the project was to evaluate the extent to which heavy metal contamination from local mining activities at the Red Shirt Mill (RM 39.5) and the Alder Creek confluence wetland (RM 34-34.5) may affect the feasibility of restoration actions proposed in the Twisp to Carlton Reach on the Methow River. This work would supplement the Twisp to Carlton Reach Assessment and would provide practical application and guidance on how to minimize and reduce exposure risks to fish species while maximizing biological benefit. The total cost of the project was $99,430. The sponsor requested $96,355 from HCP Tributary Funds. Because of a lack of information, the Committees were unable to make a funding decision and requested additional information.

Following the April meeting, the sponsor provided responses to the Committees' questions. During the May meeting, the Committees reviewed and discussed the available information and responses, and concluded that they needed more time to consider the proposal. Since then, the Committees have investigated why Ecology has not taken a larger role in this effort, given that they assigned it a hazard ranking of 1. In addition, the Committees discussed this project with a USFWS toxicologist (Russ MacRae).

In short, the USFWS toxicologist recommended that the sponsor should not waste time and effort sampling the sites, because he is certain that the work will show that the concentrations of metals at the sites will support additional removal and stabilization. Instead, he recommended that the sponsor partner with Ecology, EPA, and/or the USFWS to seek funding to remove or stabilize the toxic sediments. They can then collect samples to see if the actions were successful. The sponsor agreed to work with the USFWS on next steps. Thus, the Committees have tabled this proposal until they hear back from the project sponsor.

VI. Okanagan Nation Alliance Monitoring Proposals

In March, the Okanagan Nation Alliance (ONA) asked if the Committees would be interested in funding some level of monitoring on four different restoration projects in the Upper Okanagan River basin. The Committees requested that ONA provide additional information on the four projects. In April, ONA provided the Committees with additional detail on the four restoration projects that ONA would like to monitor. The Committees reviewed the four projects and requested that ONA submit proposals on the following two projects:

1. **<u>Penticton Channel Monitoring Spawning Platforms</u>**. The objective of this study is to monitor the effects of the proposed spawning platforms as adaptive management for designing and construction of more platforms. The Committees requested that the proposal describe how ONA intends to document changes in the quantity and quality of spawning habitat in the Penticton Channel. This work should focus on quantifying spawners (redd surveys), egg retention (carcass surveys), egg-to-fry success, and habitat conditions (e.g., gravel stability, thalweg slope, fine sediment deposition, and gravel composition) within treated and untreated

areas. The Committees were not interested in monitoring macrophytes, macroinvertebrates, water levels, or water depths and velocities during spawning.

2. **ORRI Phase II Effectiveness Monitoring**. The objective of this study is to monitor the effects (channel, hydraulic, and biological responses) of ORRI-Phase II restoration work and to continue to monitor the long-term effects of Phase I and VDS 13 restoration. The Committees requested that the proposal include all activities associated with channel and hydraulic responses, and aquatic biological responses (save macrophytes and macroinvertebrates). That is, the monitoring of macrophytes and macroinvertebrates should not be included in the proposal.

In May, the Committees received the two full proposals from ONA. After carefully evaluating each proposal, ***the Rocky Reach Tributary Committee approved funding for the Penticton Channel Monitoring Spawning Platforms and the Wells Tributary Committee approved funding for the ORRI Phase II Effectiveness Monitoring Project***. As required in the HCPs, Chelan and Douglas PUDs will provide funding for the approved monitoring projects through the Rocky Reach and Wells Tributary Assessment Programs rather than through the Rocky Reach and Wells Plan Species Accounts.

VII. General Salmon Habitat Program Draft Proposals

The Committees received nine General Salmon Habitat Program draft proposals. The Committees reviewed each draft proposal and selected those that they believe warranted a full proposal. Projects that the Committees dismissed were either inconsistent with the intent of the Tributary Fund or did not have strong technical merit. The Committees assigned draft proposals to one of two categories: Fundable and Not Fundable. It is important to note that these are ratings of draft proposals and do not reflect ratings of full proposals. The Committees directed Tracy to notify sponsors with appropriate projects to submit a full proposal, with a discussion of the questions/comments identified for each draft proposal listed below. Tracy will also notify sponsors with projects that have no chance or a low likelihood of receiving funding from the Tributary Committees.

Upper Peshastin Migration Barrier Design Project (Fundable)

The Committees would entertain a final proposal **if** the project sponsor (Chelan County Natural Resources Department) addresses the following comments/suggestions:

- Focus the proposal on addressing the recruitment of upslope sediments to the stream channel. This should include methods for removing, decommissioning, or stabilizing the road on the hillside and using planting techniques to stabilize the slopes. For the latter, the sponsor should consider the bioengineering techniques developed by Chris Hoag.
- There is no need to seek funding for designing fish passage through the reach. Rather, submit a proposal that will implement actions to improve fish passage (e.g., the creation of step-pools).
- The proposal needs to include the involvement of WDFW and WDOT. At a minimum, these entities need to be included in a supporting role on the project.

Skinney Creek Floodplain Restoration Design Project (Not Fundable)

The Committees recommend that this project, sponsored by the Chelan County Natural Resources Department, should not be submitted as a full proposal to the Tributary Committees for the following reason:

- Because of the small drainage area, low peak flows, and relatively steep gradient (6%), the reactivation of the floodplain will have low biological benefit.

Nason Creek Kahler Design Project (Not Fundable)

The Committees recommend that this project, sponsored by the Chelan County Natural Resources Department, should not be submitted as a full proposal to the Tributary Committees for the following reasons:

- There is no need to do additional assessments or design work in the Kahler Reach.
- The sponsor should identify restoration options to address each of the habitat impairments within the reach, seek approval from the stakeholders (BPA, Weyerhaeuser, and USFS) about which actions are most appropriate, and then submit a proposal seeking funds to implement the preferred restoration actions.

Restore Lower Peshastin Creek—Design Project (Not Fundable)

The Committees recommend that this project, sponsored by the Cascade Columbia Fisheries Enhancement Group, should not be submitted as a full proposal to the Tributary Committees for the following reasons:

- Potential landowner issues and the cost of moving the road and power lines to increase the length of channel 200 feet will not be cost effective.
- The biological benefits associated with this project will likely be low and will not justify the cost.

Barkley Irrigation Company—Under Pressure Project (Fundable)

The Committees recommend that the project sponsor (Trout Unlimited) address the following comments/suggestions as they develop the full proposal:

- Confirm who will be responsible for covering the long-term costs of O&M.
- Request no more than $300,000 from the Tributary Committees.

Methow Watershed Beaver Reintroduction Project (Fundable)

The Committees recommend that the project sponsor (Methow Salmon Recovery Foundation) address the following comments/suggestions as they develop the full proposal:

- Address the comments provided by the RTT.
- Summarize any monitoring data that have been collected, or include within the proposal a request for funding to analyze the monitoring data.

MSRF Methow Riparian Stewardship Program Project (Not Fundable)

The Committees recommend that this project, sponsored by the Methow Salmon Recovery Foundation, should not be submitted as a full proposal to the Tributary Committees for the following reasons:

- Riparian vegetation, if planted correctly, should not need long-term stewardship. If the plantings are surviving poorly, then the planting techniques were likely inappropriate.
- The draft proposal did not define "success," nor did it explain why the plantings were unsuccessful and in need of long-term stewardship.

Burns-Garrity Floodplain Enhancement Project (Not Fundable)

The Committees recommend that this project, sponsored by the Cascade Columbia Fisheries Enhancement Group, should not be submitted as a full proposal to the Tributary Committees for the following reason:

- The project needs to be more fully thought out before a proposal is submitted for funding. That is, more work needs to be done to determine what exactly can or should be done to activate the floodplain and side channel.

Silver Side Channel Revival Project (Fundable)

The Committees recommend that the project sponsor (Cascade Columbia Fisheries Enhancement Group) address the following comments/suggestions as they develop the full proposal:

- Show how each proposed restoration element links with a specific fish life stage and how fish will respond to each proposed element.
- Explain why vegetation mats and alcoves are necessary in the success of this project.
- Add some language in the proposal stating why the potential benefits of this project justify the cost.

Tracy will share this information with project sponsors by Monday, 16 June. The Committees hope this feedback will help sponsors develop full proposals, which are due on 24 June. The Committees will evaluate final proposals on Thursday, 10 July.

VIII. Information Updates

The following information updates were provided during the meeting.

1. Approved Payment Requests in May and June:

   Rocky Reach Plan Species Account:

   - $9,280.00 to the Colville Tribes for the Okanogan Basin Stream Discharge Monitoring Project (for March work).
   - $9,280.00 to the Colville Tribes for the Okanogan Basin Stream Discharge Monitoring Project (for April work).
   - $619.97 to the Okanogan Conservation District for the Similkameen RM 3.8 Design Project.
   - $831.66 to Okanagan Nation Alliance for the Fish Passage at Shingle Creek Dam Project.
2. Joe Connor, BPA, gave a brief update on their funding interests on the Nason Creek RM 4.6 Side Channel Reconnection Construction Project. Recall that the purpose of this project is to provide high-flow refugia and rearing habitat for adult and juvenile salmonids in Nason Creek. The project proposes to reconnect a 4.6-acre, high-flow channel to the mainstem near RM 4.6. Last year, the Rock Island Tributary Committee approved $88,000 for this project. The total cost of the project was $525,030. BPA considered funding the remaining $437,030; however, Joe reported that the total cost of the project has increased to $712,505 and BPA will not fund the remaining balance ($624,505). Therefore, the project does not currently have a cost share.
3. Chris Fisher reported that fish passage is now available at Skaha Dam on the Okanagan River (see photo below). This will allow fish passage into the Penticton Channel, Shingle and Shatford creeks, and other small tributaries upstream from the dam. Chris noted that it is a matter of time before passage is provided at Penticton Dam (the last impassible dam preventing passage of fish into Okanagan Lake).

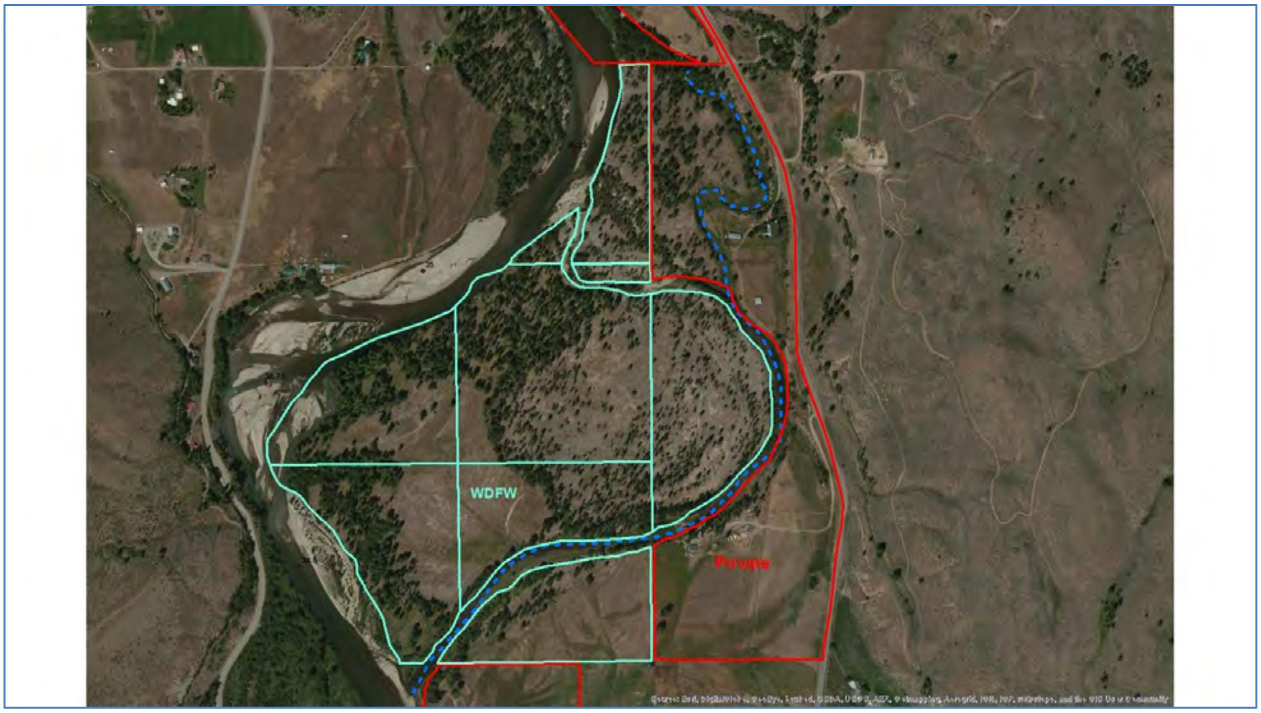
IX. Next Steps

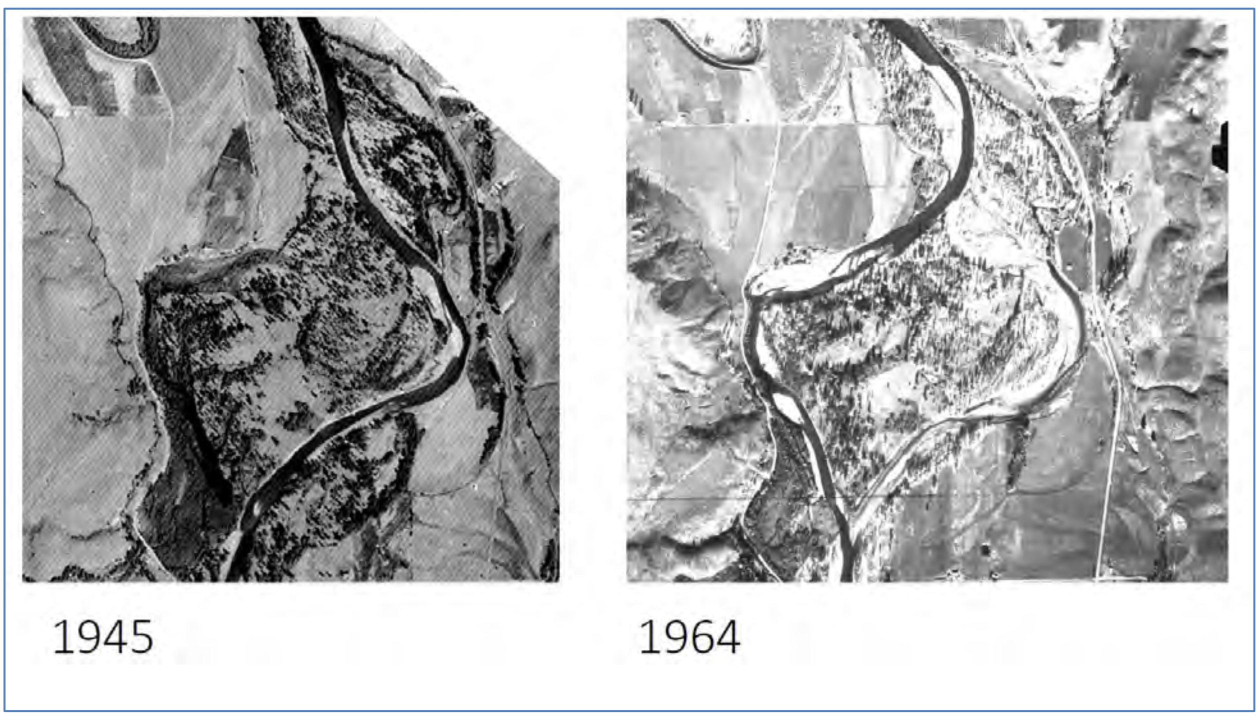
The next meeting of the Tributary Committees will be on Thursday, 10 July at Grant PUD in Wenatchee.

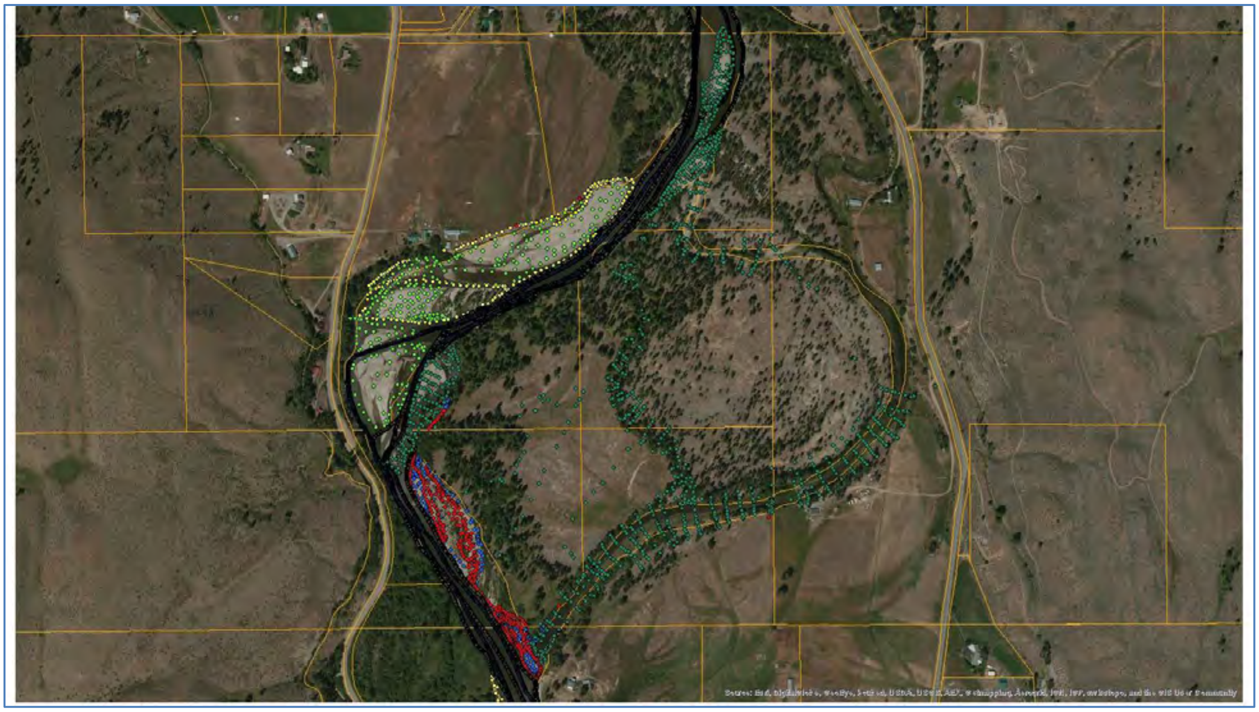
Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

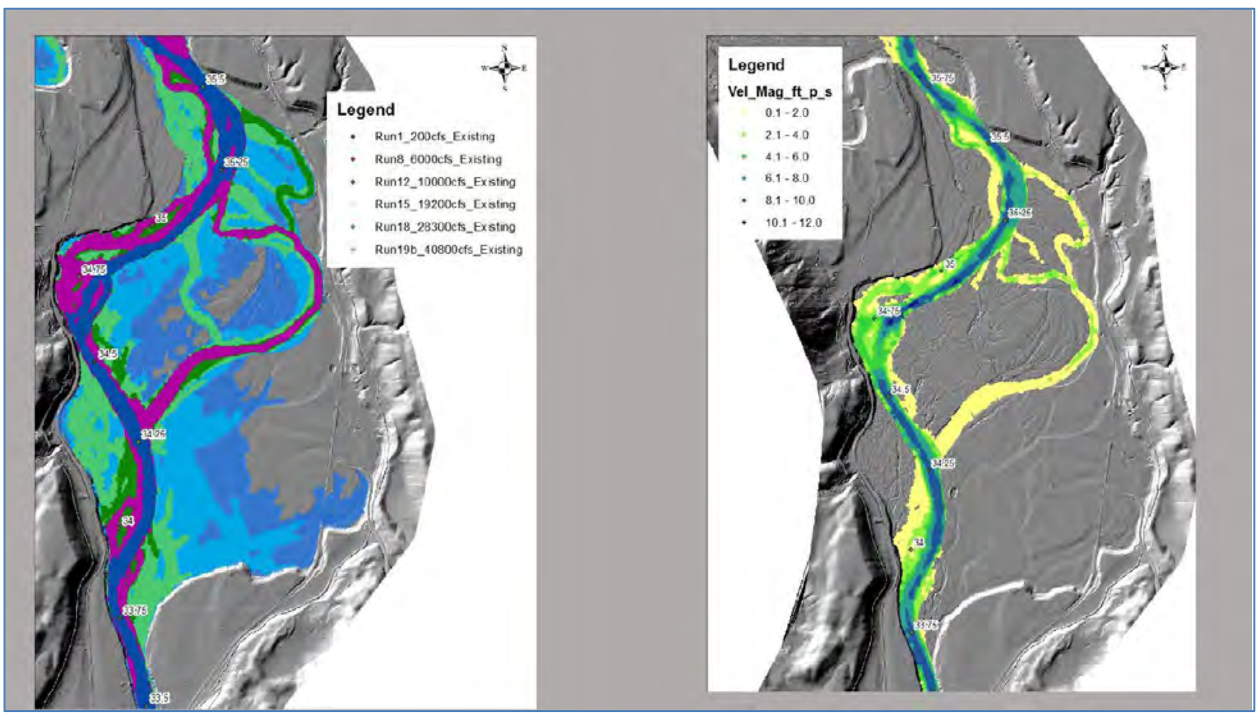
Attachment 1

Presentation by Matt Shales on the Silver Side Channel Design and Groundwater Monitoring Projects


WDFW
Private


1945
1964

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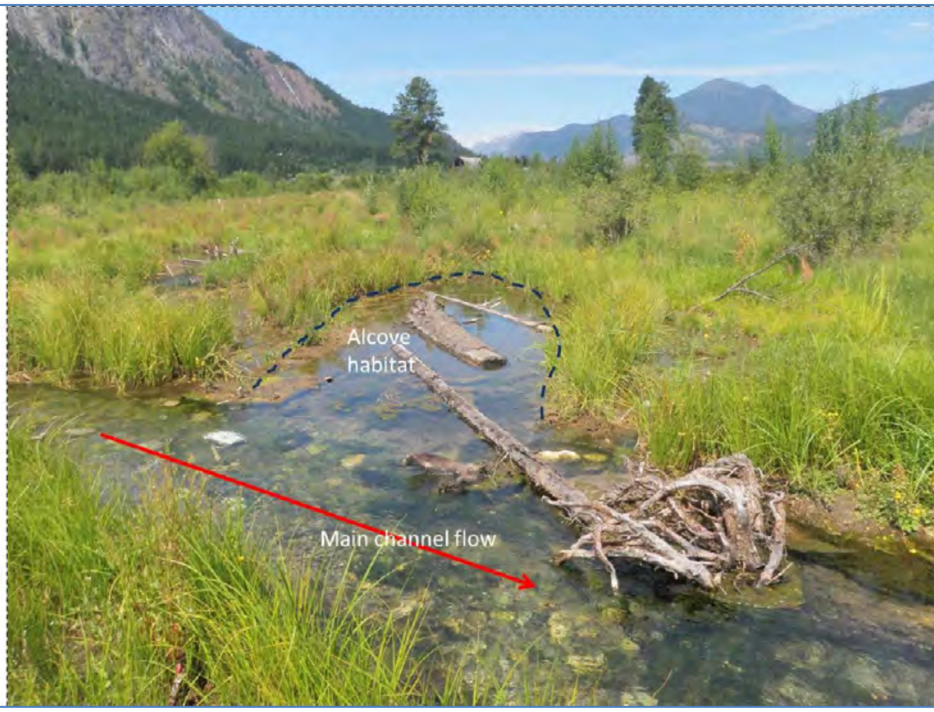
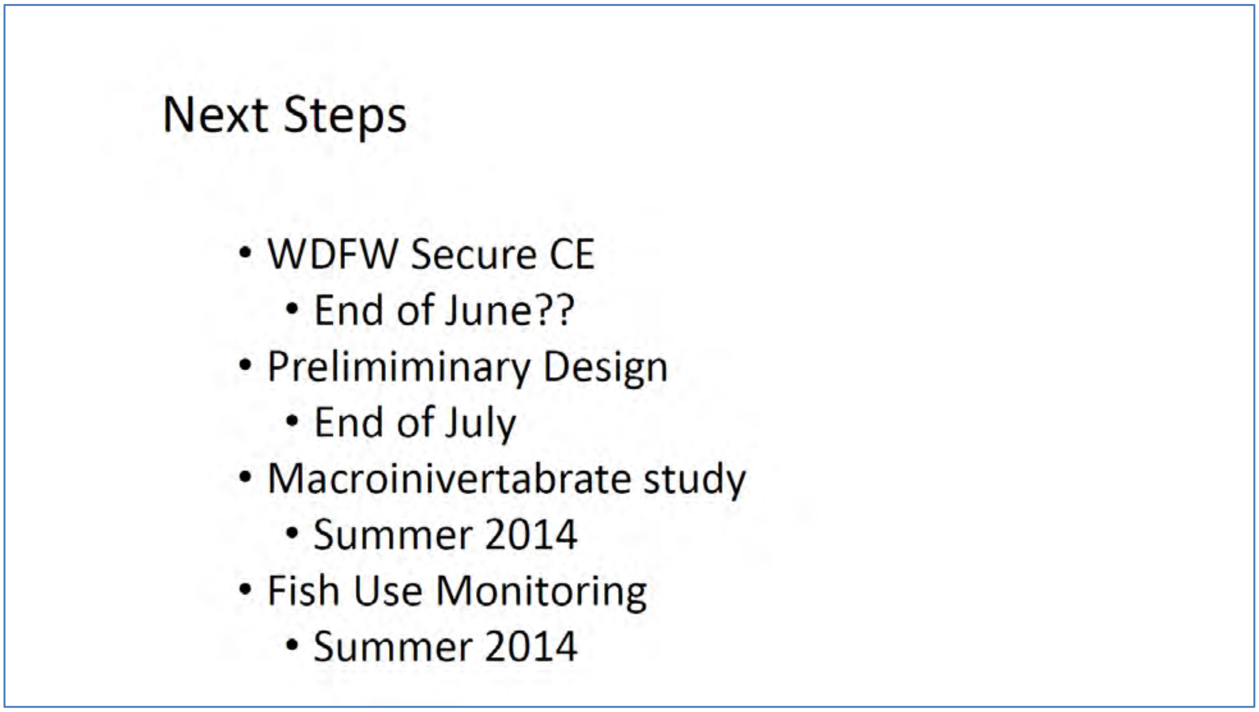
Run15_19200cfs_Existing
Run18_28300cfs_Existing
Run19b_40800cfs_Existing
Legend
Vel_Mag_ft_p_s
0.1 - 2.0
2.1 - 4.0
4.1 - 6.0
6.1 - 8.0
8.1 - 10.0
10.1 - 12.0

Project Goals

- Overwintering Habitat
- Methow Riparian Restoration Goals WDFW
- Potential Spawning?
- Year round thermal refugia
- Great food source
- Floodplain Restoration!!

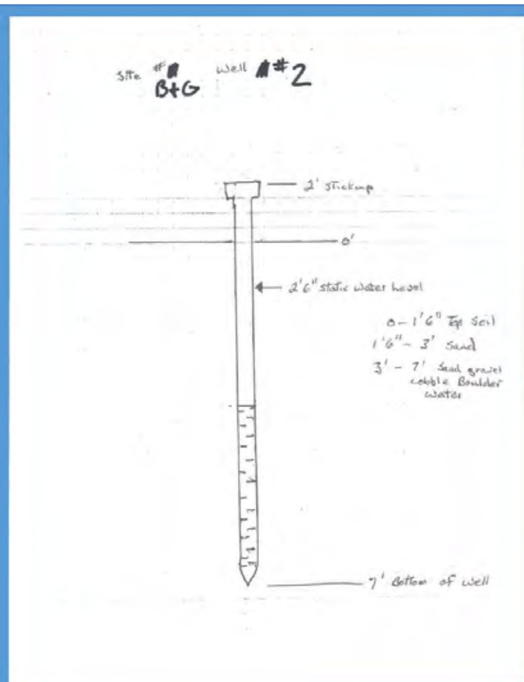
Hancock Springs is a great analog for Silver


Alcove habitat
Main channel flow

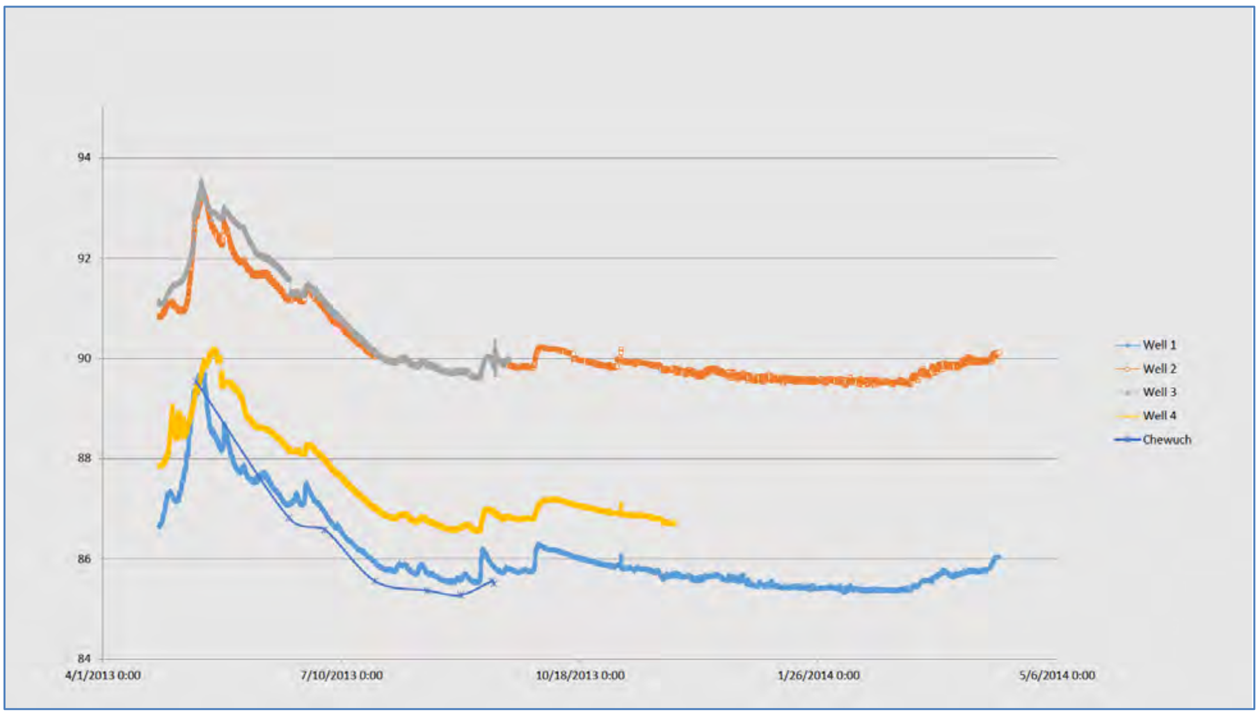

Next Steps
• WDFW Secure CE
• End of June??
• Prelimiminary Design
• End of July
• Macroinivertabrate study
• Summer 2014
• Fish Use Monitoring
• Summer 2014

Methow Chewuch Monitoring

- Data collection April 2013 – November 2014
- 3 sites all on WDFW Property
  - Silver Floodplain
  - Lewisia Floodplain
  - Burns-Garrity Floodplain
- Shallow groundwater well (piezometers)
  - ➢ Groundwater Elevation
  - ➢ Relationship to Adjacent River
  - ➢ Flow Direction
  - ➢ Assumption of Discharge
- Water level loggers
  - ➢ Continuous recording of water level and temperature
- Staff Gauges
  - ➢ River Stage




#2
#3
#4
#1
Burns-Garrity
Google earth


94
92
90
88
86
84
4/1/2013 0:00
7/10/2013 0:00
10/18/2013 0:00
1/26/2014 0:00
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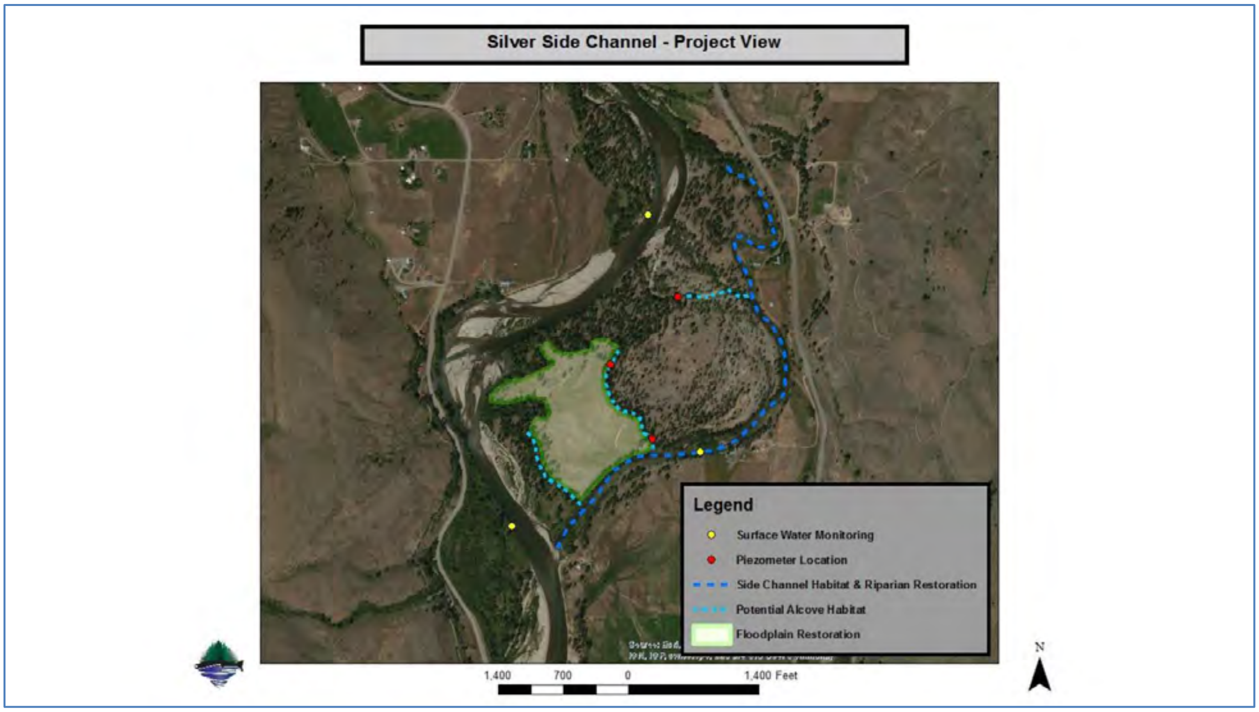
Well 1
Well 2
Well 3
Well 4
Chewuch


Silver Side Channel - Project View
Legend
Surface Water Monitoring
Piezometer Location
Side Channel Habitat & Riparian Restoration
Potential Alcove Habitat
Floodplain Restoration
1,400
700
0
1,400 Feet
N


SSC#1
SSC#2
SSC#3
Methow River Stage (ft)
5.5
4.5
3.5
2.5
1.5
0.5
-1.5
-2.5
-3.5
-4.5
4/26/2013
5/3/2013
5/10/2013
5/17/2013
5/24/2013
5/31/2013
6/7/2013
6/14/2013
6/21/2013
6/28/2013
7/5/2013
7/12/2013
7/19/2013
7/26/2013
8/2/2013
8/9/2013
8/16/2013
8/23/2013
8/30/2013
9/6/2013
9/13/2013
9/20/2013
9/27/2013
10/4/2013
10/11/2013
10/18/2013
10/25/2013
11/1/2013
11/8/2013
11/15/2013
11/22/2013
11/29/2013


Lewisia Floodplain
#3
#2
#1
Google earth

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Notes 10 July 2014

Members Present: Lee Carlson (Yakama Nation), Jeremy Cram (WDFW), Chris Fisher (Colville Tribes), Steve Hays (Chelan PUD), Tom Kahler (Douglas PUD), Kate Terrell (USFWS), Justin Yeager (NOAA Fisheries), and Tracy Hillman (Committees Chair).

Others Present: Becky Gallaher (Tributary Project Coordinator). Joe Connor (Bonneville Power Administration) joined via conference call during the discussion on GSHP Proposal Review and Funding Coordination.

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met at Grant PUD in Wenatchee, Washington, on Thursday, 10 July 2014 from 9:00 am to 12:20 pm.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting and the Committees adopted the proposed agenda with the following addition:

- Discuss the addition of Tom Walters as an approved appraiser.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 12 June 2014 meeting notes with edits.

III. Monthly Update on Ongoing Projects

Becky Gallaher gave an update on funded projects. Most are progressing well or had no salient activity in the past month.

- Nason Creek Upper White Pine Reconnection – The project is complete and the sponsor (Chelan County Natural Resource Department; CCNRD) has submitted the final report to the Rock Island Tributary Committee.
- Chewuch River Instream Flow Project – The project is complete and the sponsor (Trout Unlimited) will submit a final report soon.
- Nutrient Enhancement Assessment Project – PACE Engineering has completed the Nutrient Enhancement Assessment Report and submitted it to Ecology for review. The sponsor (Cascade Columbia Fisheries Enhancement Group; CCFEG) received commitment from Ecology, who will provide an Administrative Order to do nutrient enhancement work in the Chiwawa River basin. Unfortunately, the notification will come too late to receive the free analogs from WDFW in 2014. However, they will be eligible for free analogs in 2015.
- Large Wood Atonement Project – Construction on this project began on 16 June. So far, 45 pilings have been installed. The sponsor (CCFEG) is working with Columbia Helicopter.

Placement of whole trees should occur in mid-September. Notices about the project have been posted at a couple main access points and on the first large wood structure.

- Silver Protection Project – Jeremy Cram reported that WDFW completed the appraisal and made an offer to the landowners. The current agreement with the landowners allows slight grazing on the entire easement and provides no public access. The Committees voiced concern about the agreement and stated that there should be no grazing allowed on the easement. They directed Jeremy to contact the WDFW Real Estate Supervisor and let him know that the Committees are not willing to fund an easement that allows grazing. At a minimum, the Committees would allow slight grazing only on the southeast parcel, which was not part of the original easement/acquisition. The southeast parcel was added during negotiations between WDFW and the landowners. If WDFW is unable to eliminate grazing, the Committees will consider purchasing the property through a different sponsor.
- Coulter Creek Barrier Replacement Project – The project sponsor (CCNRD) provided no new update on this project.
- Upper Beaver Habitat Improvement Channel Restoration Project – The project sponsor (Methow Salmon Recovery Foundation; MSRF) indicated that work in June focused on additional re-vegetation and protective cage and fence installation. Other work included monitoring channel formation and the diversion facility operation.
- Okanogan Basin Stream Discharge Monitoring – The sponsor (Colville Tribes) provided no new update on this project.
- Shingle Creek Fish Passage Project – Chris Fisher reported that construction is scheduled to begin in July. Re-vegetation work will occur during autumn 2014. The Okanagan Nation Alliance (ONA) has about $5,000 for an engineer to oversee the implementation of Wayne Cornwall's design. ONA is negotiating with Anchor QEA on the budget and oversight job.
- Methow/Chewuch Shallow Groundwater Monitoring Project – The Lewisia data have been finalized and sent to the Methow Salmon Recovery Foundation (MSRF). Data loggers continue to collect information at all three sites. Aspect Consulting has provided some preliminary groundwater information, but will continue to analyze the Burns-Garrity data and provide next steps for further data analysis.
- MVID Instream Flow Improvement Project – The project sponsor (TU) reported that the Bureau of Reclamation awarded design contracts for the West pipe system and E1 at the end of May and held kick-off meetings in early June. Construction on the well field and East main pipe is scheduled to start in October 2014 (subject to permitting). Construction on the E1 lateral is proposed to begin in spring 2015. West side pipe construction will begin during the 2015 irrigation season.
- Silver Side Channel Design Project – The Sponsor (CCFEG) appreciated the opportunity to present the current design to the Committees in June. A meeting was held with the design team to finalize the conceptual plan and move forward with the preliminary design. WDFW has been working internally on providing specific design criteria. That information will be incorporated into preliminary designs.
- Twisp to Carlton Reach Assessment Project – The sponsor (CCFEG) noted that Cardno Entrix continues to collect background information. In addition, they are identifying data gaps.
- Similkameen RM 3.8 Project – Chris Fisher reported that there is no new activity on this project. The Okanogan Conservation District and Cardno Entrix are waiting for lower flows (late July) to begin field surveys. Designs should be available for review in September or October.

- Remove Collapsed Bridge from Shingle Creek Project – No new update from the project sponsor (Okanagan Nation Alliance).
- Entiat Stillwaters Gray Reach Acquisition – The sponsor (Chelan-Douglas Land Trust) reported that appraisals are complete for all four properties. The Bockhoven South property is ready for closing. The remaining three properties are unsettled.

IV. Budget Amendment Request: Entiat Stillwaters Gray Reach Acquisition

The Chelan-Douglas Land Trust asked the Rocky Reach Tributary Committee if they could move $36,000 from "land purchase" to "sponsor salaries and benefits." The sponsor indicated that the additional funds are needed to develop Stewardship Plans. The landowners are unwilling to pay for the stewardship plans. After careful consideration, the ***Rocky Reach Tributary Committee approved the budget amendment***. The total budget amount will not change as a result of this amendment.

V. General Salmon Habitat Program Proposals

The Committees received five General Salmon Habitat Program proposals. Before reviewing the proposals, Becky Gallaher reported that currently there is about $4,074,020 in the Rock Island Plan Species Account, $1,745,241 in the Rocky Reach Plan Species Account, and about $1,228,313 in the Wells Plan Species Account. In addition, and consistent with the Committees' Operating Procedures, members of the Committees identified potential conflicts of interest. Kate Terrell and Jeremy Cram recused themselves from voting on the Silver Side Channel Design project.

Upper Peshastin Migration Barrier Design Project

Chelan County Natural Resource Department is the sponsor of the Upper Peshastin Migration Barrier Design Project. The purpose of this project is to identify fish passage issues, geomorphic site constraints, and design alternatives to address passage for steelhead and bull trout. The potential barrier is located between RM 10.2 and 10.6 on Peshastin Creek. The total cost of the project is $74,500. The sponsor requested $12,000 from HCP Tributary Funds.

Although the Committees would like to see improved passage for steelhead in upper Peshastin Creek, they do not believe that hydraulic modeling and extensive alternatives analyses are necessary. The Committees would like to see a proposal that will implement actions to improve fish passage and slope stability. Based on these concerns, ***the Tributary Committees elected not to fund this project***.

Silver Side Channel Revival Project

Cascade Columbia Fisheries Enhancement Group is the sponsor of the Silver Side Channel Revival Project. The purpose of this project is to increase habitat quality and quantity for salmonids within the one-mile side channel and floodplain corridor. This will be accomplished by increasing sinuosity and groundwater input, improving channel geometry, adding structure and complexity appropriate to the flow regime, developing groundwater-fed alcoves, improving fish passage, adding wood cover throughout the channel, and re-vegetating the riparian zone and floodplain. The Silver Side Channel is located between Twisp and Carlton on the Methow River at about RM 35. The total cost of the project is $1,050,573. The sponsor requested $525,287 from HCP Tributary Funds.

Although the Committees support the proposed project, ***the Tributary Committees elected not to fund this project*** because BPA has agreed to fund the Committees' portion of the project. Nevertheless, the Committees identified a few issues that the sponsor should consider as they move forward with the project. First, the Committees questioned the value of debris jams in the Cottonwood Regeneration/Pine Management areas. They also questioned why the sponsor would thin the pines and try to establish cottonwood galleries. The presence of pines in these areas may suggest that they are not suitable for cottonwoods. Finally, the Committees had some concerns with the four off-channel alcove habitats. These habitats may become disconnected and therefore offer little benefit to target species. In contrast, the Committees see value in the in-channel alcove habitats.

Methow Watershed Beaver Reintroduction Project

The Methow Salmon Recovery Foundation is the sponsor of the Methow Watershed Beaver Reintroduction Project. The purpose of this project is to restore 50 beaver colony sites in strategic locations within the Methow River basin. This action should improve water quality, late-season stream flows, stream habitat complexity, riparian conditions, and sedimentation while helping to ameliorate the effects of climate change. The total cost of the project is $216,000. The sponsor requested $33,500 from HCP Tributary Funds. ***The Wells Committee approved funding for this project.***

The Committees questioned why the sponsor has not analyzed the plethora of monitoring data that has been collected. Following the meeting, the sponsor indicated that they are following their peer-reviewed protocol, which includes three years of pre-treatment data, two years of treatment data, and three years of post-treatment data. They are currently in the treatment phase of the study and therefore do not have all the data necessary to assess adequately the effects of the beaver treatments.

Barkley Irrigation Company—Under Pressure Project

Trout Unlimited – Washington Water Project is the sponsor of the Barkley Irrigation Company—Under Pressure Project. The purpose of this project is to eliminate mortality of ESA-listed fish species, improve stream flows (add up to 26 cfs) within eight miles of the Methow River, eliminate fish stranding within the upper half mile of the diversion side channel, and reconnect Bear Creek with the Methow River. This will be accomplished by building a permanent pressurized irrigation system about two miles downstream from the current diversion. The Barkley diversion is located at RM 48.5 on the Methow River. The total cost of the project is $3,293,180. The sponsor requested $300,000 from HCP Tributary Funds. ***The Rock Island Committee approved funding for this project.***

Icicle Creek District Flow Control Structure Project

Chelan County Natural Resource Department is the sponsor of the Upper Peshastin Migration Barrier Design Project. The purpose of this project is to install a flow control structure to regulate the amount of water that flows down the Icicle Irrigation canal. The control structure will maintain stream flows in the main channel of Icicle Creek. The total cost of the project is $140,633. The sponsor requested $70,000 from HCP Tributary Funds.

Although the original proposal did not identify a benefit to Plan Species, the Committees believe this project will benefit steelhead in Icicle Creek. Therefore, they requested that the sponsor identify the benefit to steelhead and resubmit the proposal. The sponsor resubmitted the proposal as requested by the Committees. ***The Rock Island Committee approved funding for this project.***

Summary of Review of 2014 General Salmon Habitat Program Projects.

Project Name	Sponsor[1]	Total Cost	Request from T.C.	T.C. Contribution[2]
Upper Peshastin Migration Barrier Design	CCNRD	$74,500	$12,000	$0
Silver Side Channel Revival	CCFEG	$1,050,573	$525,287	$0[3]
Methow Watershed Beaver Reintroduction	MSRF	$216,000	$33,500	W: $33,500
Barkley Irrigation Company – Under Pressure	TU-WWP	$3,293,180	$300,000	RI: $300,000
Icicle Irrigation District Flow Control Structure	CCNRD	$140,633	$70,000	RI: $70,000
Total:		**$4,774,886**	**$940,787**	**$403,500**

[1] CCNRD = Chelan County Natural Resource Department; CCFEG = Cascade Columbia Fisheries Enhancement Group; MSRF = Methow Salmon Recovery Foundation; and TU-WWP = Trout Unlimited – Washington Water Project.

[2] RI = Rock Island Plan Species Account; RR = Rocky Reach Plan Species Account; W = Wells Plan Species Account.

[3] BPA elected to fund the Committees' portion of this project.

VI. Information Updates

The following information updates were provided during the meeting.

1. Approved Payment Requests in June and July:

   Rock Island Plan Species Account:

   - $60,565.00 to Cascade Columbia Fisheries Enhancement Group for the White River Large Wood Atonement project.
   - $3,389.16 to Cascade Columbia Fisheries Enhancement Group for the Twisp to Carlton Reach Assessment project.
   - $4,020.33 to the Chelan County Treasurer for the Nason Creek Upper White Pine Reconnection – Chelan PUD Powerline Alternatives Analysis project.
   - $11,615.58 to the Chelan County Treasurer for the Wenatchee Levee Removal and Riparian Restoration project.
   - $1,003.89 to Chelan PUD for project coordination and administration during the second quarter of 2014.

   Rocky Reach Plan Species Account:

   - $5,500.00 to North Meridian Title for the Bockhoven South property, which is part of the Entiat Stillwaters Gray Reach Acquisition project.
   - $10,500.00 to Chelan-Douglas Land Trust for the Entiat Stillwaters Gray Reach Acquisition project.
   - $7,959.93 to the Methow Salmon Recovery Foundation for the Upper Beaver Habitat Improvement Channel Restoration project.
   - $19,523.04 to Cascade Columbia Fisheries Enhancement Group for the Silver Side Channel Design project.
   - $298.26 to the Okanogan Conservation District for the Similkameen RM 3.8 Design project.
   - $1,222.16 to Chelan PUD for project coordination and administration during the second quarter of 2014.

   Wells Plan Species Account:

   - $7,959.92 to the Methow Salmon Recovery Foundation for the Upper Beaver Habitat Improvement Channel Restoration project.
   - $916.62 to Chelan PUD for project coordination and administration during the second quarter of 2014.

2. Becky Gallaher reported that CCFEG asked if they could amend their project budgets to include meals as an allowable cost. CCFEG would like to bill the projects for lunches and maybe dinners when they travel to project sites outside the Wenatchee River basin. After consideration, the Committees denied the request and recommended that CCFEG pack their meals when they travel to sites outside the Wenatchee River basin. However, meals are covered if they have overnight travel.

3. Tracy Hillman noted that he received an email from Jennifer Goodridge-Hadersberger asking if CCNRD and BOR could attend the September meeting to describe the proposed approach for the Nason Creek Upper White Pine Restoration Project. The Committees agreed to invite the County and BOR to the meeting, and also requested the presence of BPA (Joe Connor and Sean Welch). The Committees directed Tracy to invite the County, BOR, and BPA to the September meeting.
4. Becky Gallaher said that Chelan-Douglas Land Trust used Tom Walters as their appraiser on the Entiat Stillwaters Gray Reach Acquisition project. Becky spoke with Larry Rees (the Committees' approved appraiser) and Larry indicated that Tom is an excellent appraiser and should be added to the Committees' list of approved appraisers. The Committees approved Tom as an appraiser, but asked Becky to get feedback from Chelan PUD's Real Estate staff on Tom Walters.

VII. Next Steps

If necessary, the next meeting of the Tributary Committees will be on Thursday, 14 August at Grant PUD in Wenatchee. If there are no agenda items for an August meeting, the next meeting date would be Thursday, 11 September.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Notes 11 September 2014

Members Present: Lee Carlson (Yakama Nation), Jeremy Cram (WDFW), Chris Fisher (Colville Tribes), Steve Hays (Chelan PUD), Tom Kahler (Douglas PUD), Kate Terrell (USFWS), Justin Yeager (NOAA Fisheries), and Tracy Hillman (Committees Chair).

Others Present: Becky Gallaher (Tributary Project Coordinator) and Jeff Osborn (Chelan PUD alternate). Those present for the Upper White Pine presentation were Steve Kolk and Rob Richardson (U.S. Bureau of Reclamation), Jennifer Hadersburger (Chelan County Natural Resources Department), Debbie Williams and Dave Duvall (Grant PUD), and Denny Rohr (PRCC Habitat Subcommittee facilitator).

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met at Douglas PUD Auditorium in East Wenatchee, Washington, on Thursday, 11 September 2014 from 9:00 am to 12:50 pm.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting and the Committees adopted the proposed agenda with the following changes:

- Removal of the White River Large Wood Atonement Budget Amendment Request (the project sponsor did not submit an amendment request).
- Addition of Plan Species Account Auditing Discussion.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 10 July 2014 meeting notes with edits.

III. Monthly Update on Ongoing Projects

Becky Gallaher gave an update on funded projects. Most are progressing well or had no salient activity in the past month.

- Large Wood Atonement Project – The sponsor (Cascade Columbia Fisheries Enhancement Group; CCFEG) reported that piling installation was completed in July. About 130 pilings were installed at 27 locations. Helicopter placement of whole trees and racking material is scheduled for 16 September.
- Silver Protection Project – Jeremy Cram reported that there is only one Conservation Easement (CE) and it is on the entire property. The CE will prohibit livestock grazing on the property west of the side channel and will require livestock to be kept away (fenced) from the side channel on the southeast side. Recall that the southeast parcel was not part of the original easement/acquisition. The southeast parcel was added during negotiations between WDFW and the landowners. The Committees voiced concern about the likely possibility of livestock grazing on the protected areas because of poor fence maintenance. Jeremy suggested the idea of including

stewardship money ($10,000) for fence maintenance. The money could be given to the Methow Salmon Recovery Foundation (MSRF) to monitor and maintain the fence. The Committees also discussed the possibility of purchasing the property through a different sponsor. Most members agreed with this approach and directed Chris Fisher to contact Chris Johnson (MSRF) to see if MSRF would be willing to discuss an acquisition with the landowner. The Committees indicated that they would be willing to fund the entire acquisition if there is a need to purchase the property quickly.

- Coulter Creek Barrier Replacement Project – The project sponsor (Chelan County Natural Resources Department; CCNRD) provided no new updates on this project.
- Upper Beaver Habitat Improvement Channel Restoration Project – Following the July fires and August flood in the Methow River basin, the project sponsor (MSRF) completed site assessments for damages to equipment and vegetation. A site coordination meeting took place between Okanogan Electric Coop, Okanogan County Public Works, and MSRF following unanticipated clearing of vegetation and relocation of power lines through the project area. New monitoring points were established to replace monitoring points damaged by the fire. The project engineer will return to the site in early September to evaluate low water operations and conduct sluice tests on the diversion. The sponsor will complete an assessment on vegetation damage and estimate replacement costs, as well as identify measures necessary to address lost wood complexity in the channel.
- Okanogan Basin Stream Discharge Monitoring – The sponsor (Colville Tribes) provided no new updates on this project.
- Shingle Creek Fish Passage Project – Chris Fisher reported that the project is complete and about 23 miles of stream are now available for colonization by anadromous species. All four weirs are in place and the rock toe is complete. The streambanks are landscaped and ready for re-vegetation, which will occur this fall.
- Methow/Chewuch Shallow Groundwater Monitoring Project – Aspect Consulting has completed the groundwater analyses for the Burns-Garrity site (a memo of their analyses was presented to the Wells Committee during the meeting). The memo contains preliminary estimates for groundwater discharge to a constructed channel during low water. It indicates that the shallow aquifer is connected to and fed by the Chewuch River, that the aquifer fluctuates by over three feet with a peak in mid-May and begins decreasing in August to its lowest levels in February, and that the aquifer has a gradient of about 0.006 feet/feet. Finally, the memo offers a preliminary estimate for groundwater discharge to a 1,000-foot long constructed channel. Based on a simple mathematical expression of groundwater discharge, aquifer contribution during low water could be about 0.1-1.3 cfs. The Wells Committee noted that this is a large range and it would be nice to have a more precise estimate. Nevertheless, the discharge estimates indicate that the side channel should be developed as a seasonal, high-flow channel. The estimated groundwater flows are not sufficient to support a perennial channel. Data loggers continue to collect information at all three sites.
- MVID Instream Flow Improvement Project – The project sponsor (TU) reported that they continue to participate in MVID Directors' Meetings, and Operations and Executive Team meetings. The bid documents for the East Main pipe were advertised and sent to interested contractors. They anticipate starting construction in mid-October. In addition, project implementation contracts between TU and MVID were signed as were the Trust Water Right Agreements between Ecology and MVID. The new Water Right Reports of Examination were posted and the 30-day review period ended on 24 August with no comments. Discussions continued with BOR and Anchor QEA on how best to contract the tree removal work. Landowner outreach continued with planning for neighborhood meetings, which will continue through

September. Easement negotiations continue for the new proposed pipe alignments, staging areas, and the production well field. Finally, permitting is close to completion.

- Silver Side Channel Design Project – In early August, the consultant conducted groundwater investigations, including multi-parameter water quality testing and temporary installation of in-channel piezometers. This information, combined with the existing groundwater and surface water monitoring, will provide an understanding of the site hydrology. The design team met for a two-day meeting, which included fieldwork to collect additional topographical and vegetation data. Additionally, the meeting provided the consultant with the remaining design criteria to finish preliminary designs. Preliminary designs will be available in early September.
- Twisp to Carlton Reach Assessment Project – The sponsor (CCFEG) noted that data collection is nearly complete. Cardno Entrix recently began the data analysis and assessment phase of the project.
- Similkameen RM 3.8 Project – Chris Fisher reported that Cardno Entrix met with the landowner and began surveying the project area. Designs should be available for review in October or November.
- Remove Collapsed Bridge from Shingle Creek Project – This project is complete and a final report will be coming soon.
- Entiat Stillwaters Gray Reach Acquisition – The sponsor (Chelan-Douglas Land Trust) provided no new updates on this project.
- Icicle Irrigation Flow Structure – The sponsor (CCNRD) provided no new updates on this project.
- Post-Fire Landowner Assistance/Habitat Protection in Beaver and Frazer Creeks – The Tributary/Sponsor Agreement is ready for signature.

IV. Budget Amendment Request: Wenatchee Nutrient Assessment – Treatment Design

In August, the Cascade Columbia Fisheries Enhancement Group asked the Rock Island Tributary Committee if they could move $9,606.52 from “Sponsor Salaries and Benefits” to “Professional Services.” The sponsor indicated that the additional funds were needed to complete the scientific report. In August, the ***Rock Island Tributary Committee approved the budget amendment***. The total budget amount of $80,000 will not change as a result of this amendment.

V. Small Projects Program Application: Post-Fire Landowner Assistance/Habitat Protection in Beaver and Frazer Creeks

In August, the Committees reviewed a Small Projects Program application from the Methow Salmon Recovery Foundation (MSRF) titled *Post-Fire Landowner Assistance/Habitat Protection in Beaver and Frazer Creeks*. The purpose of the project was to assist landowners affected by fires in Beaver and Frazer watersheds in protecting and restoring infrastructure in a manner that will not further damage fish resources. Proposed actions include removing and relocating woody materials threatening culverts, crossings, and diversions; removing mud and debris flows affecting spawning and rearing habitat; and assessing the need for other actions in response to anticipated landowner requests for material removal, dredging, and hardening. The total cost of the project was $100,000. The sponsor requested $57,328 from HCP Tributary Funds. In August, ***the Rock Island Tributary Committee approved funding for this project***.

As part of funding for this project, the Rock Island Committee recommended that the sponsor do the following:

1) In the case of cleaning debris from culverts, the sponsor needs to GPS the locations and photo-document the sites. This information can then be used to request funding in the future to replace the apparent undersized drainage structure with a larger structure that would reduce the risk of plugging in the future.
2) The Committee recognizes the need to stabilize burned slopes, which in the long-term is accomplished via the root systems of plants. That said, the Committee recommended that the sponsor does not apply seeding in areas where hydrophobic soils exist. It is likely that grass seed will be transported down slope during the first rainfall or snowmelt.

VI. Information Updates

The following information updates were provided during the meeting.

1. Approved Payment Requests in July, August, and September:

   Rock Island Plan Species Account:

   - $11,608.66 to Cascade Columbia Fisheries Enhancement Group for the Wenatchee Nutrient Assessment project.
   - $2,616.78 to Cascade Columbia Fisheries Enhancement Group for the Twisp to Carlton Reach Assessment project in July.
   - $523.23 to Cascade Columbia Fisheries Enhancement Group for the Twisp to Carlton Reach Assessment project in August.
   - $251.25 to Clifton Larson Allen for Rock Island financial administration during the second quarter 2014.

   Rocky Reach Plan Species Account:

   - $8,812.56 to Trout Unlimited – Washington Water Project for the Chewuch River Instream Flow Project.
   - $9,280.00 to the Confederated Tribes of the Colville Reservation for the Okanogan Basin Stream Discharge Monitoring project.
   - $82.67 to Okanagan Nation Alliance for the Fish Passage at Shingle Creek Dam project.
   - $2,067.77 to the Methow Salmon Recovery Foundation for the Upper Beaver Habitat Improvement Channel Restoration project.
   - $1,856.70 to Cascade Columbia Fisheries Enhancement Group for the Silver Side Channel Design project.
   - $325.13 to the Okanogan Conservation District for the Similkameen RM 3.8 Design project in May.
   - $200.97 to the Okanogan Conservation District for the Similkameen RM 3.8 Design project in July.
   - $251.25 to Clifton Larson Allen for Rocky Reach financial administration during the second quarter 2014.

   Wells Plan Species Account:

   - $2,067.78 to the Methow Salmon Recovery Foundation for the Upper Beaver Habitat Improvement Channel Restoration project.

- $82.67 to Okanagan Nation Alliance for the Fish Passage at Shingle Creek Dam project.

2. Tom Kahler reported that the State Auditors have recently indicated that they have changed their position regarding off-book accounts, such as the Tributary Plan Species Accounts, because of abuse of such accounts by some entities. These accounts, although not officially under the control of the PUDs, use the PUDs Tax Identification Numbers. To that end, the State Auditors have asked Douglas PUD to bring the Wells Plan Species account into full control of the PUD so it can be audited annually. This account will be set up so funding decisions will not need to go through the PUD Board of Commissioners for approval (as in the past, board approval of the annual contributions to the account will constitute approval of the Tributary Committee's discretion in the use of the account). In addition, the account will be audited annually, which means the Wells Committee will not need to conduct independent audits every five years. Tom noted that the Committees will see no changes in the way the Committees do business. He also indicated that because this is a new position of the State Auditor regarding these types of accounts, the auditors had indicated that they will ask for the same changes by Chelan PUD regarding the Rock Island and Rocky Reach accounts.
3. Kate Terrell shared with the Committees that the Citizen Advisor Committee recommended that the Barkley Irrigation Company – Under Pressure Project receive $723,732 from the Salmon Recovery Funding Board (SRFB). This is less than the $1,193,800 that TU requested from SRFB. Recall that the Rock Island Committee agreed to fund up to $300,000, even though the sponsor requested $746,900 from the Committees. Thus, TU may submit a request to the Committees asking for the unfunded portion of the project ($470,068).
4. Chris Fisher reported that the tour of restoration projects in Canada will occur on 8 and 9 October. The current schedule is that members will meet at the U.S. Forest Service Building in Wenatchee at 7:30 am on Wednesday, 8 October. They will car pool to Oliver, where they will meet with the Okanagan Nation Alliance. That afternoon they will tour ORRI 1 and 2, VDS-13, McIntyre Dam, Shuttleworth Creek, and Skaha Dam. They will spend the night at the Ramada in Penticton. On Thursday, they will tour Shingle Creek Dam, the Penticton Channel, and Trout Creek. They will head back to Wenatchee during the afternoon. At this time, Tom Kahler, Steve Hays, Chris Fisher, and Tracy Hillman are confirmed attendees. Kate Terrell, Jeff Osborn, and Jeremy Cram are questionable. Lee Carlson and Justin Yeager cannot attend. Brandon Rogers may attend the tour in Lee Carlson's stead. The tour will replace the Committees' October meeting.

VII. Upper White Pine Presentation (Chelan County Natural Resources Department and Bureau of Reclamation)

In June, Chelan County Natural Resources Department asked the Committees if the County and BOR could attend the September meeting to describe the proposed approach for the Nason Creek Upper White Pine Restoration Project. The Committees agreed to invite the County and BOR to the meeting. Jennifer Hadersburger (CCNRD) and Rob Richardson (BOR) presented their proposed approach to the Committees during the September meeting (their presentation is appended as Attachment 1).

Jennifer Hadersburger began the presentation by talking about the development of the project and the current conditions. She noted that in the project area about one mile of Nason Creek has been relocated by the construction of the railroad. The U.S. Forest Service TEAMS completed a restoration plan in 2013. Currently there is very little habitat in the project area, because the stream has incised, water velocities are relatively high, and there is little instream complexity. The six small tributaries that enter the project area drain into the wetland. Chelan PUD power lines are also within the floodplain area. Jennifer then presented information on flows, temperatures, and counts of fish within the project area. She identified the goals of the project, which are to (1) restore natural stream channel and floodplain structure and function to increase floodplain connectivity and promote habitat formation, and (2) rehabilitate and restore aquatic habitat to allow for the opportunity and capacity to support diverse life history strategies and increased growth and survival of fish. Jennifer described the alternatives that were considered in the restoration plan. These included levee removal and breaching only, construction of channel meanders within current stream alignment (with or without levee removal), full levee removal and channel reconstruction (re-alignment) from RM 13.4-13.8, and partial levee removal and partial channel re-construction. She then discussed the PUD power lines and the 15 alternatives considered for moving them out of the project area. The preferred alternative is to relocate the power lines to the Upper White Pine road. Jennifer concluded her presentation by giving an overview of the 30% design.

Rob Richardson picked up the presentation by describing profiles and inundation results from the 30% design. He identified some of the comments they received on the 30% design, which included, "go bigger," they can fill the existing channel to avoid avulsion, and they need to consider the benefits of long term channel migration and floodplain re-connection. Rob walked the Committees through the different "go big" evaluations. He identified the preferred scenario and presented 1-D model results of restored conditions for annual, two-year, ten-year, 50-year, and 100-year flow events. The existing channel will be filled with about 37,000 cubic yard of fill to avoid channel avulsion back into it, and the preferred scenario will increase floodplain connectivity by over 7 acres at the two-year event and 15 acres at the 100-year event. In addition, the preferred scenario will allow access to the existing wetland habitat in the area. The project will increase access to thermal refugia, increase channel length, sinuosity, pools, large wood, and floodplain function. Jennifer shared with the Committees additional benefits such as increased fish production and the amount of habitat impairment that will be fixed.

Jennifer said that they expect to complete the 60% design by October, and complete permits by the end of the year. They hope to construct in 2015-2016. They plan to move the power lines in 2015 and the channel in 2016. The total cost of the project is estimated at about $2.6M; they have already secured $780,000 from Ecology. They intend to ask the Tributary Committees and the PRCC Habitat Subcommittee for about $1.2M.

Members of the Committees had several questions. One question that was discussed extensively was why not just breach the levee and let the stream carve out a preferred channel or channels. This would create extensive edge habitat for juvenile salmonids and would be far less expensive. Rob answered that this is not feasible at this time because the Forest Service needs assurance and some certainty about the location of the channel within the floodplain. He also said that the channel may avulse into the existing channel, because it is the preferred flow path. Another concern is the mobilization of extensive amounts of fine sediments into downstream spawning and rearing areas. Finally, Rob noted that even if the stream is allowed to carve out its own path, it will ultimately evolve into a single-thread channel. Thus, the multiple channels created early will be short lived. The Committees provided the County and BOR with suggestions and the County will likely submit a proposal to the Committees in the near future.

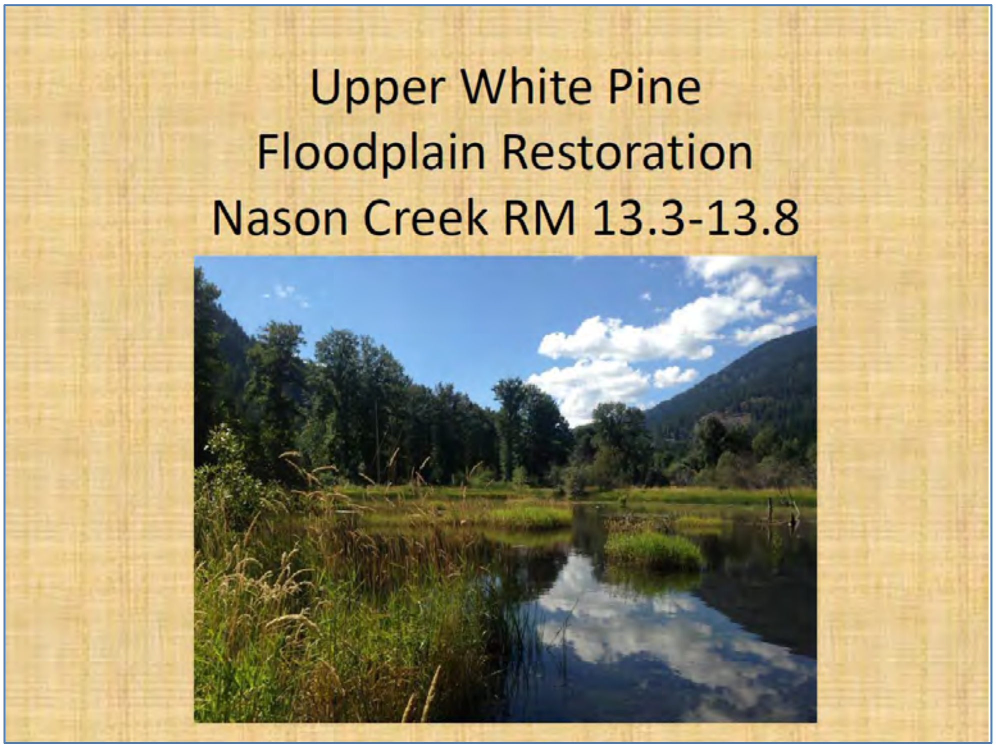
VIII. Next Steps

The next meeting of the Tributary Committees will be on Thursday, 13 November at Grant PUD in Wenatchee. In October, some members of the Committees will visit restoration sites on the upper Okanagan in Canada.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Attachment 1

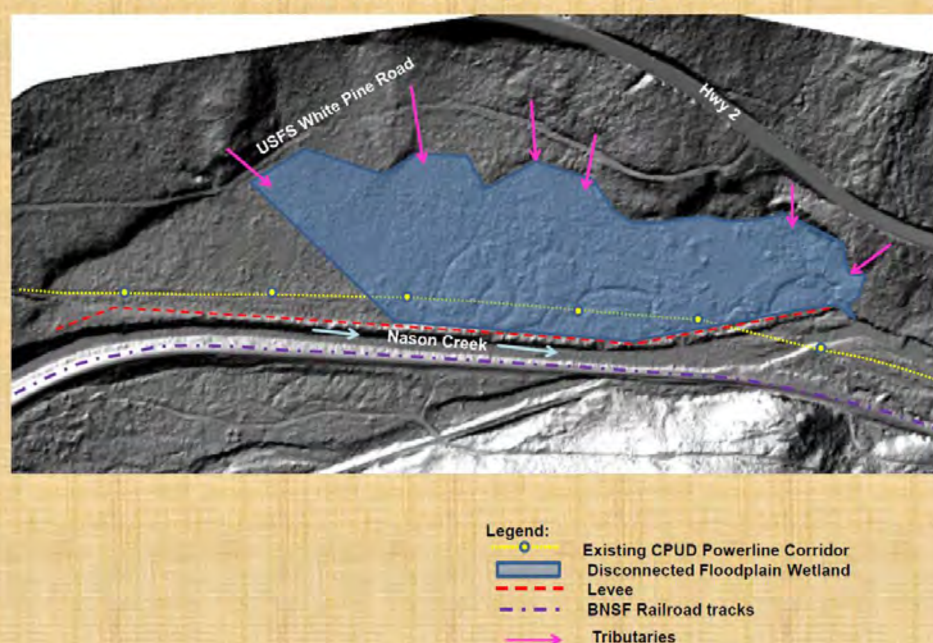
Presentation by Jennifer Hadersburger and Rob Richardson on the Upper White Pine Floodplain Restoration Project



Presentation Overview

- Project Development
- Existing Conditions
- Restoration Plan Alternatives
- Powerline Alternatives
- 30% Design
- Current Design
- Biological Benefit
- Status, Timeline, Funding

Nason Creek Floodplain Restoration Project – Existing Conditions



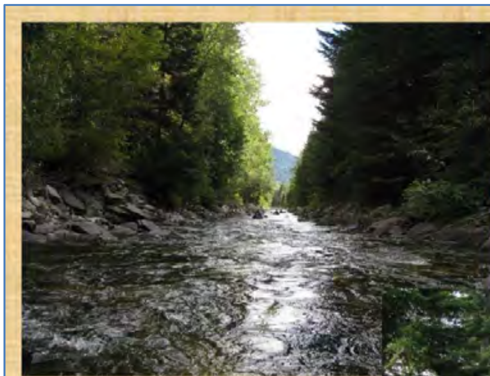
Project Development - RA

Project Development-
Watershed Scale Prioritization

Table 2. Prioritization of Reconnect Isolated Habitat Subreach Units

Sub-Reach Unit	Biological Benefit	Social Feasibility	Construction Feasibility	Cost	Overall Feasibility	Description
LWP DIZ-1	5	3	3	1	7	Railroad reconnection w/ LWP DOZ-2
UWP DIZ-1	5	3	3	1	7	Railroad reconnection
LWP DIZ-2	5	1	3	1	5	Railroad reconnection w/ LWP DOZ-4
UWP DOZ-1	3	5	5	5	15	Levee breach
K DIZ-3	3	5	3	3	11	SR 207 reconnection
LWP DOZ-3	3	3	3	3	9	US 2 reconnection
UWP DOZ-4	3	3	3	3	9	US 2 reconnection w/

Existing Conditions - Impacts Levee Channelization



Looking Downstream

Looking Upstream

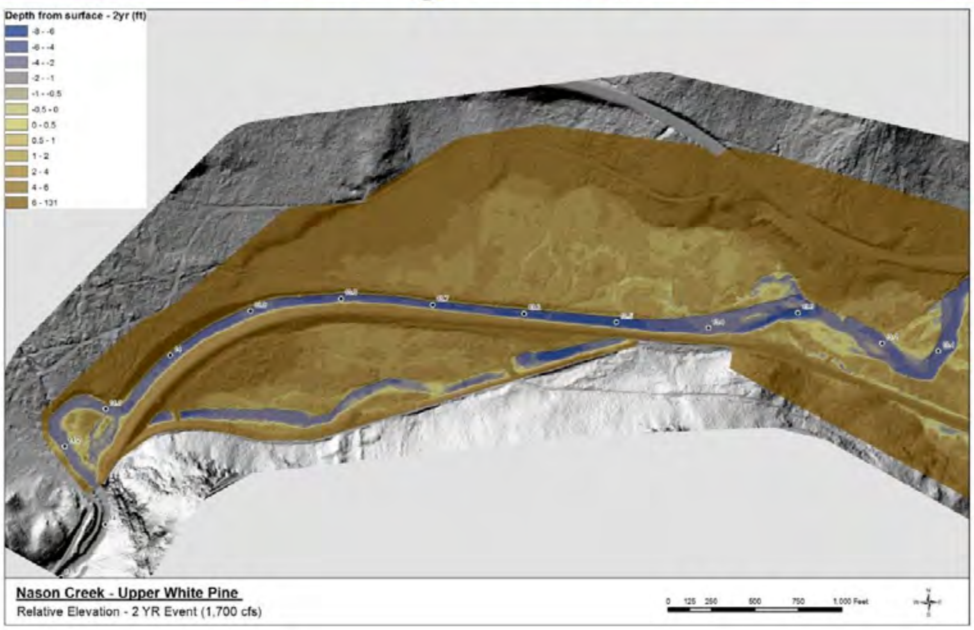
Existing Conditions – Impacts Levee near RM 13.45

Existing Conditions – Impacts
Levee near RM 13.35

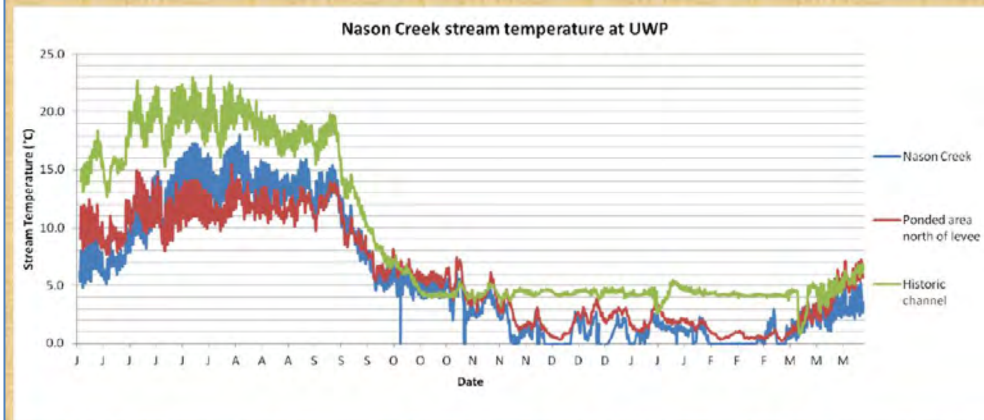
Existing Conditions - Floodplain Wetland

Existing Conditions - Floodplain Wetland

Existing Conditions



Existing Conditions – Temperature Data



Fish Data March 2014/June 2013/Sept 2013

Site	Brook trout	Chinook	Coho	Steelhead	Whitefish	Sculpin	Shiner
Wetland	19/0/141	10/0/42	0/0/0	5/0/0	0/0/0	3/0/0	0/0/0
Mainstem RM 13.26-13.78	0/NS/0	39/NS/22	0/NS/1	190/NS/0	0/NS/158	4/NS/0	0/NS/0

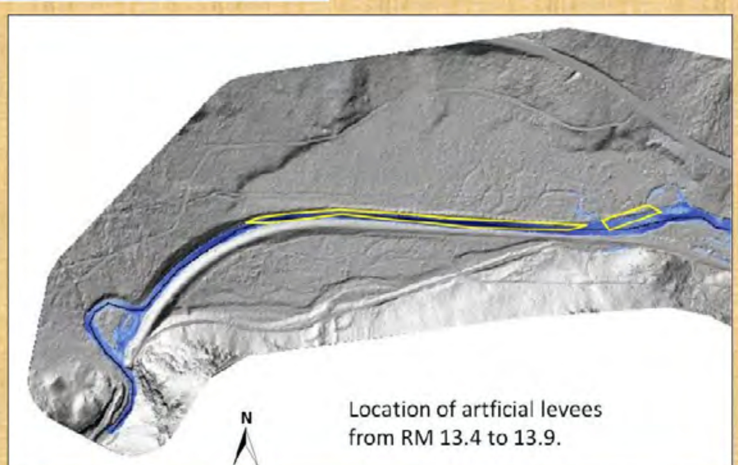
Project Goals

Goal 1: Restore natural stream channel and floodplain structure and function to increase floodplain connectivity and promote habitat formation. Reconnect the stream channel to its historic floodplain and improve channel migration to allow for more frequent floodplain inundation, natural rates of channel migration, and natural lateral channel dynamics to restore and support habitat-forming processes.

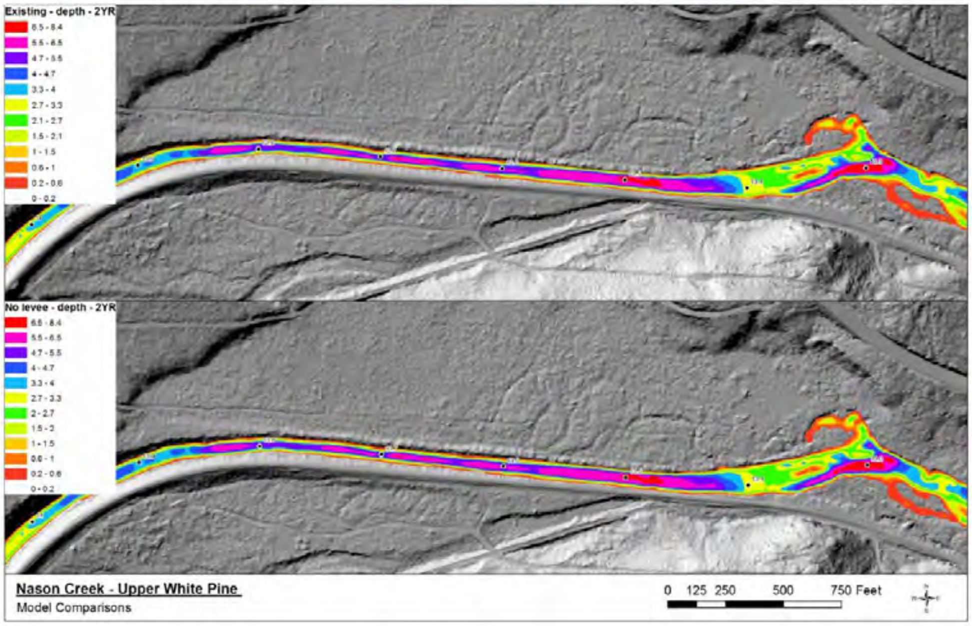
Goal 2: Rehabilitate and restore aquatic habitat to allow for the opportunity and capacity to support diverse life history strategies and increased growth and survival of fish. Restore the structure and function of Nason Creek in order to support and create high quality, complex, and diverse fish habitat that can support productive fish populations.

Restoration Plan - Alternatives Analysis

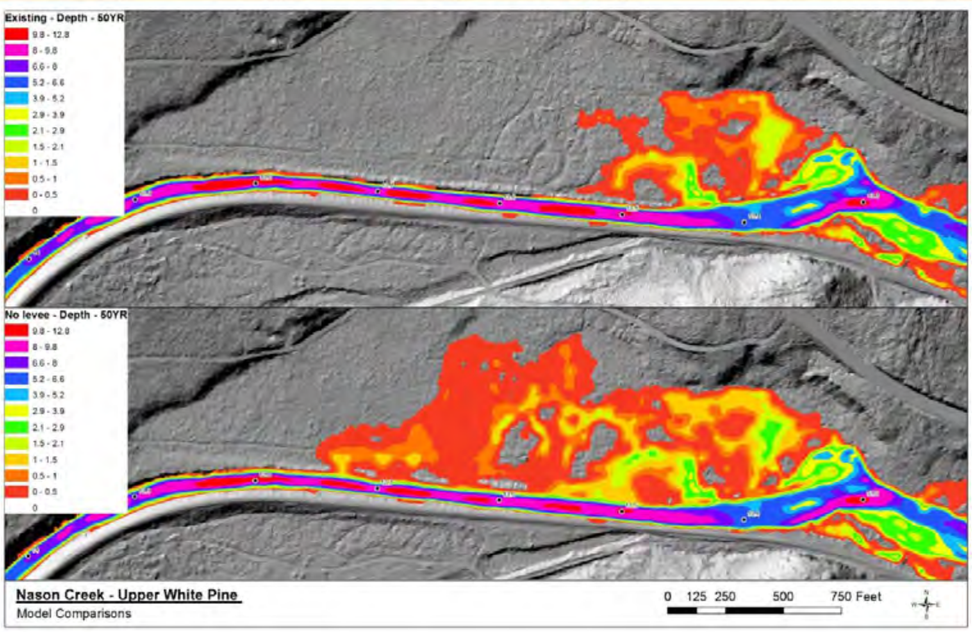
Option	Description
A	Levee removal/breach only



Modeling



Modeling



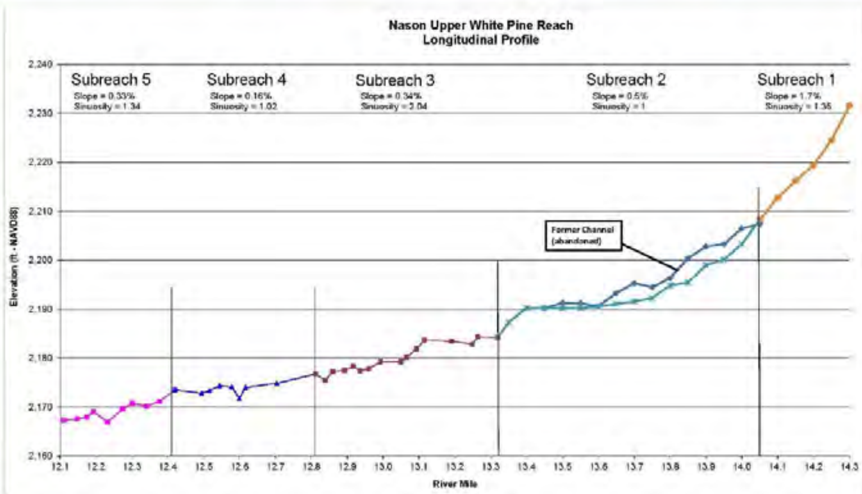
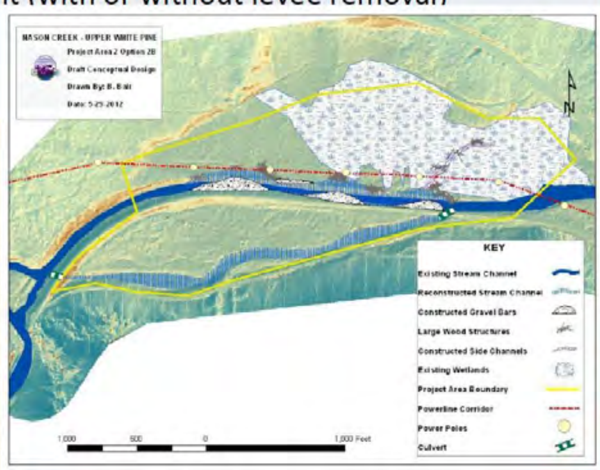


Figure 2. Longitudinal profile of the Upper White Pine Reach. Data for subreaches 1 and 2 was obtained from LiDAR and therefore represents water surface at the time of the LiDAR flight. Data for subreaches 3-5 is from bathymetric survey data and represents the channel thalweg. Note the incision in the current bed profile in reach 2 compared to the historic channel bed.

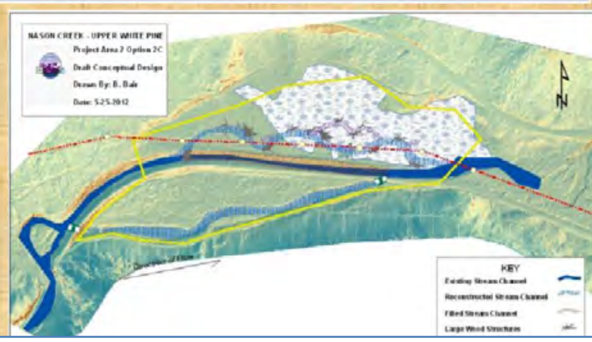
Restoration - Alternatives Analysis

Option	Description
A	Levee removal/breach only
B	"Mini me" construction of channel meanders within current stream alignment (with or without levee removal)



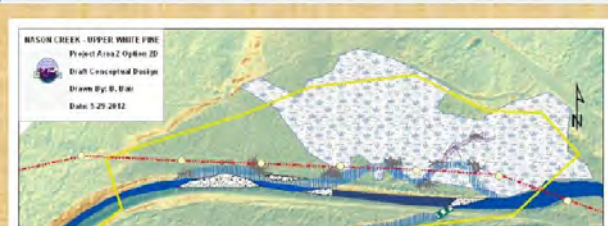
Restoration - Alternatives Analysis

Option	Description
A	Levee removal/breach only
B	"Mini me" construction of channel meanders within current stream alignment (with or without levee removal)
C	Full levee removal and channel reconstruction (re-alignment) from RM 13.4-13.8



Restoration - Alternatives Analysis

Option	Description
A	Levee removal/breach only
B	"Mini me" construction of channel meanders within current stream alignment (with or without levee removal)
C	Full levee removal and channel reconstruction (re-alignment) from RM 13.4-13.8
D	Partial levee removal and partial channel re-construction



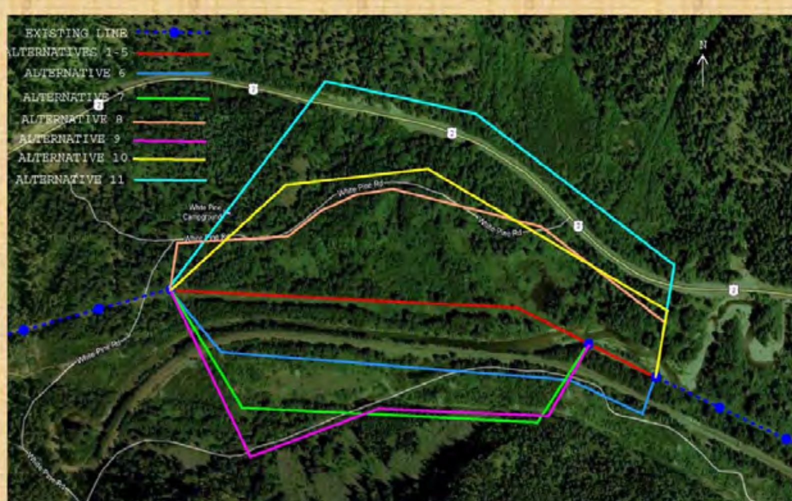
Restoration and CPUD Powerlines

- June 2011 Meeting
  - Alternatives Analysis
  - Remove the CPUD powerlines as a constraint to restoration

- Re-scoped 53K 2009 Grant round

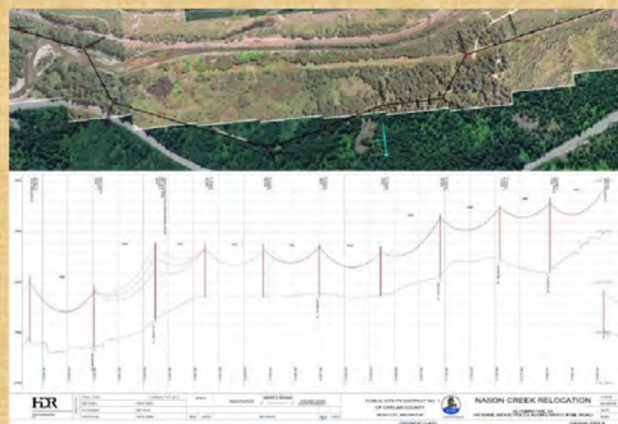
Powerlines Alternatives Analysis

- March 2012 memo 15 alternatives



Powerlines Alternatives Analysis

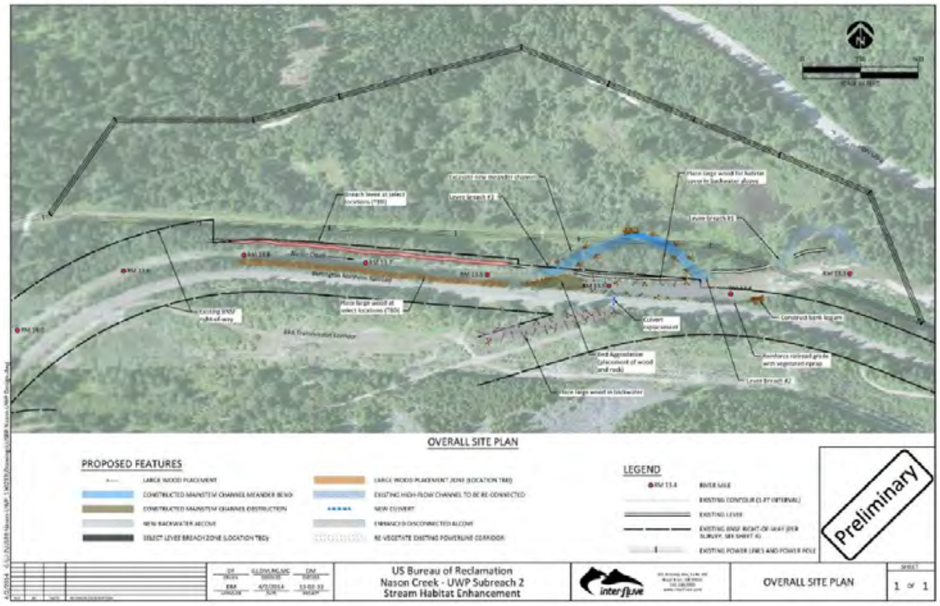
- March 2012 memo 15 alternatives
- Stakeholder review comments (USFS, BPA, UCSRB, CPUD)
- July 2012 memo four alternatives



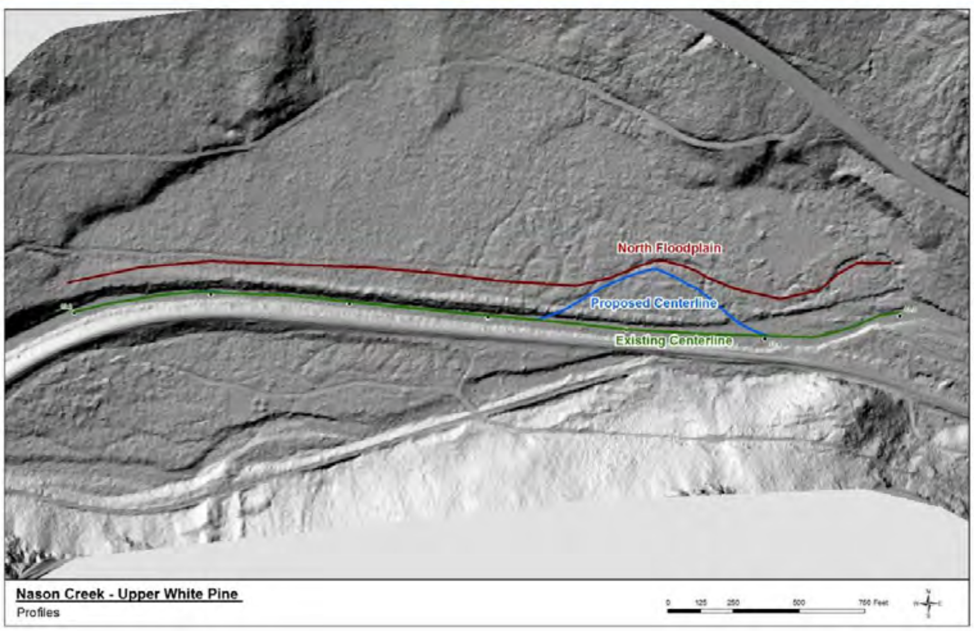
Powerlines Alternatives Analysis

- March 2012 memo 15 alternatives for removing the CPUD powerlines as a constraint to restoration
- Stakeholder review comments (USFS, BPA, UCSRB, CPUD)
- July 2012 memo four alternatives
- Signed MOU between CPUD and CCNRD that outlines the terms of powerline re-location to Upper White Pine road (April 2014)
- 30% design and cost estimate for powerline relocation to Upper White Pine road (May 2014)

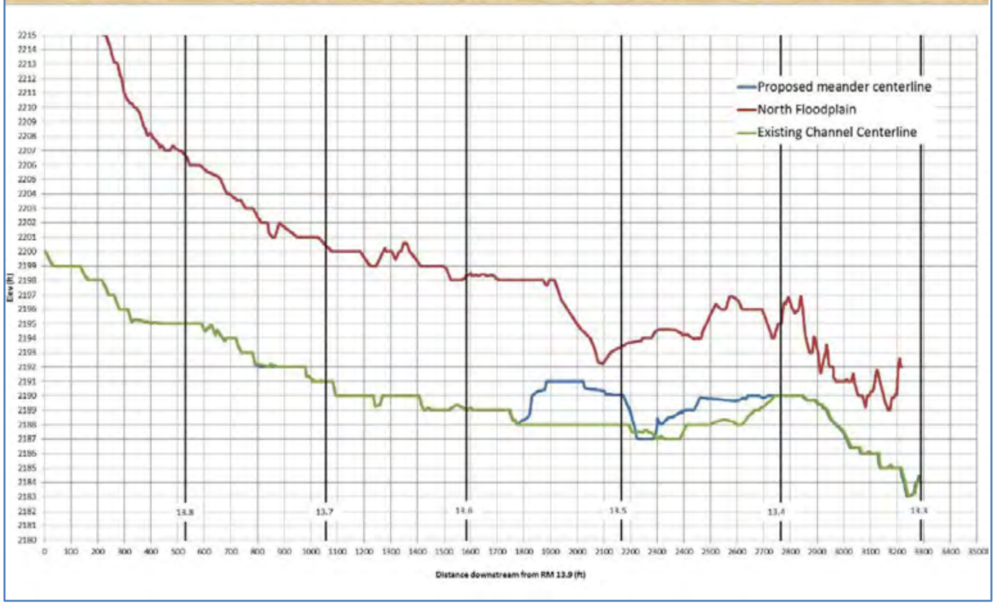
Overview of 30% Design



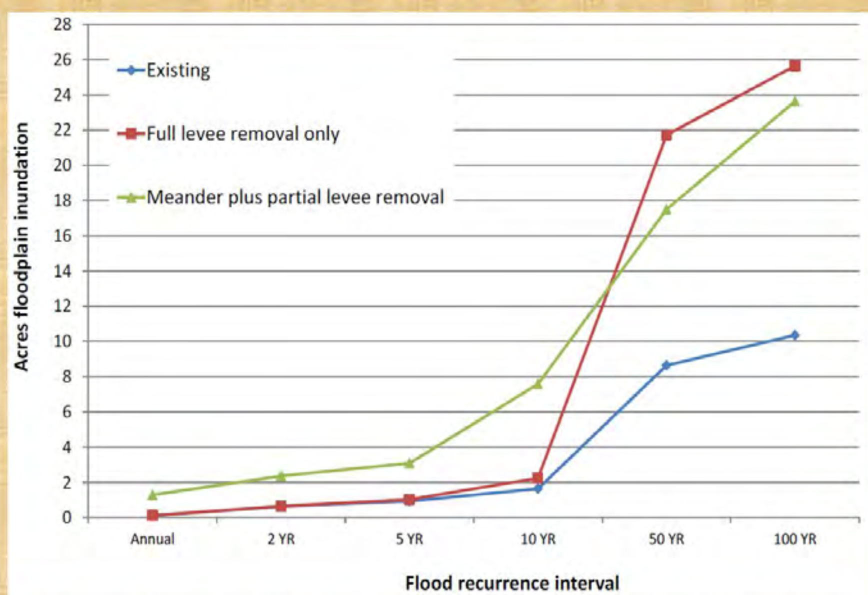
Profiles



Profiles

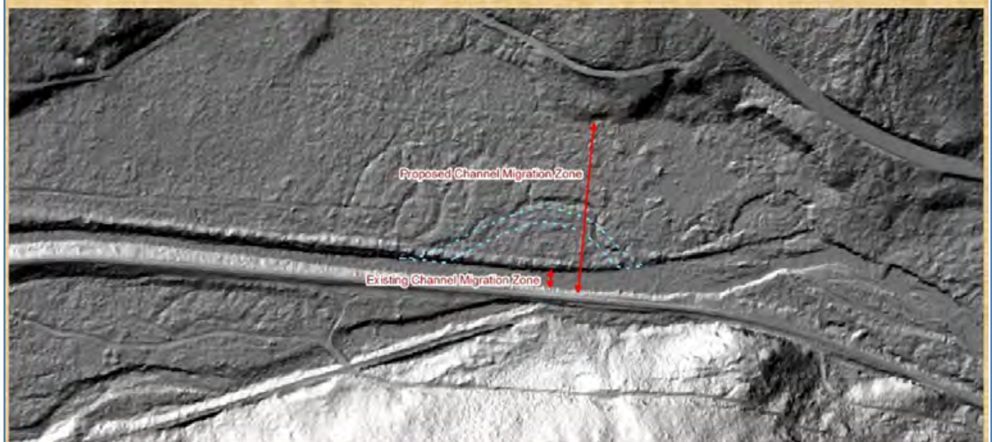


Inundation Results



Long-Term Channel Migration

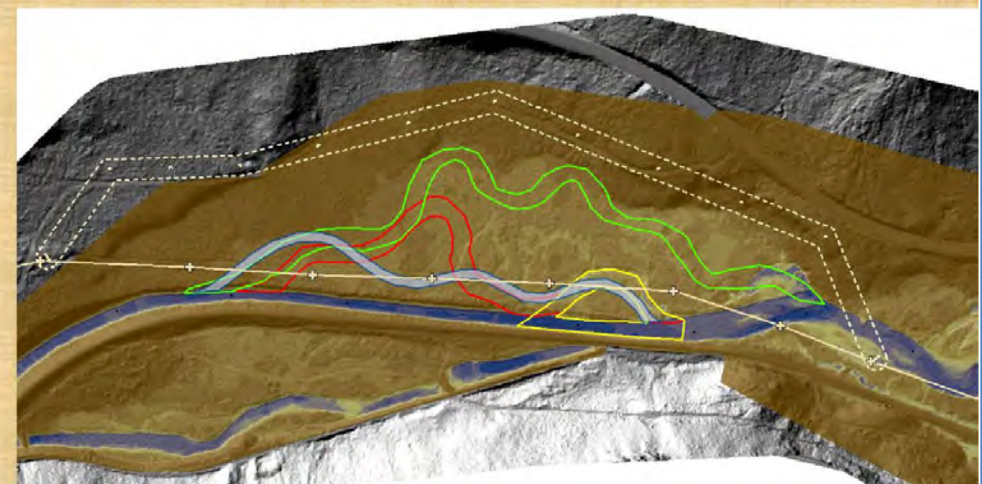
- A primary objective and one of the greatest benefits from a geomorphic and biologic perspective
- Existing channel is locked in a ditch and cannot laterally migrate
- Even with levee and riprap removal alone, channel is incised and straightened (due to ditch creation and subsequent incision) and will not freely migrate
- Creation of meander(s) will set channel up to laterally migrate over the long-term



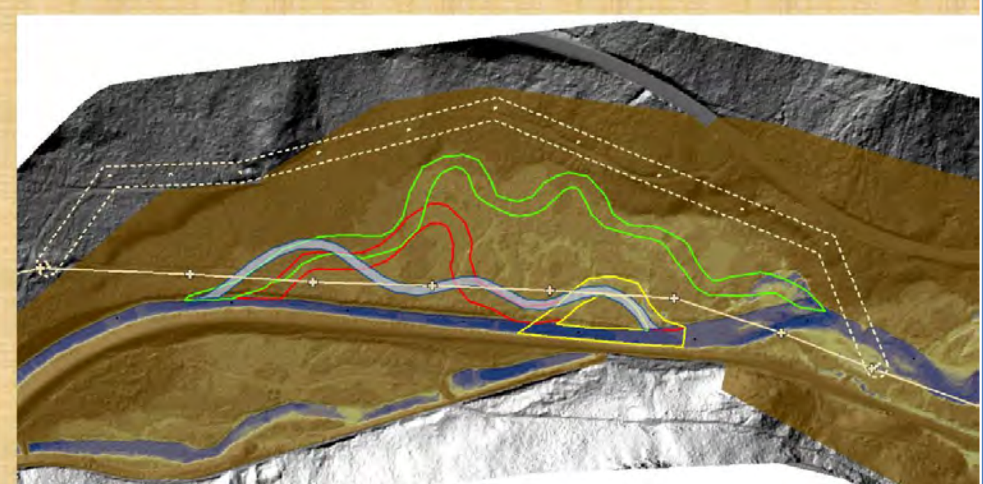
30% Design Comments

- "Go big"
- Ok to fill the historic channel
- Consideration of the benefits of long term channel migration and floodplain re-connection

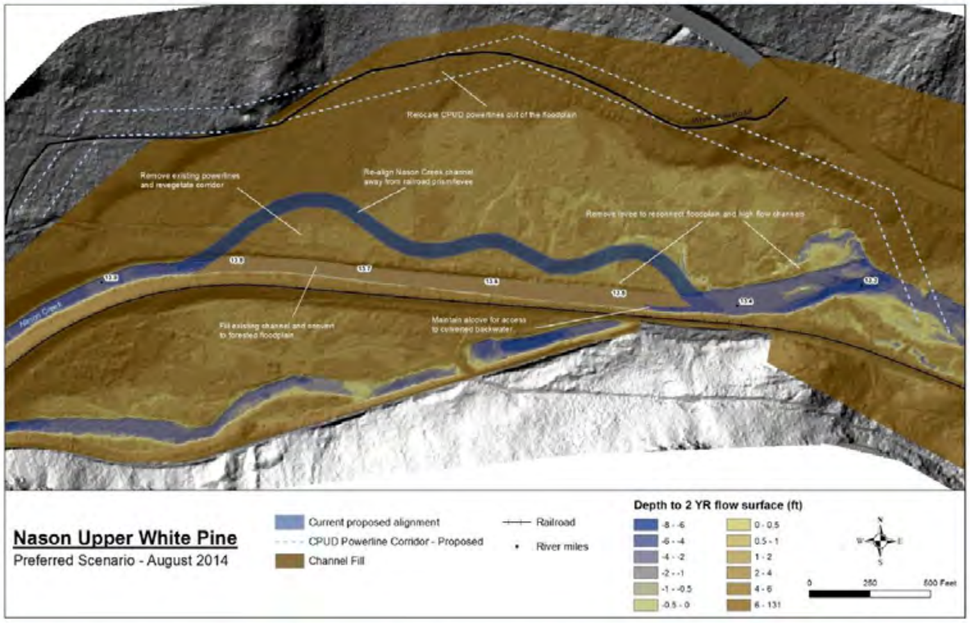
“Go Big” Evaluation



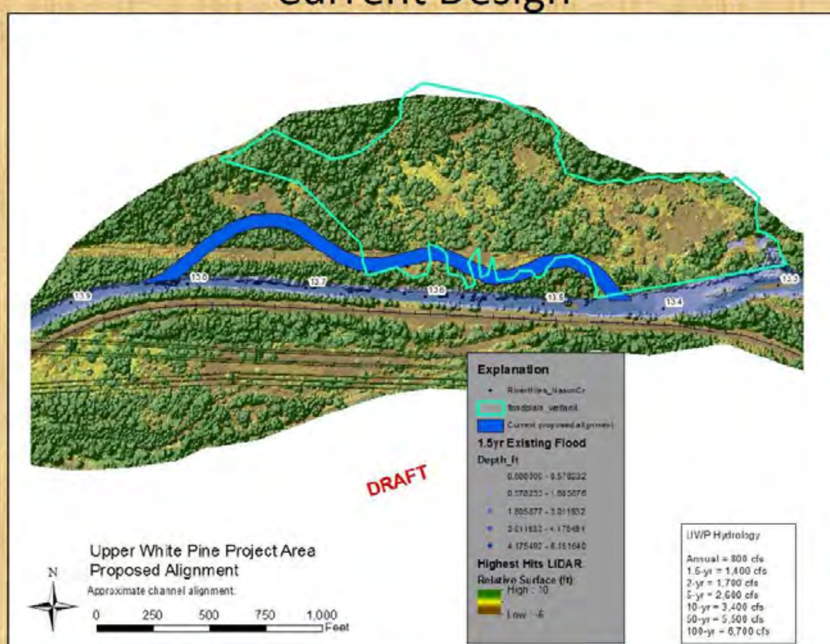
“Go Big” Evaluation

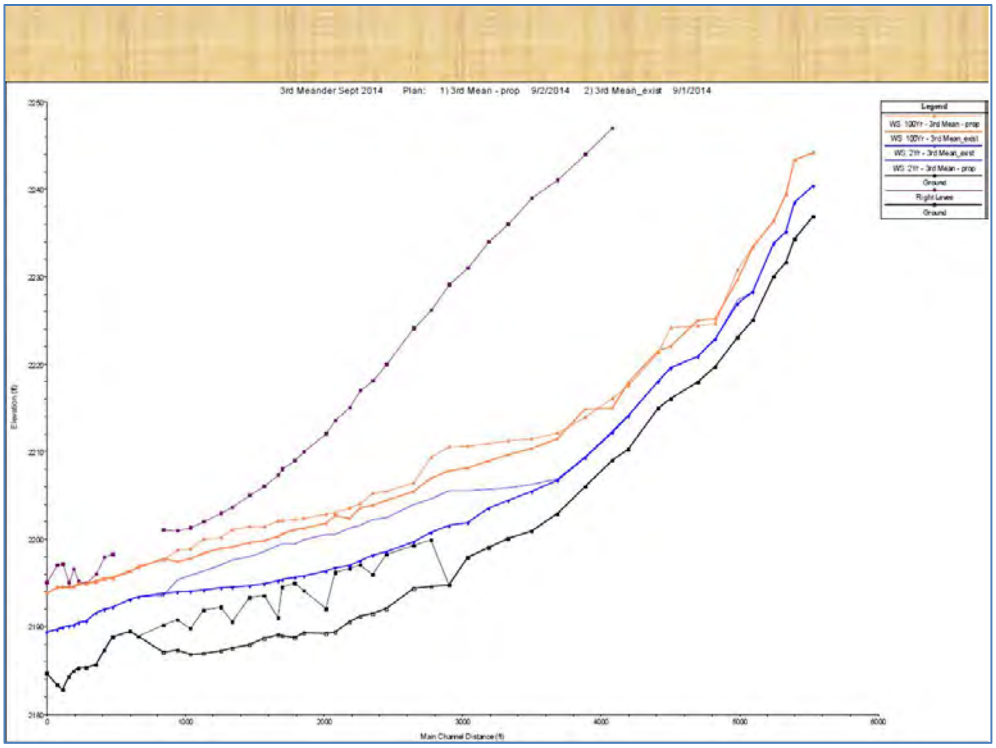


Current Design

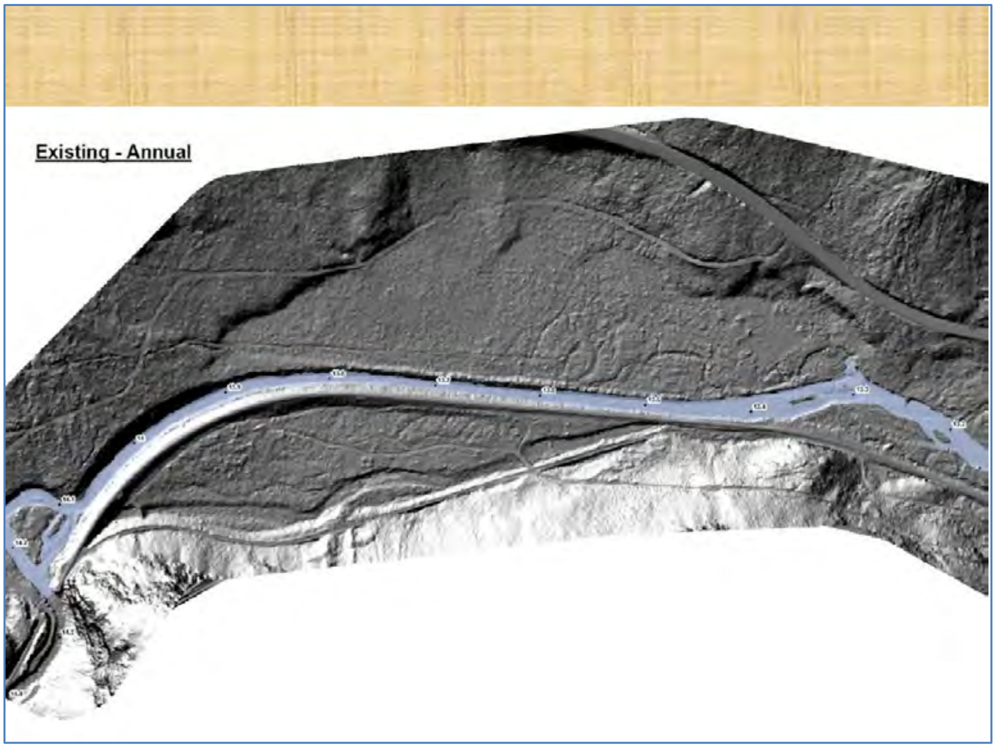


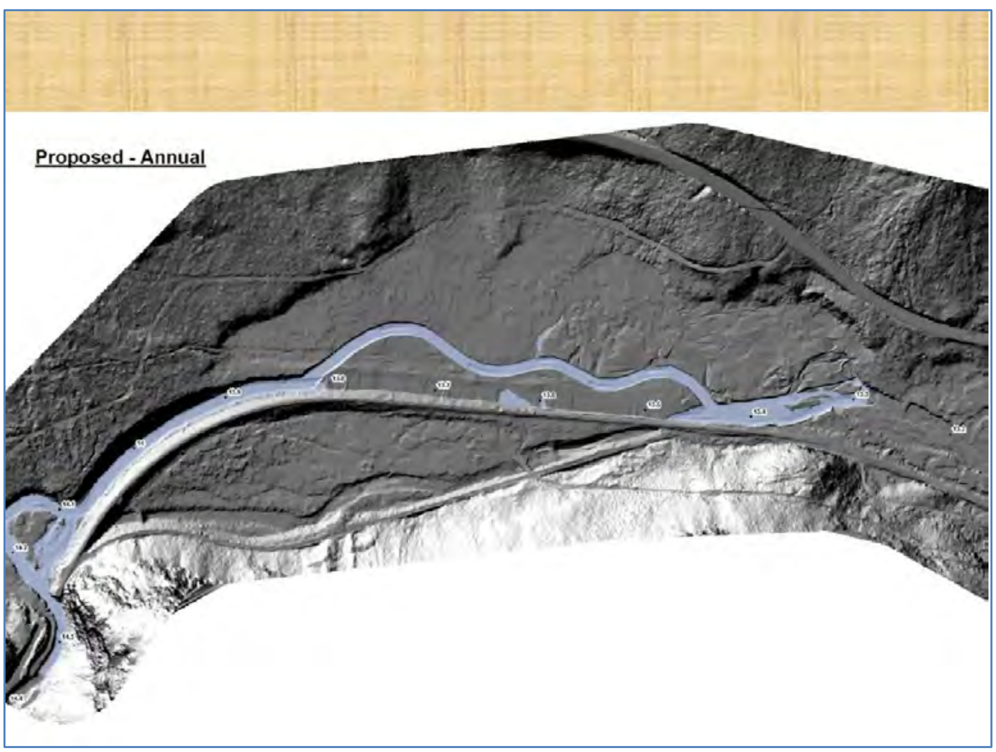
Current Design





3rd Meander Sept 2014 Plan: 1) 3rd Mean - prop 9/2/2014 2) 3rd Mean_exist 9/1/2014
Legend
WS 100Yr - 3rd Mean - prop
WS 100Yr - 3rd Mean_exist
WS 2Yr - 3rd Mean_exist
WS 2Yr - 3rd Mean - prop
Ground
Right Levee
Ground
Elevation (ft)
Main Channel Distance (ft)


Existing - Annual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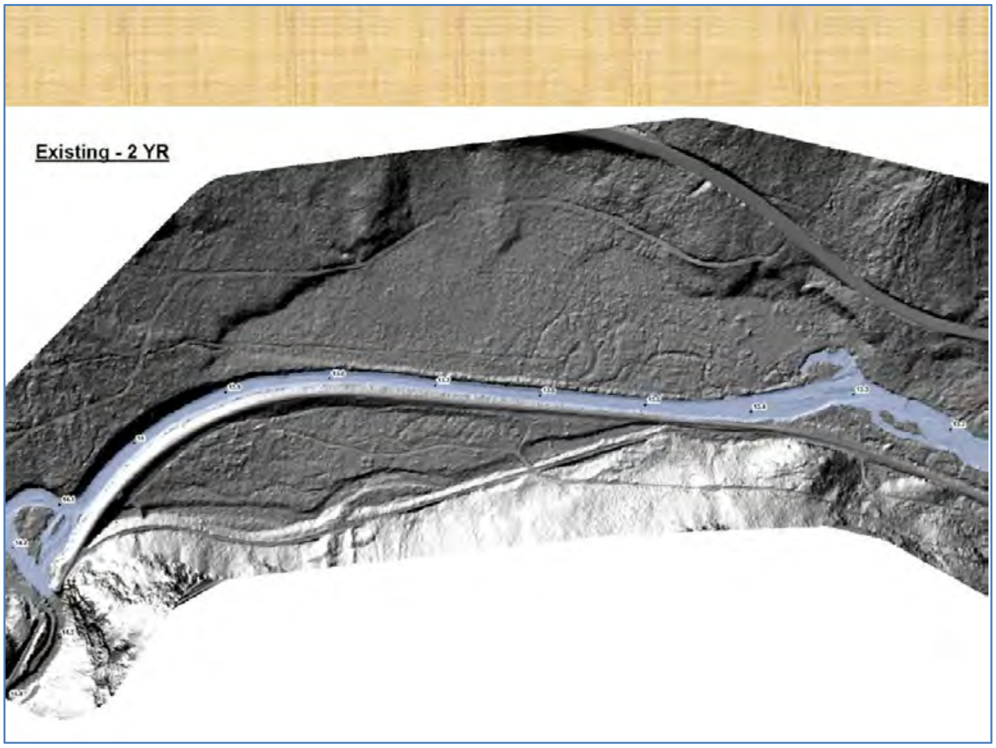
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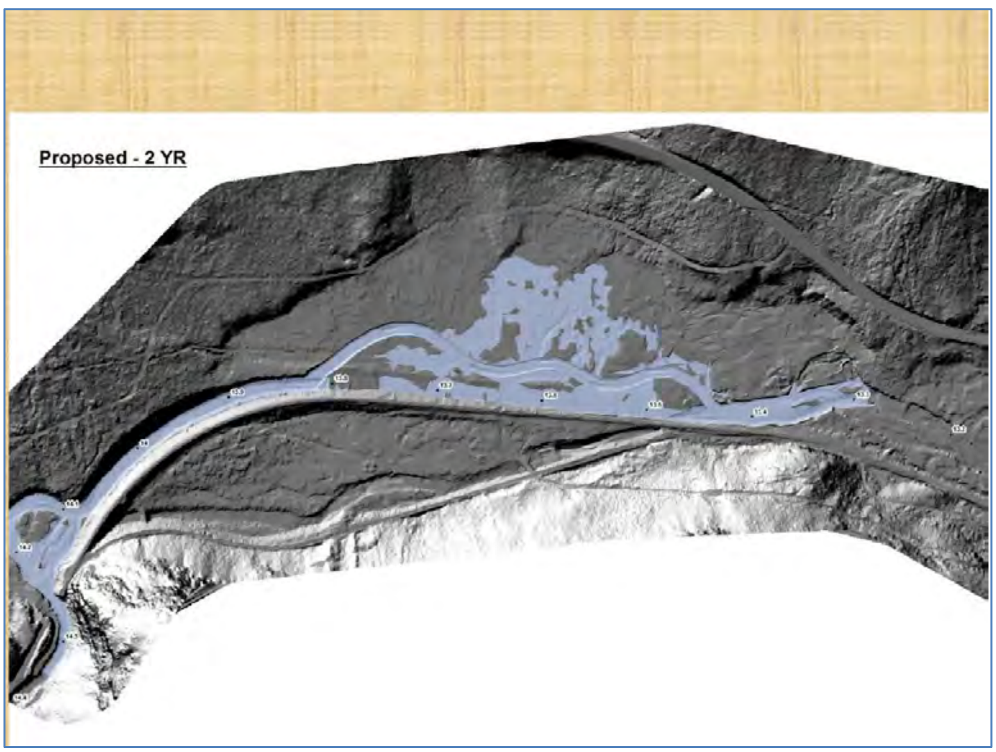
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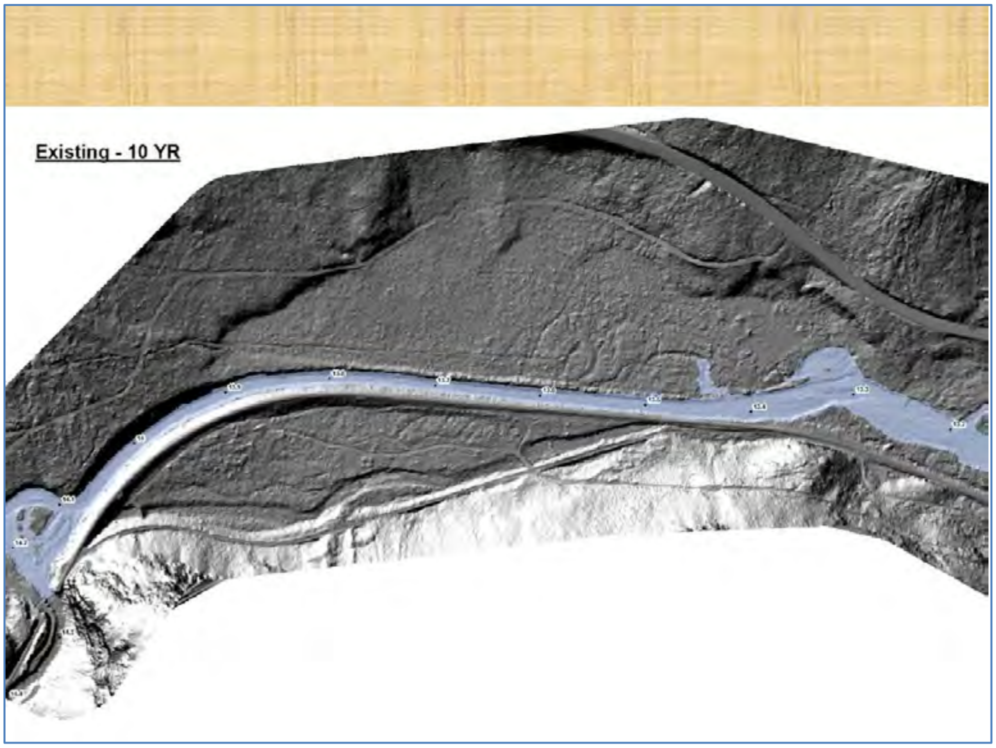
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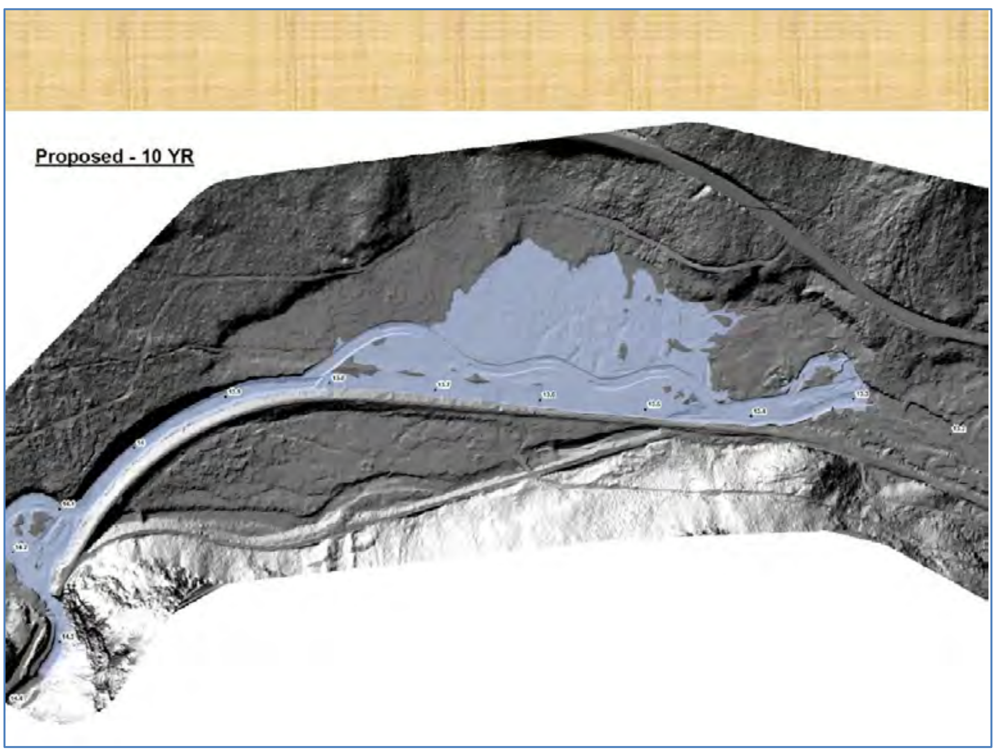
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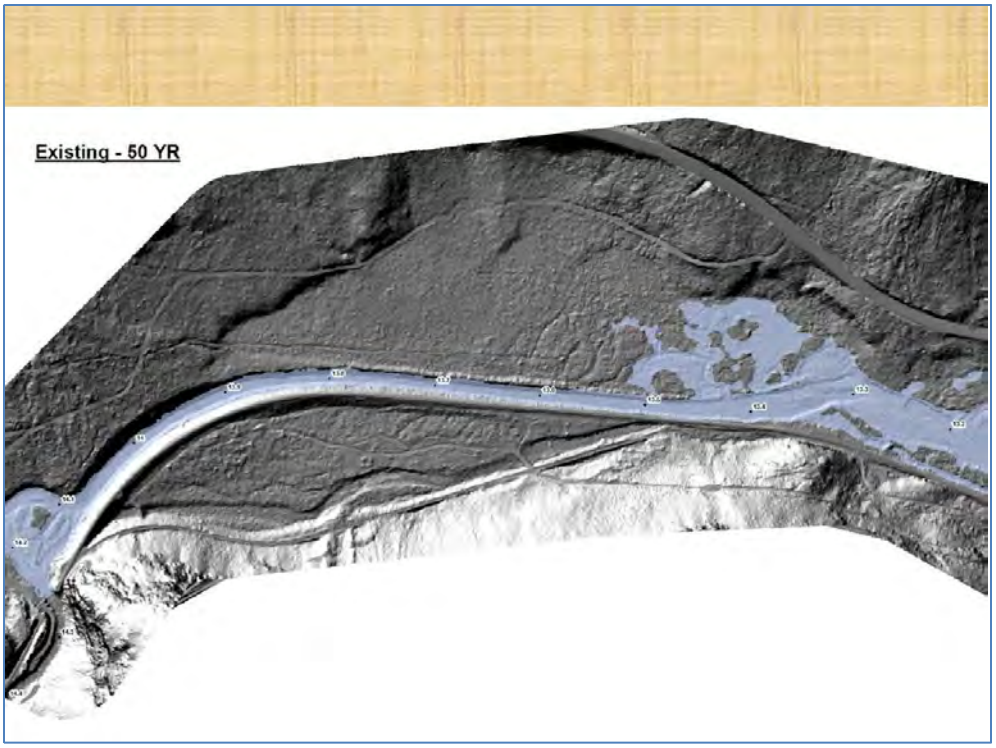
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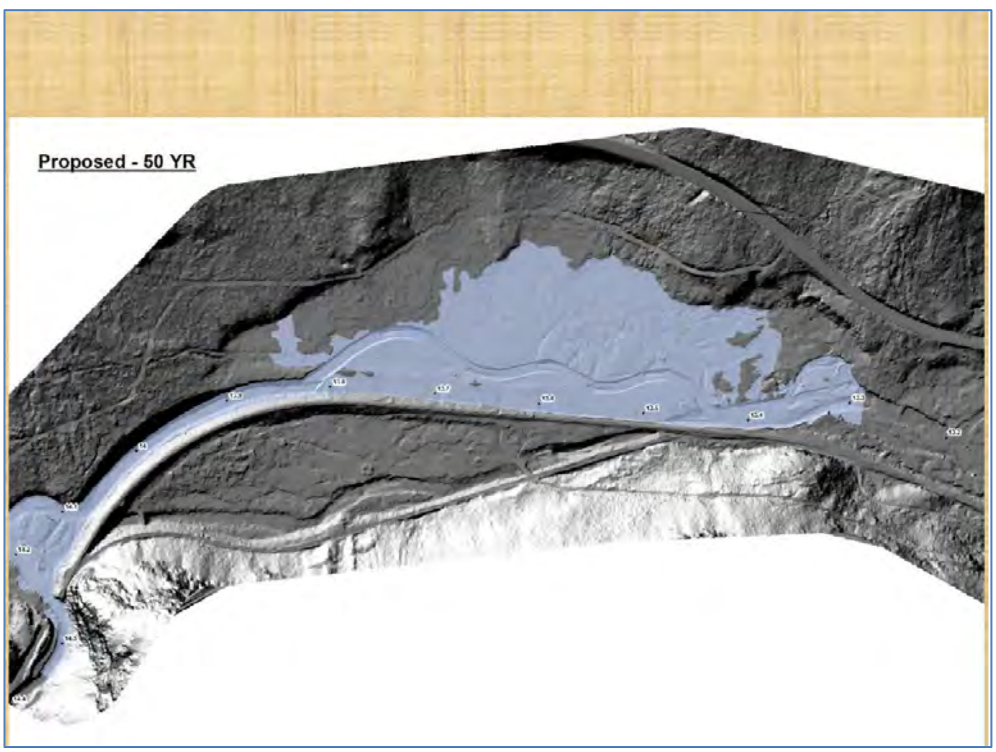
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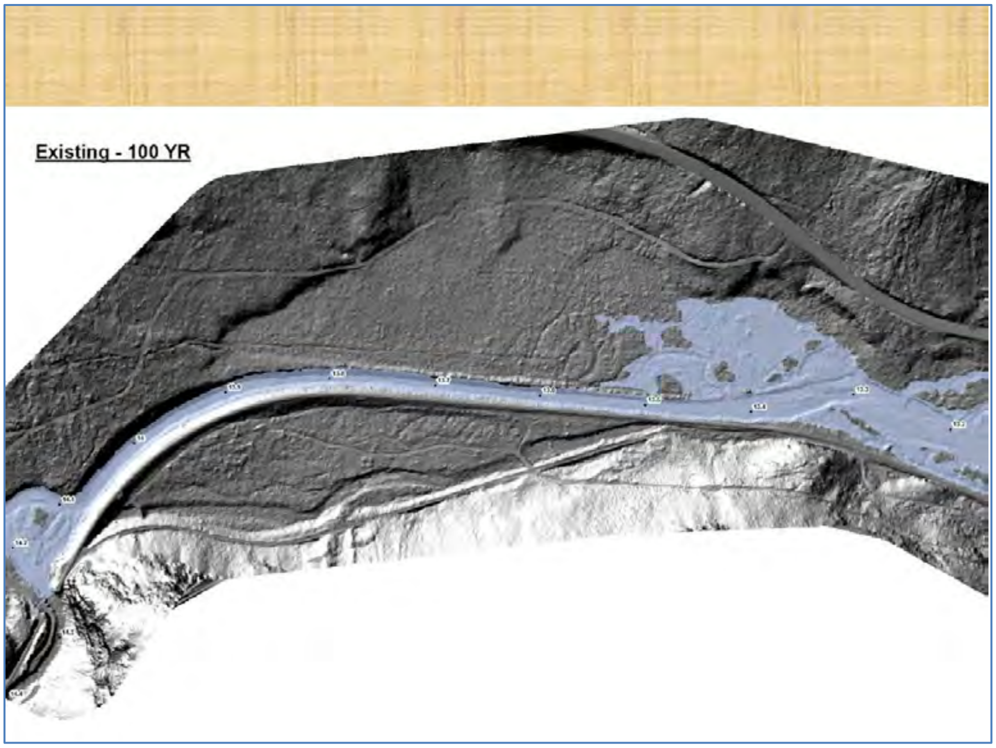
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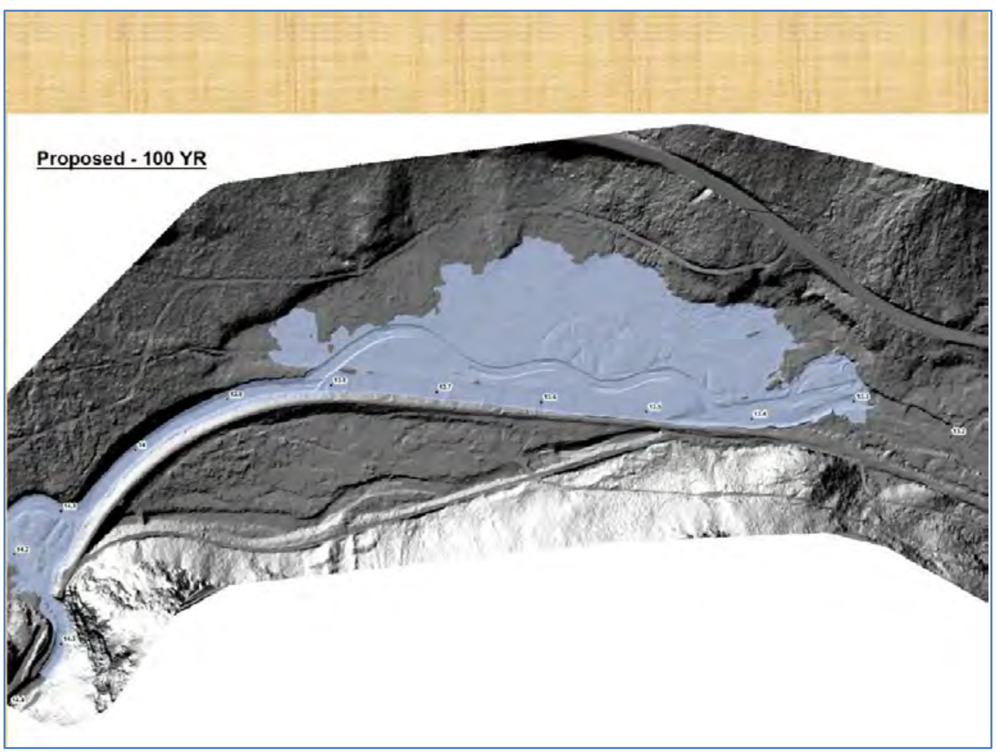
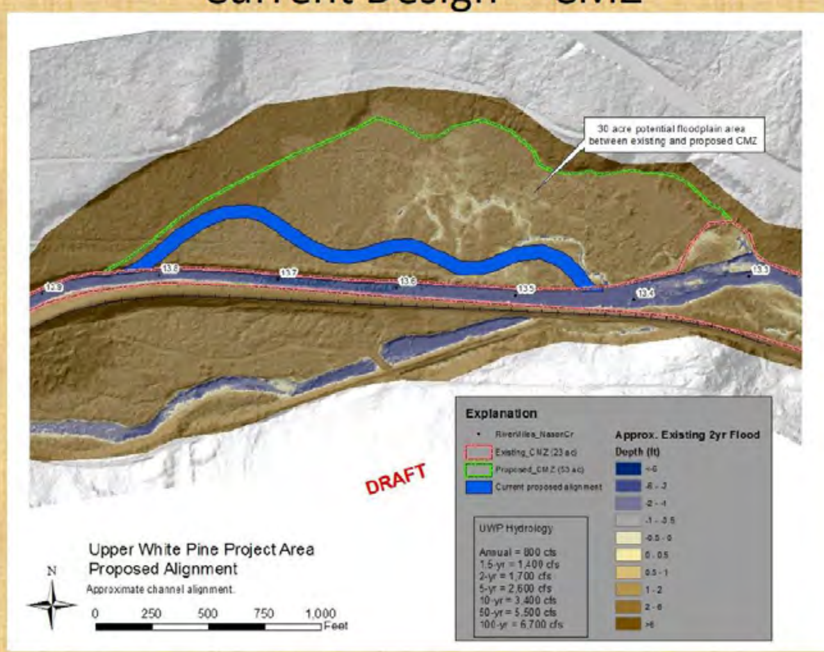

Proposed - 100 YR

Current Design -- CMZ



Biological Benefit

Goal 1: Restore natural stream channel and floodplain structure and function to increase floodplain connectivity and promote habitat formation.

-Short term = increase in floodplain connectivity by over 7 acres at the 2yr event and 15 acres at the 100yr event

-Long term = improved channel migration to allow for more development of up to 30-acre inset floodplain and natural lateral channel dynamics to restore and support habitat-forming processes

Goal 2: Rehabilitate and restore aquatic habitat to allow for the opportunity and capacity to support diverse life history strategies and increased growth and survival of fish.

-Access to thermal refugia

-Increase channel length by 270 feet

-Increase sinuosity from 1.0 to 1.1

-Increase pools from 1 to 7

-Increase LWM from 0 to >41 per mile

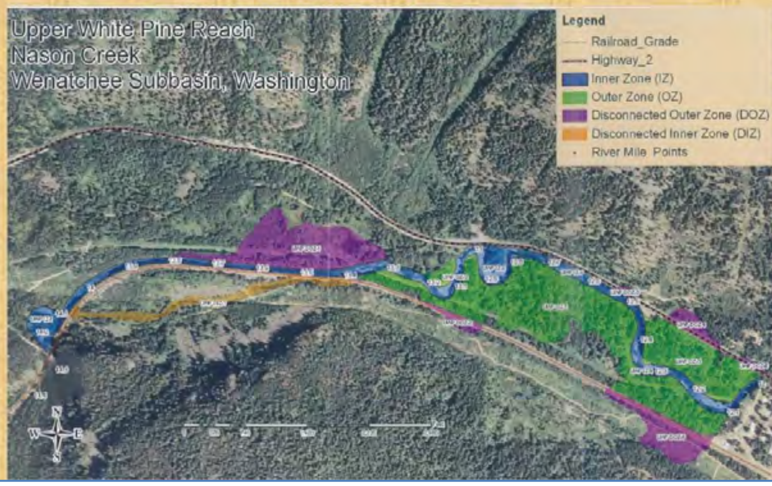
-Increase channel migration zone from 23 ac to 53 ac

Cost-Benefit

- Increase in production?
  - Increase number of juveniles in project area
    - > 2.7/m^2 steelhead
    - >.1/m^2 spring Chinook
  - Increase redd densities to pre-implementation levels
    - >15/mile steelhead
    - >94/mile spring Chinook

Cost-Benefit

- Amount of habitat/cost?
  - How much impairment does this project fix?
    - DOZ in UWP Reach 35 acres



Project Status, Timeline, Funding

- 30% Design Review (through June 30)
- 60% Design completion Oct 2014
- JARPA submittal November 2014
- Construction 2015-2016
- Funding
  - 30% Design Cost Estimate 2.6 million
  - $780,000 DOE secured

Questions

1. Project Liaison?

2. Funding Request

Funding

- DOE $ 780,000 Secured
- PRCC/Tributary Com. $1.2 million Combined
- Other $ 800K – 1 million

Wells, Rocky Reach, and Rock Island HCP
Tributary Committees Notes
13 November 2014

Members Present: Lee Carlson (Yakama Nation), Jeremy Cram (WDFW), Chris Fisher (Colville Tribes), Steve Hays (Chelan PUD), Tom Kahler (Douglas PUD), Kate Terrell (USFWS), Justin Yeager (NOAA Fisheries), and Tracy Hillman (Committees Chair).

Others Present: Becky Gallaher (Tributary Project Coordinator). Those present for the Entiat Restoration Projects presentation were David Morgan (Chelan-Douglas Land Trust), John Soden (Natural Systems Design), Steve Kolk (U.S. Bureau of Reclamation), Dave Duvall (Grant PUD), and Denny Rohr (PRCC Habitat Subcommittee facilitator).

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met at Douglas PUD Auditorium in East Wenatchee, Washington, on Thursday, 13 November 2014 from 9:00 am to 12:00 pm. Members of the Tributary Committees joined the PRCC Habitat Subcommittee from 1:30 – 3:00 pm to listen to a presentation from Chelan County on the proposed Upper White Pine project.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting and the Committees adopted the proposed agenda.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 11 September 2014 meeting notes.

III. Monthly Update on Ongoing Projects

Becky Gallaher gave an update on funded projects. Most are progressing well or had no salient activity in the past month.

- Large Wood Atonement Project – This project is complete and a final report will be coming soon.
- Silver Protection Project – Jeremy Cram reported that WDFW secured funding from the U.S. Fish and Wildlife Service to replace the Committees portion. He indicated that the Conservation Easement closed yesterday (12 November). WDFW may approach the Committees to fund a stewardship plan on the property.
- Coulter Creek Barrier Replacement Project – The project sponsor (Chelan County Natural Resources Department; CCNRD) provided no new updates on this project.
- Upper Beaver Habitat Improvement Channel Restoration Project – The project sponsor (Methow Salmon Recovery Foundation; MSRF) negotiated an agreement for the relocation of the post-fire powerline route. The agreement will specify that MSRF can replant the affected areas with desired plant species without limitation. Okanogan County Electric Coop (OCEC) agreed to relocate the powerline when the plantings have matured and pose a risk (within 10-15 years). The OCEC will not trim or remove vegetation in the interim. The sponsor also notified the contractor

(Lloyd Logging) to discuss warranty work and adaptive management. The sponsor identified several improvements to the project as part of adaptive management.

- Okanogan Basin Stream Discharge Monitoring – The sponsor (Colville Tribes) indicated that the gauging stations continue to monitor stream flows.
- Shingle Creek Fish Passage Project – Chris Fisher reported that the project is complete and about 23 miles of stream are now available for colonization by anadromous species. A final report will be available soon. Chris said that the cost of the project exceeded the allocated amount by $10,128. The project sponsor (Okanagan Nation Alliance) will contact Becky to discuss a budget amendment.
- Methow/Chewuch Shallow Groundwater Monitoring Project – The project sponsor (Cascade Columbia Fisheries Enhancement Group; CCFEG) indicated that data loggers continue to collect information at the three monitoring sites.
- MVID Instream Flow Improvement Project – The project sponsor (Trout Unlimited; TU) reported that that they continue to participate in the twice-monthly MVID Directors meetings and monthly Operations and Executive Team meetings. Areas of focus in October were water rights permit completion, transfer of water right deeds to Ecology, and completion of the final designs for the west-side wells and east-side piping. The sponsor recently awarded the west-side pump station contract. Construction on the east-side piping started the first week of October.
- Silver Side Channel Design Project – The project sponsor (CCFEG) has been working toward consensus on several key features of the design. In addition, several timely meetings were held with multiple permitting agencies, including the Army Corps of Engineers, Ecology, Bonneville Power Administration, and WDFW. Feedback from these meetings is being considered and will help inform how they move forward with finalizing preliminary designs. Next steps include evaluating and refining the preliminary design, and beginning the permitting process. ***The sponsor asked to present their updated designs to the Committees in December. The Rocky Reach Committee agreed to invite CCFEG to the December meeting.***
- Twisp to Carlton Reach Assessment Project – The sponsor (CCFEG) indicated that they and their consultant (Cardno Entrix) floated the survey reach on 10 October with the Bureau of Reclamation (Jennifer Molesworth and Rob Richardson) and John Crandall (MSRF). During the float they accessed private land to look at a large side channel feature that offers opportunities for restoration. On 7 November they will have preliminary results available for review. Based on review comments, Cardno Entrix will work to produce the draft Reach Assessment. CCFEG and Cardno Entrix will share the Reach Assessment with the Regional Technical Team on 12 November. ***CCFEG asked if they could present results to the Committees in December. The Rock Island Committee agreed to invite CCFEG to the December meeting.***
- Similkameen RM 3.8 Project – The project sponsor (Okanogan Conservation District) reported that they conducted a site evaluation in September and are in the process of developing conceptual designs. Designs should be available for review in November or December.
- Entiat Stillwaters Gray Reach Acquisition – The sponsor (Chelan-Douglas Land Trust) provided no new updates on this project.
- Icicle Irrigation Flow Structure – The sponsor (CCNRD) reported that they and WDFW removed fish from the coffer dam area before any work began. Fish were also removed from the irrigation canal. A list of fish species and size classes will be provided in the final report. Once fish were removed, the irrigation structure was formed and concrete was poured. Boulders were placed just downstream from the diversion dam. Five boulder clusters were installed to help create scour and habitat pools. The sponsor will plant vegetation this fall.

- Post-Fire Landowner Assistance/Habitat Protection in Beaver and Frazer Creeks – The project sponsor (MSRF) has secured landowner agreements and funding to install six bridges at locations where culverts failed. Construction for these bridges will occur in November.

IV. Small Projects Program Applications

Clear Creek Fish Passage and Instream Flow Enhancement Project

The Committees reviewed a Small Projects Program application from Trout Unlimited titled *Clear Creek Fish Passage and Instream Flow Enhancement Project*. The purpose of the project is to improve flows within the lower 0.65 miles of Clear Creek by removing two irrigation diversions (partial fish barriers) and replacing them with a well. This will increase flows in Clear Creek by 0.45 cfs during the irrigation season (15 May through 30 September) and 0.25 cfs throughout the year. These actions will improve spawning and rearing habitat for steelhead and rearing habitat for juvenile Chinook salmon. The total cost of the project was $96,116. The sponsor requested $69,500 from HCP Tributary Funds. ***The Rocky Reach Tributary Committee approved funding for this project***.

Lehman Riparian Restoration Project

The Committees reviewed a Small Projects Program application from the Methow Conservancy titled, *Lehman Riparian Restoration Project*. The purpose of the project is to restore a 75-foot-wide riparian zone in four areas near RM 44 on the Methow River (M2 Reach) by planting over 700 stems consisting of black cottonwood, ponderosa pine, and Pacific willow. The sponsor will protect the plantings by placing a 7.5-foot-tall deer fence around the four areas. The sponsor will weed and monitor the site each year through 2018. The total cost of the project was $40,267. The sponsor requested $9,053 from HCP Tributary Funds. ***The Rock Island Tributary Committee approved funding for this project***. As part of the funding for this project, the Committee requires that the sponsor provide annual reports through 2018 describing the success of the project.

V. Amendment Requests

Methow/Chewuch Shallow Groundwater Monitoring Project

In September, CCFEG asked the Wells Tributary Committee if they could move $3,483.10 from Contract Labor to Professional Services. Thus, the final amount allocated for Professional Services would be $4,483.10 and the final amount allocated for Contract Labor would be $9,562.90. After careful consideration, the ***Wells Tributary Committee approved the budget amendment***. The total budget amount will not change as a result of this amendment.

Entiat Stillwaters Gray Reach Acquisitions Project

In September, the Chelan-Douglas Land Trust asked the Rocky Reach Tributary Committee if they could (1) grant a time extension on the project so the sponsor has time to complete all four acquisitions, (2) change the scope so the sponsor can acquire the entire Crone property (this will increase the acquired acreage from 10 acres to 16.47 acres), and (3) approve the use of Mark Noble as the appraiser and Larry Rees as the reviewer. After careful consideration, the ***Rocky Reach Tributary Committee approved the time extension, scope change, and the use of Mark Noble and Larry Rees.*** The contract was extended from 31 October 2014 to 31 December 2015. Both Mark Noble and Larry Rees are approved Tributary Committee appraisers. The sponsor indicated that they do not believe the change in scope will require additional funding.

VI. Okanagan Project Tour

Tracy Hillman, with help from Chris Fisher, Tom Kahler, Steve Hays, and Jeremy Cram, provided a briefing on their trip to the Okanagan River in Canada. The Okanagan Nation Alliance (ONA) conducted the site tours. During the first day of the fieldtrip (8 October), members visited the lower portion of Shuttleworth Creek. The lower portion of Shuttleworth Creek was designed to act as a sediment trap. About every five-ten years, the Ministry of Environment removes the sediment from the channel. This results in what looks like a bombing range. A rock dam located just upstream from the mouth of the stream maintains the sediment trap. Restoration actions under consideration include removing the barrier, reconfiguring the channel, and restoring riparian vegetation. Reconfiguration would result in a step-pool sequence, which would allow the Ministry of Environment to clean annually the first few pools in the sequence. Restoration would open about 31 km of tributary habitat. This stream is an important spawning and rearing area for steelhead/rainbow. In the future, the Committees would like to visit the upper watershed.

ONA then discussed the status of the Shuttleworth Creek diversion, which is located at Rkm 3.5. Surface water is diverted through an unscreened intake into a 700-m long open ditch that feeds into Hody Lake. The water is then piped to the Water Users' Community (WUC) properties. The system significantly reduces stream flows and habitat conditions in Shuttleworth Creek, and strands rainbow/steelhead in pools. The goal of the restoration project is to transfer the WUC from surface water to groundwater, and decommission the existing intake and diversion. The PRCC Habitat Subcommittee approved funding for the conversion to groundwater. So far, ONA has completed the drilling of wells, tested the wells, and completed part of the irrigation pipeline. They may need an additional $200,000 to complete the project. The remaining pipeline and irrigation system will be completed in 2015.

Following the Shuttleworth Creek discussion, members traveled to Skaha Dam and observed the operation of the fishway. The dam was constructed in 1952 with a fishway, but the fishway was never operated. Stop logs were installed in the fishway in 2015 allowing fish passage for the first time in about 60 years. ONA will monitor fish passage using video tapping and PIT and acoustic tag detections. Two PIT-tag arrays were installed in the fishway. Acoustic arrays are located upstream and downstream from the dam.

Members toured the new sockeye hatchery near the mouth of Shingle Creek and then visited the site where Shingle Creek irrigation dam was removed. The dam was located at Rkm 2.3 and blocked access to 35.4 km of spawning and rearing habitat for steelhead and Chinook. The dam was removed in 2014 and a series of four, inverted vortex rock weirs were installed to stabilize the channel and to create a series of riffles. Re-vegetation work will occur during autumn 2014. The Okanogan Basin Monitoring and Evaluation Program will monitor salmon use in Shingle and Shatford creeks.

Members then visited Trout Creek, a tributary to Okanagan Lake. The lower portion of Trout Creek was channelized in the 1950's. Historically, large numbers of kokanee and sockeye salmon spawned in Trout Creek. Trout Creek is one of ten tributaries to the lake that is being evaluated under the Okanagan Sub-basin Habitat Improvement Project. The program will develop an assessment report by March 2015. They will also complete a lake feasibility report by June 2015. The Tributary Committees may see a proposal seeking funds to restore habitat conditions within Trout Creek and perhaps other tributaries to the lake.

On the second day (9 October), ONA described restoration actions for the Penticton Channel (Okanagan River upstream from Skaha Dam), which was channelized in the 1950s. Members observed the two spawning platforms and several boulder clusters that were placed in the channel in 2014. ONA intends to install three more spawning platforms in the future. They are currently working on the designs and permits for those platforms. ONA expects the spawning platforms to be used heavily by sockeye salmon passing Skaha Dam. In 2014, the Rocky Reach Tributary Committee approved funding for the monitoring of the two spawning platforms. Because of controlled flows, the gravels should remain stable in the channel.

Members traveled to McIntyre Dam, where ONA is currently evaluating different gate settings and discharge rates on the jumping efficiency of sockeye salmon. Recall that in 2009 the dam was fitted with overshot gates. ONA has found the optimal setting for gate #2, which will be maintained until November. They will continue to evaluate settings for the other gates.

Member then visited the Okanagan River Restoration Initiative (ORRI) Project, which is located just upstream from the Town of Oliver. The first phase of implementation, which is complete, was to rebuild the setback dike in the lower portion of the project area. Members observed the completed side channel and instream rock structures, and noted the gravel bar forming in the main channel upstream of the side channels. They also visited the second phase of the project, which was the reconnection of a 300-m long side channel with the main channel. This was accomplished by placing bottomless, concrete structures at the upstream and downstream ends of the side channel. Last year, members questioned the opening to the side channel, noting that the long rock barb extending upstream would likely be modified during spring flows. This year, members observed little change to the opening to the side channel. The rock barb was still in place and had limited vegetation growing on it. In 2014, the Wells Tributary Committee approved funding for continued monitoring of the ORRI project (2014-2018).

Lastly, members visited Vertical Drop Structure (VDS) 13, which was modified by removing four V-shaped concrete components within the two middle bays of the structure. This should improve fish passage at the structure and enhance fish habitat (velocities and substrates) upstream from the structure. Large numbers of sockeye were spawning just upstream from VDS 13. ONA will monitor the effects of the modification on changes in slope, water velocities, water depths, and incubating sockeye eggs.

VII. Presentations

Entiat River Restoration Projects Presentation

The Bureau of Reclamation (BOR) and their consultant, Natural Systems Design, gave the Committees and the PRCC Habitat Subcommittee a presentation on restoration actions proposed for the Gray and Stormy Reaches on the Entiat River. Although the final list of actions will likely be funded by the Bonneville Power Administration, the Committees need to review and approve the proposed actions because some are located on properties acquired by the Chelan-Douglas Land Trust with Plan Species Account Funds. That is, restoration actions proposed on lands acquired (or protected) with Plan Species Account Funds must be approved by the Committees, even if the Committees are not funding the restoration actions.

The BOR and their consultant described the process by which they developed the conceptual plans, including the use of hydraulic modeling and using the Chiwawa River as a reference for the Entiat River. They then described the different types of large wood designs (e.g., meander jams, deflector jams, deflector jam series, and apex jams) and noted that the number of jams in the Entiat is about 40% of those in the Chiwawa River. They indicated that they will use helicopters to place wood in areas with limited access. They also described their general approach for restoring side channels and alcoves, noting that they want to focus on restoring perennial side channels with the philosophy of “go big but use a light touch.” They considered geomorphology, beaver activity, and fish stranding as important elements in designing side-channel restoration actions. Finally, they showed the location and proposed actions (conceptual plans) for each project area. The Committees will review the conceptual plans and provide comments to the BOR by 5 December. The Committees will have additional opportunities to provide comments on the 30% and 60% designs.

Upper White Pine Presentation

Chelan County Natural Resources Department (CCNRD), Interfluve, and the BOR gave a presentation to the PRCC Habitat Subcommittee and Tributary Committees on updated information on the proposed approach for the Nason Creek Upper White Pine Restoration Project. The presentation included updated information on soil sampling, 2D modeling (including both water depth and velocity projections), and changes in the design concept. CCNRD would like to move the power lines in 2015 and construct the channel in 2016. Because of a change in design, the sponsor has not yet prepared a cost estimate. They have already secured $780,000 from Ecology for the project. They intend to ask the Tributary Committees and the PRCC Habitat Subcommittee for funding. The Committees provided CCNRD and the BOR with several comments. CCNRD will likely submit a proposal to the Committees in December.

VIII. Information Updates

The following information updates were provided during the meeting.

1. Approved Payment Requests in September, October, and November:

   Rock Island Plan Species Account:

   - $735.52 to Cascade Columbia Fisheries Enhancement Group for the Twisp to Carlton Reach Assessment project in October.
   - $10,033.80 to Cascade Columbia Fisheries Enhancement Group for the Twisp to Carlton Reach Assessment project in November.
   - $34,435.00 to Cascade Columbia Fisheries Enhancement Group for the White River Large Wood Atonement project in November.
   - $1,188.52 to Chelan PUD for Rock Island Tributary Committee administration and coordination.
   - $87.50 to Clifton Larson Allen for Rock Island financial administration during the third quarter 2014.

   Rocky Reach Plan Species Account:

   - $10,851.24 to Cascade Columbia Fisheries Enhancement Group for the Silver Side Channel Design project in September.
   - $1,305.34 to Cascade Columbia Fisheries Enhancement Group for the Silver Side Channel Design project in October.
   - $27,899.03 to Cascade Columbia Fisheries Enhancement Group for the Silver Side Channel Design project in November.
   - $2,668.24 to the Okanogan Conservation District for the Similkameen RM 3.8 Design project in October.
   - $6,464.89 to the Okanogan Conservation District for the Similkameen RM 3.8 Design project in November.
   - $4,527.61 to Okanagan Nation Alliance for the Fish Passage at Shingle Creek Dam project in October.
   - $9,280.00 to the Confederated Tribes of the Colville Reservation for the Okanogan Basin Stream Discharge Monitoring project in November.
   - $1,020.12 to Chelan PUD for Rocky Reach Tributary Committee administration and coordination.
   - $87.50 to Clifton Larson Allen for Rocky Reach financial administration during the third quarter 2014.

   Wells Plan Species Account:

- $3,500.00 to Cascade Columbia Fisheries Enhancement Group for the Methow/Chewuch Shallow Groundwater Monitoring project in October.
- $4,527.04 to the Okanagan Nation Alliance for the Fish Passage at Shingle Creek Dam project in October.
- $6,688.77 to the Okanagan Nation Alliance for the Remove Collapsed Bridge from Shingle Creek project in November.
- $2,416.00 to Douglas PUD for Wells financial administration during fiscal year 2014.
- $656.02 to Chelan PUD for Wells Tributary Committee administration and coordination.

IX. Next Steps

The next meeting of the Tributary Committees will be on Thursday, 11 December at Grant PUD in Wenatchee.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Notes 11 December 2014

Members Present: Lee Carlson (Yakama Nation), Jeremy Cram (WDFW), Jeff Osborn (Chelan PUD), Kate Terrell (USFWS), Justin Yeager (NOAA Fisheries), and Tracy Hillman (Committees Chair).

Members Absent: Chris Fisher (Colville Tribes) and Tom Kahler (Douglas PUD).[1]

Others Present: Becky Gallaher (Tributary Project Coordinator). Those present for the Silver Side Channel Design and Twisp-Carlton Reach Assessment presentation were Matt Shales (Cascade Columbia Fisheries Enhancement Group) and Robes Parrish (USFWS).

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met at Grant PUD in Wenatchee, Washington, on Thursday, 11 December 2014 from 9:30 am to 12:30 pm.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting and the Committees adopted the proposed agenda with the following additions:

- Update from Robes Parrish on the White River Large Wood Atonement Project.
- Evaluation of the Shingle Creek Budget Amendment.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 13 November 2014 meeting notes.

III. Monthly Update on Ongoing Projects

Becky Gallaher gave an update on funded projects. Most are progressing well or had no salient activity in the past month.

- Large Wood Atonement Project – This project is complete and a final report will be coming soon. Robes Parrish, USFWS, described the status of the 28 large wood structures that were placed in the lower White River this year. He showed photos of the structures following a high flow event this fall. The flood increased river stage 8.7 feet in the lower White River. Of the 130 pilings placed in the river, only five were lost. All the structures are racking wood resulting in substantial accumulations of new wood. In addition, beavers are adding wood to the structures. Overall, Robes was pleased with the stability of the structures and their ability to rack wood.
- Coulter Creek Barrier Replacement Project – The project sponsor (Chelan County Natural Resources Department; CCNRD) provided no new updates on this project. Because the sponsor has not provided any updates on this project for several months, the Rocky Reach Tributary

[1] Chris and Tom provided their votes on decision items before and after the meeting.

Committee discussed their concerns about CCNRD's lack of communication with the Tributary Committee on this project. Becky noted that she contacts CCNRD and reminds them to send updates by the 5th of each month. She also said that the Committee's contract with CCNRD requires the sponsor to provide monthly updates (*sensu* Section 15, Sponsor Responsibilities – Monthly Updates). ***The Rocky Reach Tributary Committee directed Tracy Hillman to write a letter to CCNRD explaining the Committee's concern with the lack of communication on the Coulter Creek Barrier Replacement Project.***

- Upper Beaver Habitat Improvement Channel Restoration Project – The project sponsor (Methow Salmon Recovery Foundation; MSRF) continues to coordinate warranty repairs with the contractor and engineer. The repairs should be completed in spring of 2015. Modifications to the constructed stream channel were completed in November to address concerns related to increased stream flows resulting from the effects of the fires. Modifications consisted of placing 22 pieces of large wood in Beaver Creek.
- Okanogan Basin Stream Discharge Monitoring – The sponsor (Colville Tribes) indicated that the gauging stations continue to monitor stream flows.
- Fish Passage at Shingle Creek Dam Project – This project is complete and a final report will be available soon. The project sponsor (Okanagan Nation Alliance) requested a budget modification (see discussion below).
- Methow/Chewuch Shallow Groundwater Monitoring Project – The project sponsor (Cascade Columbia Fisheries Enhancement Group; CCFEG) indicated that data loggers continue to collect information at the three monitoring sites. The loggers will be removed in December and returned to the Wells Tributary Committee.
- MVID Instream Flow Improvement Project – The project sponsor (Trout Unlimited; TU) continues to make progress on the east-side pipeline. To date, they have installed 4.4 miles of pipe. The final 300 feet should be completed by 12 December. Bach Drilling started drilling the production wells for the west-side pipeline on 10 November. Currently, they have two, 12-inch diameter wells completed. Drilling on the third should be completed by 18 December. The wells are about 68-72 feet deep.
- Silver Side Channel Design Project – The project sponsor (CCFEG) is moving forward with finalizing preliminary designs. They are currently evaluating and refining the preliminary design, and beginning the permitting process. The sponsor provided a presentation to the Committees (see summary of the presentation below).
- Twisp to Carlton Reach Assessment Project – The sponsor (CCFEG) indicated that Cardno Entrix is working on the draft Reach Assessment. The sponsor provided a presentation to the Committees (see summary of the presentation below).
- Similkameen RM 3.8 Project – The project sponsor (Okanogan Conservation District) held a design meeting with the stakeholders and permitting agencies. They are working on the 30% design.
- Entiat Stillwaters Gray Reach Acquisition – The sponsor (Chelan-Douglas Land Trust) provided no new updates on this project.
- Icicle Irrigation Flow Structure Project – The sponsor (CCNRD) provided no new updates on this project.
- Post-Fire Landowner Assistance/Habitat Protection in Beaver and Frazer Creeks Project – The project sponsor (MSRF) reported no new activity on this project.

- Lehman Riparian Restoration Project – The Tributary/Sponsor Agreement is ready for signature.
- Clear Creek Fish Passage and Instream Flow Project – The Tributary/Sponsor Agreement is ready for signature. The sponsor (TU) continued planning and due diligence for the project in November. They are working with groundwater specialists in finding suitable locations for the well. They are also working with the Thousand Trails Resort manager to determine the final well location. December activities will include continued project planning and development of a draft project plan.

IV. General Salmon Habitat Program Application

Nason Creek Upper White Pine Floodplain Reconnection Project

The Committees reviewed a General Salmon Habitat Program application from Chelan County Natural Resources Department (CCNRD) titled *Nason Creek Upper White Pine Floodplain Reconnection Project*. The purpose of the project is to restore floodplain and channel dynamics, and to restore aquatic habitat in Nason Creek between RM 13.3 and 13.9. This will be accomplished by relocating the Chelan PUD powerlines, removing the left-bank levee, creating stream channel meanders, and adding large woody debris. This work should increase flood-prone area by 7-15 acres, increase stream sinuosity, and increase habitat quality and quantity. The total cost of the project was $3,037,136. The sponsor requested $400,000 from HCP Tributary Funds. ***The Tributary Committees declined funding for this project***.

Although the Committees generally support floodplain reconnection projects, and they recognized that the proposed project is a priority action in a priority area that would benefit Plan Species, the Committees could not support the total cost of the proposed project. They do not believe the potential benefits to Plan Species justify the total cost of the project, even when the cost of re-routing the Chelan PUD powerlines is ignored (powerline relocation = $721,136). The Committees based this conclusion on the cost of other comparable projects funded by the Tributary Committees and the fact that some members of the Committees have implemented similar projects at a much reduced cost. The Committees urged the sponsor to move forward with re-routing the powerlines and to work on ways to reduce the total cost of the proposed project. The Committees indicated that they would review a revised proposal.

V. Small Projects Program Application

Lower Wenatchee River Riparian Restoration (RM 1.8 and RM 16.0) Project

The Committees reviewed a Small Projects Program application from Cascadia Conservation District titled *Lower Wenatchee River Riparian Restoration (RM 1.8 and RM 16.0) Project*. The purpose of the project is to reduce streambank erosion, increase stream shading, and improve water quality (i.e., reduce temperatures) by reestablishing native riparian vegetation at two different locations along the Lower Wenatchee River. The project proposes to restore 1.1 acres (600 linear feet) of riparian habitat at RM 16.0 and 1.1 acres (1,000 linear feet) at RM 1.8. The total cost of the project was $44,000. The sponsor requested $40,000 from HCP Tributary Funds. ***The Tributary Committees declined funding for this project***.

The Committees generally support riparian restoration projects; however, the proposed project occurs in areas where the action will have limited benefit to Plan Species. In addition, the Committees did not consider the proposed action to be a high priority in the lower Wenatchee River. The success of some of the plantings will likely be limited because of the location of plantings on gravel bars that experience regular cycles of disturbance. Also, the vegetation on some sites appears to be going through natural succession (i.e., natural progression from herbaceous colonizers to more competitive-resistant species). Thus, these sites may already be moving toward their restoration potential. Finally, the Committees were not confident that the Conservation District will be able to implement the proposed action and achieve

80% survival of planted vegetation. This concern was based on the success of the Conservation District's restoration efforts on the Lower Entiat Riparian Project, where plant survival was well below 80%.

VI. Amendment Requests

Fish Passage at Shingle Creek Dam Project

The Rocky Reach and Wells Tributary Committees received a request from the Okanagan Nation Alliance (ONA) asking for a budget modification for the Shingle Creek Dam Fish Passage Project. For each contract, the sponsor asked to move $5,688 from Contract Labor to Salaries/Benefits, Professional Services, and Overhead/Administration. Thus, for the Rocky Reach contract, the final amount allocated for Salaries/Benefits = $7,017, Contract Labor = $36,812, Professional Services = $7,779, and Overhead/Administration = $7,617. For the Wells contract, the final amount allocated for Salaries/Benefits = $6,186, Contract Labor = $36,812, Professional Services = $8,502, and Overhead/Administration = $7,725. ***After careful consideration, the Rocky Reach and Wells Tributary Committees approved the budget amendment.*** The total budget amount will not change as a result of this amendment.

Silver Side Channel Design Project

The Cascade Columbia Fisheries Enhancement Group asked the Rocky Reach Tributary Committee if they could move $5,000 from "Engineering" to "Salaries and Benefits." Thus, the final amount allocated for Professional Services = $16,000, Engineering = $93,000, and Salaries and Benefits = $23,000. After careful consideration, the ***Rocky Reach Tributary Committee approved the budget amendment***. The total budget amount will not change as a result of this amendment.

VII. Presentations

Silver Side Channel Design Presentation

Matt Shales with Cascade Columbia Fisheries Enhancement Group gave the Committees a presentation on updates to the Silver Side Channel Design Project. The purpose of this project is to evaluate past, current, and future desired conditions and develop permit-ready designs for the Silver Side Channel and adjacent floodplain. The Silver Side Channel is located between Twisp and Carlton on the Methow River at about RM 35. The Committees were generally pleased with the design presented. They provided feedback on some of the design elements (e.g., they questioned the need for a small pond, which could increase temperatures in the restored channel downstream from the pond). Next year, the sponsor will submit a design report to the Committees for their review.

Twisp-Carlton Reach Assessment Presentation

Matt Shales with Cascade Columbia Fisheries Enhancement Group gave the Committees a presentation on updates to the Twisp to Carlton Reach Assessment (see Attachment 1). The purpose of this project is to collect and compile watershed process information, link processes with known habitat limiting factors, and develop and prioritize multiple projects in the Middle Methow (RM 28-41). The sponsor hired Cardno Entrix to do the assessment work following the U.S. Bureau of Reclamation's Reach Assessment methodology. Matt described the timeline, data sources, data constraints, products (deliverables), and additional data needs. The sponsor will submit the reach assessment report to the Committees by June 2015.

VIII. Information Updates

The following information updates were provided during the meeting.

1. Approved Payment Requests in November and December:

Rock Island Plan Species Account:

- $14,604.58 to Cascade Columbia Fisheries Enhancement Group for the Twisp to Carlton Reach Assessment Project.
- $8,816.55 to the Methow Salmon Recovery Foundation for the Post-Fire Landowner Assistance/Habitat Protection in Beaver and Frazer Creeks Project.

Rocky Reach Plan Species Account:

- $5,950.10 to Cascade Columbia Fisheries Enhancement Group for the Silver Side Channel Design Project.
- $15,259.61 to the Okanogan Conservation District for the Similkameen RM 3.8 Design Project.
- $53,783.54 to the Okanagan Nation Alliance for the Fish Passage at Shingle Creek Dam Project.
- $9,410.25 to the Methow Salmon Recovery Foundation for the Upper Beaver Habitat Improvement Channel Restoration Project.

Wells Plan Species Account:

- $9,410.25 to the Methow Salmon Recovery Foundation for the Upper Beaver Habitat Improvement Channel Restoration Project.
- $54,614.70 to the Okanagan Nation Alliance for the Fish Passage at Shingle Creek Dam Project.

2. Tracy Hillman thanked the Committees for providing feedback on the proposed actions on CDLT property in the middle Entiat. The following comments were sent to the Bureau of Reclamation:

    In general, reviewers supported the concepts presented to the Committees. Reviewers recognized that lateral migration opportunities are limited and they supported activation of side channels. That said, they questioned the benefits of the main channel jams as illustrated on Plan Drawing A1 (specific to project areas A3 and A4). Several jams are identified, but reviewers did not fully understand the intent of these structures.

    With regard to Plan Drawing E1, the entrance to the proposed perennial side channel (E3) may be challenging to obtain and possibly more difficult to maintain. Reviewers recognized the importance of activating side channels, but it appears the river is migrating away from the side channel entrance. In addition, it appears that the jam proposed at the entrance may actually reduce velocities and accelerate sediment deposition.

    Finally, regarding Plan Drawing D1, removal of the fill is appropriate for floodplain activation. Reviewers did not favor channel excavation for the proposed perennial side channel if a historic channel already exists. If a historic channel does not exist, reviewers suggested that you allow the area to flood and carve out its own channel. This is considerably cheaper than excavating a channel. In addition, if deposition occurs at the entrance, which may occur in 5 or 10 years, then the benefit is lost.

IX. Next Steps

The next meeting of the Tributary Committees will be on Thursday, 12 February 2014 at Grant PUD in Wenatchee.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Attachment 1

Presentation by Matt Shales on the Twisp to Carlton Reach Assessment Project

Project Partners

WASHINGTON STATE Recreation and Conservation Office

HCP TRIBUTARY COMMITTEE

RECLAMATION Managing Water in the West

Twisp to Carlton Reach Assessment Goal

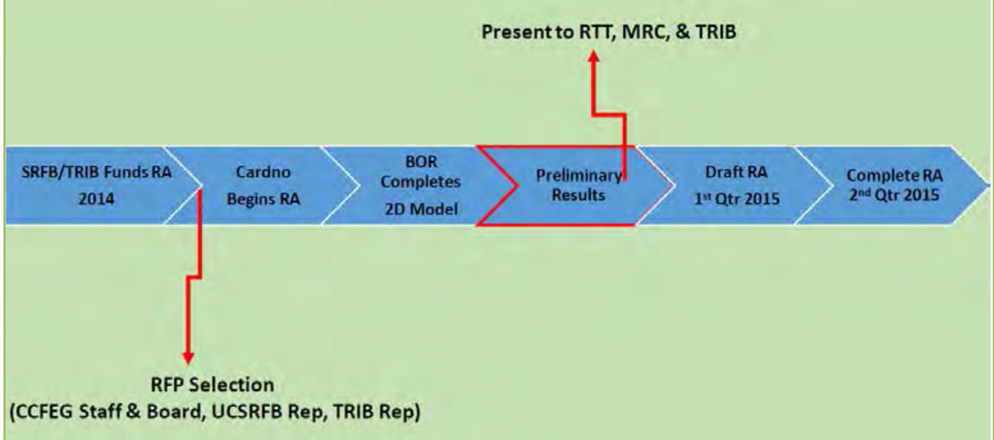
Methow River (RM 28-41)

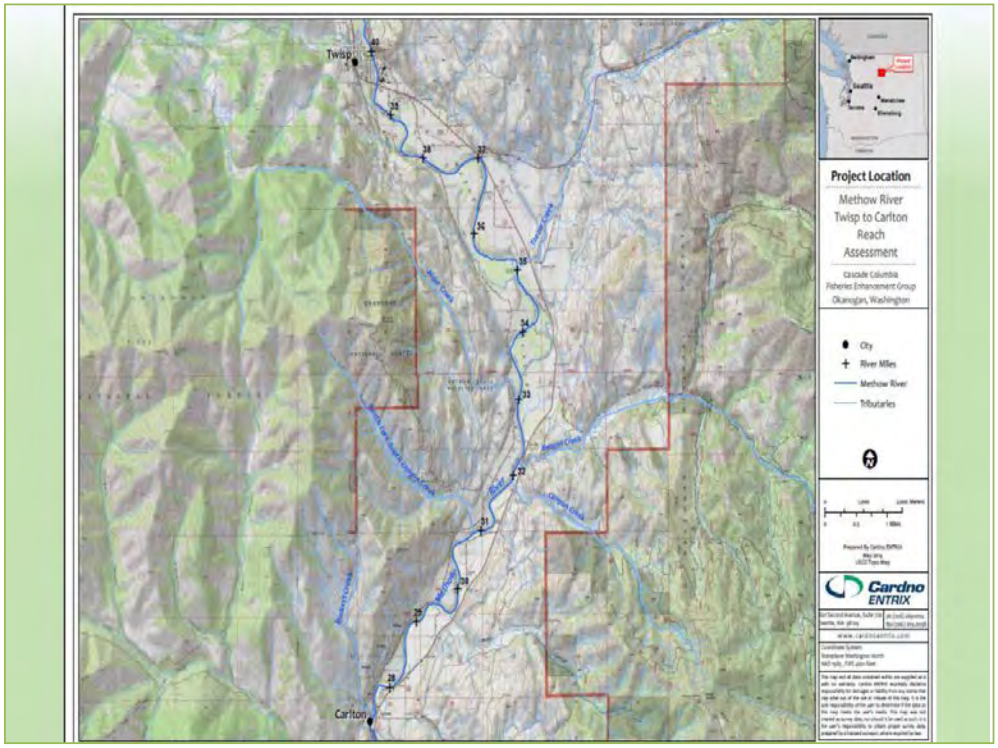
Determine how best to <u>protect</u> and <u>improve</u> habitat conditions needed to promote recovery of populations of listed salmonid species in this reach of the

Objectives (as defined in RA Guidance)

- Define the environmental baseline for the Project Area by **characterizing existing geomorphic conditions and key habitat-forming processes** at the watershed and sub-reach scale;
- Identify locations where habitat conditions could be either protected or enhanced through removal of constraints on natural processes, or thoughtful selection of specific locations that warrant direct restoration project intervention.
- Defining what protection or enhancement actions at specific locations might be most effective in addressing limiting factors; and
- Recommending a priority ranking for these actions

Project Timeline





Summary of Sources & Prior Reports

- Methow Sub-basin Geomorphic Assessment (Bureau of Reclamation [Reclamation] et al. 2008)
- Middle Methow Reach Assessment (Reclamation et al. 2010)
- Upper Columbia Spring Chinook Salmon, Steelhead, and Bull Trout Recovery Plan (Upper Columbia Salmon Recovery Board [UCSRB] 2007)
- A Biological Strategy to Protect and Restore Salmonid Habitat in the Upper Columbia Region (Upper Columbia Regional Technical Team [RTT] 2014)
- GIS data (BoR), LiDAR, FLIR, Google Earth imagery

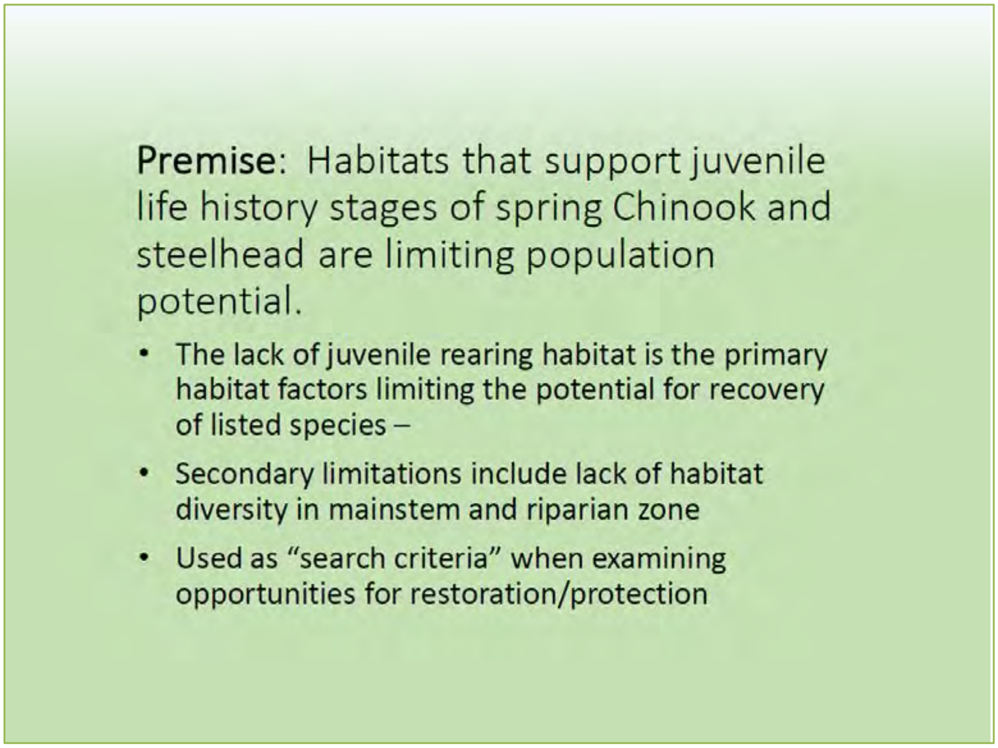
Existing Data Constraints

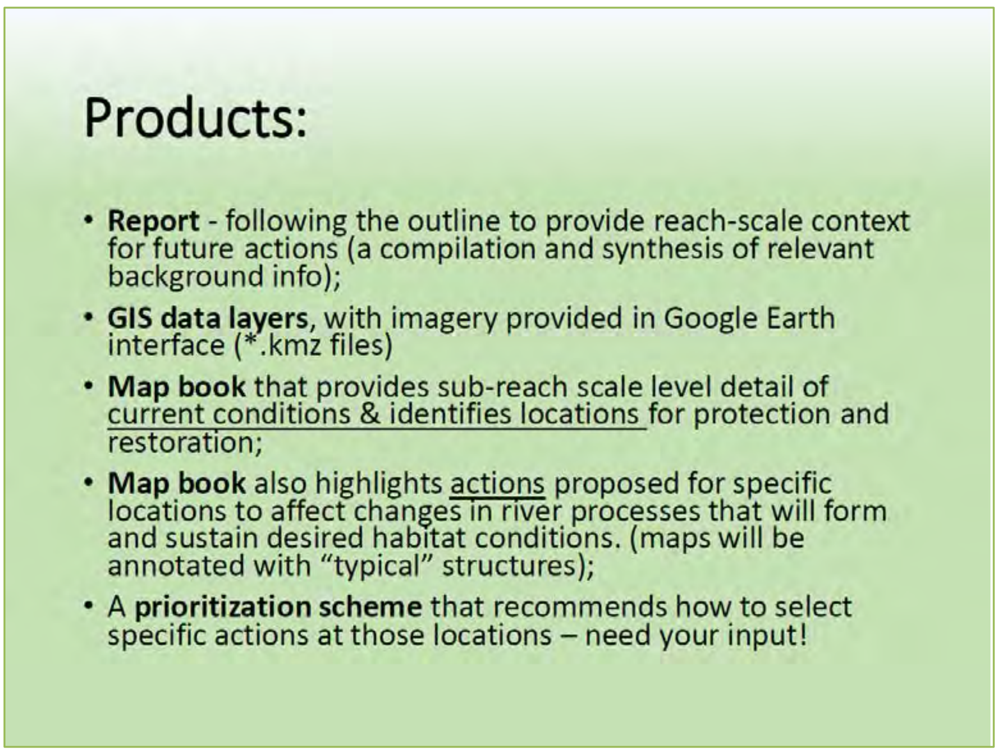
- The Methow Subbasin Geomorphic Assessment (Reclamation 2008) listed a variety of data gaps that remained upon the conclusion of that study (Reclamation 2010, pp 96-97) but these have been resolved in the course of this current study effort.
- These included updates to human features, geologic surface mapping, floodplain features and temperature data.
- No existing in-channel habitat mapping has been completed prior to this study.
- No LWD mapping has been completed prior to this study (see Sec. 1.2.3 of this report).

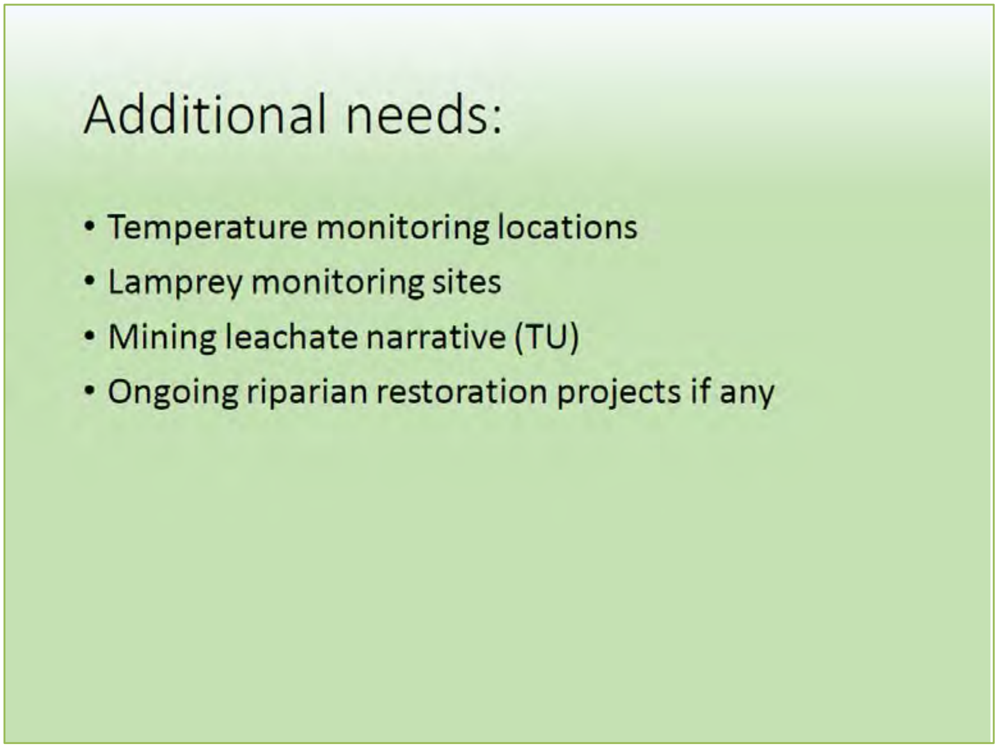
Approach:

Protect & Restore Natural River Processes

- Examined river processes in the larger context and how it has shaped this reach;
- Analyzed existing constraints and how they might be reconciled
- This is the fundamental approach to identifying protection & restoration opportunities to create and maintain desired habitats.


Premise: Habitats that support juvenile life history stages of spring Chinook and steelhead are limiting population potential.
• The lack of juvenile rearing habitat is the primary habitat factors limiting the potential for recovery of listed species –
• Secondary limitations include lack of habitat diversity in mainstem and riparian zone
• Used as "search criteria" when examining opportunities for restoration/protection


Products:
• **Report** - following the outline to provide reach-scale context for future actions (a compilation and synthesis of relevant background info);
• **GIS data layers**, with imagery provided in Google Earth interface (*.kmz files)
• **Map book** that provides sub-reach scale level detail of current conditions & identifies locations for protection and restoration;
• **Map book** also highlights actions proposed for specific locations to affect changes in river processes that will form and sustain desired habitat conditions. (maps will be annotated with "typical" structures);
• A **prioritization scheme** that recommends how to select specific actions at those locations – need your input!


Additional needs:
• Temperature monitoring locations
• Lamprey monitoring sites
• Mining leachate narrative (TU)
• Ongoing riparian restoration projects if any

APPENDIX D
HABITAT CONSERVATION PLAN
POLICY COMMITTEES
2014 MEETING MINUTES

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Seattle, Washington 98101
Phone 206.287.9130
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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Policy and Coordinating Committees	**Date:**	January 27, 2015
From:	Michael Schiewe, Chair		
Cc:	Kristi Geris		
Re:	Final Minutes of the November 6, 2014 Joint HCPs Policy and Coordinating Committees Conference Call		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Policy and Coordinating Committees met by conference call, on Thursday, November 6, 2014, from 1:00 p.m. to 2:30 p.m. Attendees are listed in Attachment A of these meeting minutes.

ACTION ITEM SUMMARY

- Douglas PUD will contact Dr. Tracy Hillman and Mr. Chuck Peven to obtain clarification on which HCP Chair positions they would like to be considered for; once clarified, an updated HCP Chair candidate table will be distributed to the Policy and Coordinating Committees (Item II-C). *(Note: Douglas PUD obtained clarification from Hillman and Peven following the meeting on November 6, 2014, and Kristi Geris distributed an updated candidate table to the Policy and Coordinating Committees that same day.)*
- Policy and Coordinating Committees representatives will review the résumés and curriculum vitaes (CVs) of the six Hatchery Committees Chair candidates and eight Coordinating Committees Chair candidates, and will rank the candidates first to last (1 to 6 for Hatchery Committees candidates, and 1 to 8 for Coordinating Committees candidates) for filling the Chair positions; Policy and Coordinating Committees representatives will provide their rankings to Kristi Geris (with a copy to Mike Schiewe) by close of business day (COB) Monday, November 17, 2014, and Geris will compile the results for discussion at the joint HCPs Policy and Coordinating Committees conference call scheduled for Tuesday, November 18, 2014 (Item II-C).

- Kristi Geris will distribute call-in information for the Joint HCPs Policy and Coordinating Committees conference call scheduled for Tuesday, November 18, 2014 (Item II-C). *(Note: Geris distributed a Microsoft Outlook meeting invitation containing call-in information, as discussed, following the meeting on November 6, 2014.)*
- **The next joint Policy and Coordinating Committees meeting will be on November 18, 2014 from 3:00 p.m. to 5:00 p.m., and will be held by conference call (Item II-C).**

DECISION SUMMARY

- The Policy and Coordinating Committees representatives present identified the following HCP signatory representatives to select the HCP Chairs for the Hatchery and Coordinating Committees: Steve Parker for the Yakama Nation (YN), Kirk Truscott for the Colville Confederated Tribes (CCT), Jim Craig for the U.S. Fish and Wildlife Service (USFWS), Ritchie Graves for the National Marine Fisheries Service (NMFS), Jeff Korth for the Washington Department of Fish and Wildlife (WDFW), Keith Truscott for Chelan PUD, and Shane Bickford for Douglas PUD (Item II-B).
- The Policy and Coordinating Committees representatives present approved a ranking system for narrowing the HCP Chair candidate lists to a "short list" for interviews, where each Party ranks the candidates first to last for filling the Chair positions, and review of the sum of those rankings along with further discussion will determine the interview lists (Item II-C).

AGREEMENTS

- The Policy and Coordinating Committees representatives present agreed to meet by conference call on Tuesday, November 18, 2014, from 3:00 p.m. to 5:00 p.m. to further discuss the HCP Chair positions candidates (Items II-C).

REVIEW ITEMS

- Kristi Geris sent several separate emails to the Hatchery and Coordinating Committees containing letters of interest, résumés, and CVs of their respective HCP Chair candidates for review, as follows:

Candidate	Agency/Company	HC Candidate	CC Candidate	ASWG Candidate	Email sent to HC/CC
Mr. Bryan Nordlund	Retired, NMFS	Yes	Yes	Yes*	9/18/14 HC 9/23/14 CC
Mr. Geoff McMichael	Mainstem Fish Research	Yes	Yes	Yes*	9/18/14 HC 9/23/14 CC
Dr. John Ferguson	Anchor QEA, LLC	Yes	Yes	Yes	9/18/14 HC 9/23/14 CC
Mr. Chuck Peven	Peven Consulting, Inc.	Yes	Yes	No	10/24/14 HC 10/24/14 CC 11/4/14 Joint
Mr. Tom Schadt	Anchor QEA, LLC	Yes	Yes	No	10/31/14 HC 10/31/14 CC
Ms. Elizabeth McManus	Ross Strategic	Yes	Yes	No	10/31/14 HC 10/31/14 CC
Dr. Tracy Hillman	BioAnalysts, Inc.	No	Yes	No	11/6/14 CC 11/4/14 Joint
Mr. Bill Muir	Retired, NMFS	No	Yes	No	9/23/14 CC
Dr. Peter Bisson	Bisson Aquatic Consulting, LLC	No	No	Yes	NA

Notes:
* = Nominated, but not selected for interview (however, not yet excluded from potential Chair selection)

DOCUMENTS FINALIZED

- No documents were finalized during today's conference call.

I. Welcome

A. Review Agenda (Mike Schiewe)

Mike Schiewe welcomed the Policy and Coordinating Committees and said that Tom Kahler will be leading the discussion today.

II. All Parties

A. Review of Discussions (Tom Kahler)

Tom Kahler said that following review of the first HCP Chair selection process in 2004, and realizing the lack of information contained in the administrative record describing that process, Douglas PUD requested that Anchor QEA document the selection process in order to develop a more comprehensive account for future reference. Kahler asked the Policy and Coordinating Committees representatives present if anyone was uncomfortable with this decision. No objections were stated.

Kahler said that Mike Schiewe announced his plans to retire at the end of April 2015. Kahler said that to start the Chair selection processes, Douglas PUD presented a list of Chair candidates to the Douglas PUD Aquatic Settlement Workgroup (SWG) in August 2014, and Chelan PUD and Douglas PUD jointly presented an initial list of Chair candidates to the HCP Hatchery and Coordinating Committees in September 2014. Kahler noted that he found it difficult to find qualified candidates who had both the availability and interest to fill the respective Chair positions. He said that the Committees were asked to identify additional candidates, making sure that the potential candidate fully understood the scope of work, qualifications, availability required for both attending and work between meetings, and administrative support needed. He said that both the Hatchery and Coordinating Committees discussed process and timeline, and acknowledged the role of the Policy Committees (which has been the same since 2004, per Sections 6 and 8 of the HCPs). He said that the PUDs circulated a Scope of Work and Qualifications document, slightly modified from the original documents used in 2004, to serve as guidance documents for identifying potential candidates. He said that the relationship between Committees was discussed, including between: 1) HCP Committees; 2) Aquatic SWG and HCP Committees; and 3) HCP Hatchery Committees and Priest Rapids Coordinating Committees Hatchery Sub-Committee (PRCC HSC). He also noted that the Coordinating Committees Chair also serves as the Policy Committees Chair, which requires experience in dispute resolution.

Kahler explained that the Aquatic SWG started their chair replacement process with five candidates and each Party ranked the candidates first to last (1 to 5); Kristi Geris compiled the rankings and based on those results, and three candidates were chosen for interviews.

Kahler said that this approach was discussed with the Hatchery and Coordinating Committees, and both Committees seemed interested in a similar approach.

Kahler said that since the last Coordinating Committees meeting on October 28, 2014, he has had productive discussions with each of the Coordinating Committees representatives, and he said that general agreement has been reached on the following issues:

- The Committees want to avoid getting bogged down in the "Facilitator" versus "Chair" debate, notably because the HCPs do not explicitly define these terms, and thus the only purpose served by insisting on one definition over another is as a means of prematurely disqualify candidates.
- The Committees do not find it necessary to approve a final Qualifications document prior to proceeding; similar to the debate above, this method seems to prematurely disqualify candidates.
- The Committees are interested in following the Aquatic SWG Chair selection approach (i.e., ranked list), and generally think that this is a practical approach which may eliminate some of the debate over such things as deciding on the Qualifications document.
- The Committees see the value in continuity of Chairs between several Committees; however, do not consider it necessary.
- The Committees believe that their respective Policy or Coordinating Committees representative will make the Chair selection for all Committees, including the Hatchery Committees Chair, after consultation with their Hatchery Committees representative.

Keith Truscott agreed that avoiding a debate over the terms "Facilitator" versus "Chair" was agreeable; however, he said that it is also important to consider the specific traits and skills that are expected of an HCP Chair. He said that Chelan PUD feels strongly that technical knowledge has contributed the success of the current HCP Chairs. He added that Chelan PUD will be looking for these traits in the next Chair. Kahler said that Douglas PUD agreed; however, with regard to the "Facilitator" versus "Chair" debate, it was viewed by several as a method to prematurely exclude a particular candidate.

B. DECISION: Who Makes the Chair Selection for Each Party (All)

Tom Kahler suggested that each Party designate who will select the HCP Chairs for the Hatchery and Coordinating Committees from their respective agencies. Steve Parker said that he understood that the Policy representative would make that decision; however, he noted that there has been interest in having the Hatchery Committees representatives select their own Chair. Kahler said that having the Policy representative select both Chairs seems ideal; however, the Policy representative can also delegate that authority. Ritchie Graves noted that the NMFS Hatchery, Coordinating, and Policy Committees representatives will be discussing the Chair selections together, but the agency will ultimately speak through the Policy representative.

The Policy and Coordinating Committees representatives present identified the following HCP signatory representatives to select the HCP Chairs for the Hatchery and Coordinating Committees: Steve Parker for the YN, Kirk Truscott for the CCT, Jim Craig for USFWS, Ritchie Graves for NMFS, Jeff Korth for WDFW, Keith Truscott for Chelan PUD, and Shane Bickford for Douglas PUD.

C. DECISION: Timeline and Selection Process (All)

Timeline

Tom Kahler said that Mike Schiewe is contracted as HCP Chair through April 2015, and ideally, the PUDs would like the new Chair to be contracted in time to shadow Schiewe through a couple of meetings for each Committee; this would also allow some time for the new Chair to be brought up to speed on the administrative support component. Kahler said that this timeline would translate to interviews in December 2014, final decisions in January 2015, and contracting by February 2015. Shane Bickford noted that, with regard to annual reporting, it would be great to have the new contract in place by January 2015, so that the new Chair will be present for the entire year. Kahler agreed that that would be ideal, but ambitious.

Selection Process

Tom Kahler recounted the Aquatic SWG's Chair selection process (as described earlier), and asked if the HCPs should take a similar approach. Steve Parker asked if the most favorable candidate is ranked first, and Kahler said that is correct. Kahler further clarified that the candidates with the lowest numerical scores could be initially invited for interviews.

Bickford said that the Regional Technical Team uses a ranking system to prioritize projects, which is based on individual criteria, and then compares notes to make final decisions. He said that this is similar to the Aquatic SWG's process, where a ranking approach is used to start the process, and final selections are made based on discussions. Ritchie Graves agreed that this approach is what he had in mind, and added that NMFS has conducted similar processes. The Policy and Coordinating Committees representatives present approved a ranking system for narrowing the HCP Chair candidate lists to a "short list" for interviews, where each Party ranks the candidates from first to last for filling the Chair positions, reviews of the sum of those rankings, and participates in further discussion to determine the interview lists.

Parker asked if a provision for discretionary veto power should be developed in the event that one or more Parties feel strongly that a particular candidate is not qualified. Bickford agreed that this may be a good idea, and may save time in the end. Graves said that he does not believe that it is in the best interest to force a Chair on any one Party; however, he is also very wary of absolute veto power. He added that this is similar to weighting the Qualifications document and criteria in the first place. Parker agreed with Graves' suggestion to discuss any differences of opinions if they should occur.

Kahler said that the next Coordinating Committees meeting is on November 18, 2014, and he suggested finalizing the rankings prior to that meeting, and convening a conference call to discuss the results. The Policy and Coordinating Committees representatives present agreed to meet by conference call on Tuesday, November 18, 2014, from 3:00 p.m. to 5:00 p.m. to further discuss the HCP Chair positions candidates. Kristi Geris said that she will distribute call-in information for the conference call. *(Note: Geris distributed a Microsoft Outlook meeting invitation containing call-in information, as discussed, following the meeting on November 6, 2014.)* Policy and Coordinating Committees representatives will review the résumés and CVs of the six Hatchery Committees Chair candidates and eight Coordinating Committees Chair candidates, and will rank the candidates from first to last (1 to 6 for

Hatchery Committees candidates, and 1 to 8 for Coordinating Committees candidates) for filling the Chair positions; Policy and Coordinating Committees representatives will provide their rankings to Geris (with a copy to Schiewe) by COB Monday, November 17, 2014, and Geris will compile the results for discussion at the joint HCPs Policy and Coordinating Committees conference call scheduled for Tuesday, November 18, 2014.

Graves said that he understood that Dr. Tracy Hillman was only interested in the Coordinating Committees Chair position, and Mr. Chuck Peven was interested in both the Hatchery and Coordinating Committees Chair positions. Bickford said that he understood that Peven was not interested in the Coordinating Committees Chair position, and that Hillman may have a conflict of interest in chairing the Hatchery Committees. Bickford said that Douglas PUD will contact Hillman and Peven to obtain clarification regarding which HCP Chair positions they would like to be considered for; once clarified, an updated HCP Chair candidate table will be distributed to the Policy and Coordinating Committees. *(Note: Douglas PUD obtained clarification from Hillman and Peven following the meeting on November 6, 2014, and Geris distributed an updated candidate table to the Policy and Coordinating Committees that same day.)*

D. Chair Continuity (All)

Tom Kahler said that Douglas PUD's Aquatic SWG Chair position interview list was already agreed upon. Kahler noted that he is uncertain of how much the Aquatic SWG Chair selection will influence Douglas PUD's HCP rankings, but noted that it is worth considering. He said that for the Hatchery and Coordinating Committees Chair selections, Douglas PUD inquired about the candidates' willingness to serve in one or more Committees. He said that there is also the question of continuity between the HCP Hatchery Committees and PRCC HSC. He said that some frustration has been expressed about reviewing the same material in both forums, and he added that the two forums would not be combined, but they could share the same Chair.

Shane Bickford said that for Douglas PUD, there is more overlap between the Coordinating Committees and Aquatic SWG than the Hatchery and Coordinating Committees. He said that there are a lot of fish passage and water quality issues that are addressed in the Wells

Dam Federal Energy Regulatory Commission license; so, he indicated that he is keenly interested in linking those Committees. Ritchie Graves asked who the candidates are for the Aquatic SWG Chair position. Bickford said that the interview list includes Dr. John Ferguson and Dr. Pete Bisson. He added that Dr. Tracy Hillman was also initially on that list; however, he withdrew. Steve Parker asked, that since Douglas PUD has indicated interest in linking the Aquatic SWG and Coordinating Committees, and Bisson is not a Coordinating Committees Chair candidate, if Douglas PUD is advocating for Ferguson. Bickford said that Douglas PUD is still considering options. He added that he wants the Parties to agree, and if that means separate Chairs, Douglas PUD is supportive of that. Parker noted that Ferguson is also the YN's top candidate for the Coordinating Committees, and added that this is also in consideration of retaining Kristi Geris for administrative support. Kahler noted that Mr. Tom Schadt is also now a candidate for the Coordinating Committees Chair position, whom would also include Geris for administrative support.

Keith Truscott noted that each Chair selection needs to be in the best interest for the respective Committee. He added that it would be great if the selections work where there is continuity; however, it should not be forced. Parker said, however, that the YN are really interested in continuity, which is largely their rationale for supporting Ms. Elizabeth McManus for the Hatchery Committees Chair position.

Kahler encouraged the Committees to contact the candidates if desired, and review their respective résumés and CVs. Kahler added that they are all qualified candidates.

List of Attachments

Attachment A List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Keith Truscott††	Chelan PUD
Lance Keller†	Chelan PUD
Alene Underwood*	Chelan PUD
Shane Bickford††,†	Douglas PUD
Tom Kahler†*	Douglas PUD
Greg Mackey*	Douglas PUD
Ritchie Graves††	National Marine Fisheries Service
Scott Carlon†	National Marine Fisheries Service
Jim Craig†	U.S. Fish and Wildlife Service
Jeff Korth†*	Washington Department of Fish and Wildlife
Kirk Truscott†*	Colville Confederation Tribes
Steve Parker†	Yakama Nation

Note:
†† = Denotes Policy Committee member or alternate
† = Denotes Coordinating Committees member or alternate
* = Denotes Hatchery Committees member or alternate

Wells, Rocky Reach, and Rock Island HCP Policy and/or Committees' Draft Minutes

The Wells, Rocky Reach, and Rock Island HCP Parties met via conference call on Tuesday, November 18, 2014, 3:00 PM to 4:00 PM. Each HCP Party was represented by either their Policy Committee or Coordinating Committees representative. See Appendix A for attendees. Tom Kahler hosted the call, which was convened with the following goals: 1) to develop a "short list" of candidates to interview for the chair positions of HCP Hatchery Committee (HC) and Coordinating Committee (CC), both of which are currently chaired by Mike Schiewe, who is retiring at the end of April 2015; and 2) to select an interview date, time, venue, and format. There were no additions or subtractions from the agenda.

The first two agenda items were to discuss and make decisions regarding the interview process. However, because of time constraints by some participants, most of the discussion on this topic was deferred until after the selection of candidates to interview. **DECISION**: Unanimous decision to select three candidates to interview for each committee (HC and CC).

The next several agenda items concerned the selection of interview candidates. Starting with the combined list of CC candidates ranked by each party; **DECISION**: all agreed to interview the three top-ranked candidates as follows in alphabetical order: Dr. John Ferguson, Dr. Tracy Hillman, and Mr. Tom Schadt.

Proceeding with the combined list of HC candidates ranked by each party; **DECISION**: all agreed to interview the three top-ranked candidates as follows in alphabetical order: Dr. John Ferguson, Ms. Elizabeth McManus, and Mr. Tom Schadt.

Discussed additional interview logistics, and agreed on the following **DECISIONS**:

1. To hold the interviews in Wenatchee;
2. To devote an entire day to the interviews and not try to squeeze the interviews into a day with other meetings (i.e., HC, CC, Priest Rapids Coordinating Committee [PRCCC], PRCC-Habitat Subcommittee);
3. To hold the interviews on December 17, 2014;
4. To have interviewers bring their lunches to allow discussion during lunch (rather than breaking for lunch);
5. To review the questions used in the original chair-selection process in 2004, and the questions that the Wells Aquatic Settlement Work Group (ASWG) has developed for their chair-selection interviews, and to provide comments on

and/or additions to or subtractions from those questions by 5:00 PM on December 2, 2014;

6. To meet by conference call @ 3:00 PM on December 3, 2014, to finalize questions and resolve other interview logistics;
7. To block out 1.5 hours per candidate interview;
8. To have additional time—if necessary—for the two candidates that made the interview list for both the HC and CC, rather than have separate interviews with those candidates for each committee;
9. To convene immediately following all the interviews to select the successful candidates for each committee;
10. To select successful candidates by unanimous consent, consistent with other decision making within the HCP.

Action Items:

11. Tom Kahler will send out a draft schedule for the interview within a week;
12. Tom Kahler will contact selected candidates as soon as possible to confirm their availability for a December 17, 2014, interview (completed November 19, 2014);
13. Tom Kahler will circulate the questions from the 2004 interviews and the ASWG upcoming interviews (completed November 18, 2014);
14. All parties will provide feedback on questions from #3, above, or propose new questions by December 2;
15. Tom Kahler will set up a conference call for December 3 at 3:00 PM (completed November 19, 2014);
16. The PUD representatives will select the venue for the interviews (completed November 20, 2014);
17. Jim Craig will notify Denny Rohr and the PRCC of the schedule change for the PRCC December meeting (completed November 20, 2014);
18. Tom Kahler will notify Mike Schiewe and Kristi Geris regarding the need to reschedule or cancel the December HC meeting (completed November 18, 2014)

Next Meeting:

Conference call on December 3, 2014, at 3:00 PM.

Appendix A – Attendees

Appendix A – Attendees

Name	Party
Becky Gallaher	Chelan PUD
Lance Keller†	Chelan PUD
Keith Truscott*	Chelan PUD
Alene Underwood‡	Chelan PUD
Kirk Truscott†‡	Colville Confederate Tribes
Shane Bickford*	Douglas PUD
Tom Kahler†‡	Douglas PUD
Greg Mackey‡	Douglas PUD
Ritchie Graves*	NOAA-National Marine Fisheries Service
Jim Craig†	U.S. Fish and Wildlife Service
Jeff Korth†	Washington Department of Fish and Wildlife
Steve Parker*	Yakama Nation

*Policy Committee representative
†Coordinating Committee representative
‡Hatchery Committee representative or alternate

APPENDIX E
LIST OF ROCKY REACH HCP COMMITTEE MEMBERS

Rocky Reach Mid-Columbia HCP Committees, 2014

Coordinating Committees

Name	Organization
Michael Schiewe (Chair)	Anchor QEA, LLC
Kirk Truscott	Colville Confederated Tribes
Steve Hemstrom (Jan-Feb) Lance Keller (Mar-Dec)	Chelan PUD
Bryan Nordlund (Jan-Sep) Scott Carlon (Oct-Dec)	NMFS
Jim Craig	USFWS
Jeff Korth	WDFW
Bob Rose	Yakama Nation

Hatchery Committees

Name	Organization
Michael Schiewe (Chair)	Anchor QEA, LLC
Kirk Truscott	Colville Confederated Tribes
Alene Underwood	Chelan PUD
Lynn Hatcher	NMFS
Bill Gale	USFWS
Mike Tonseth	WDFW
Tom Scribner	Yakama Nation

Tributary Committees

Name	Organization
Tracy Hillman (Chair)	BioAnalysts
Chris Fisher	Colville Confederated Tribes
Tom Kahler	Douglas PUD
Steve Hays	Chelan PUD
Dale Bambrick	NMFS
Kate Terrell	USFWS
Jeremy Cram	WDFW
Lee Carlson	Yakama Nation

Policy Committees

Name	Organization
Michael Schiewe (Facilitator)	Anchor QEA, LLC
Randy Friedlander	Colville Confederated Tribes
Kirk Hudson	Chelan PUD
Ritchie Graves	NMFS
Jessica Gonzales	USFWS
Jim Brown	WDFW
Steve Parker	Yakama Nation

APPENDIX F
STATEMENTS OF AGREEMENT FOR COORDINATING COMMITTEES

HCP Hatchery Committees and Coordinating Committees

Final Statement of Agreement

Annual Broodstock Collection Protocols

Hatchery Committees Approved September 17, 2014
Coordinating Committees Approved October 28, 2014

In fulfillment of requirements of existing and forthcoming Endangered Species Act permits for the Habitat Conservation Plan (HCP) Hatchery Programs, the Wells, Rocky Reach, and Rock Island HCP Hatchery Committees (HCP-HC) agree to develop and submit to the National Marine Fisheries Service (NMFS) annual Broodstock Collection Protocols each year by April 15.

Process and Schedule: The Permit Holders will prepare a draft Broodstock Collection Protocol for review by the HCP-HC and the HCP Coordinating Committees[1] (HCP-CC) no later than 10 days prior to their respective February meetings. Following Committees review and revision, a final Broodstock Collection Protocols will be subject to approval at the March HCP-HC and HCP-CC[1] meetings and submitted to NMFS by April 15.

NMFS Approval: Participation in the development, submission, and approval of the annual Broodstock Collection Protocols within the Committees by the NMFS HCP-HC and HCP-CC[1] representatives will constitute NMFS acceptance and approval of the annual Broodstock Collection Protocols.

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[1] HCP-CC approval meets the Wells HCP requirement for approval of broodstock collection and monitoring and evaluation activities involving the Wells Project facilities.

FINAL
Rock Island and Rocky Reach Habitat Conservation Plan
Coordinating Committees

Statement of Agreement

Maintain Rock Island and Rocky Reach Juvenile Bypass Operating Period of April 1-August 31 Annually

(Approved November 18, 2014)

Agreement Statement

The Rock Island and Rocky Reach HCP Coordinating Committees (CC) reviewed the juvenile subyearling Chinook bypass data collected during extended operations from September 1 through September 15, 2014 and agree that the normal juvenile bypass period as outlined in the Rocky Reach and Rock Island HCPs (April 1 through August 31) is adequately protecting 95% of the spring and summer migrations of juvenile Plan Species. The juvenile bypass operational period will be evaluated again in ten years (2024).

Background

Section 5.4.1 of both the Rocky Reach and Rock Island HCPs includes a requirement to conduct additional juvenile run-time monitoring outside of the normal operational timeframe to ensure bypass operations adequately cover 95% of the juvenile outmigration of all Plan Species. In consultation with the CC, both the Rocky Reach Juvenile Bypass System and the Rock Island Juvenile Bypass Trap were operated through September 15, 2014 to collect additional run timing data on subyearling Chinook (Table 1). Through approval of the CC, additional juvenile subyearling Chinook indexing was completed on September 15, 2014.

Table 1. Juvenile subyearling Chinook index counts (and run percentiles) during extended bypass operations, September 1-15, 2014.

	Index Count on 8/31/14	Index Count 9/1-9/15/14
Rocky Reach	22,251	76 (0.34%)
Rock Island	34,165	471 (1.37%)

APPENDIX G
STATEMENTS OF AGREEMENT FOR HATCHERY COMMITTEES

HCP Hatchery Committees
Statement of Agreement
Regarding NTTOC Objective Finalization
***September 17*, 2014**

Statement

The Wells, Rocky Reach, and Rock Island Habitat Conservation Plan (HCP) Hatchery Committees (HC) agree that that evaluation of Objective 12, included in the Monitoring and Evaluation Plan for PUD Hatchery Programs 2013 Update, has been completed based on the results and identified limitations described in the *Ecological Risk Assessment of Upper-Columbia Hatchery Programs on Non-Target Taxa of Concern* June, 2014. Should new information become available, the HC agree to assess the suitability of the data as it relates to conducting future NTTOC evaluations as a regional objective including Douglas, Chelan, and Grant PUDs; WDFW; USFWS; CCT; NMFS; and YN.

Background

The NTTOC ecological risk assessment was developed as a regional objective that would be addressed by collaboration between the Chelan County PUD, Douglas County PUD, Grant County PUD, Washington Department of Fish and Wildlife (WDFW), United States Fish and Wildlife Service (USFWS), Confederated Tribes and Bands of the Yakama Nation (YN), Confederated Tribes of the Colville Reservation (CCT), and National Marine Fisheries Service (NMFS). In 2008 the Wells HCP, Rocky Reach HCP, Rock Island HCP Hatchery Committees, and the Priest Rapids Hatchery Sub-Committee agreed to an approach to evaluate the potential effects of hatchery programs on non-target taxa of concern (NTTOC). The committees originally planned to convene a panel of experts to conduct a preliminary evaluation of the potential effects of Plan supplemented species on NTTOC. At the October 15, 2008 Hatchery Committees meeting, the members agreed to convene an expert panel to conduct a preliminary evaluation of potential effects of supplemented Plan Species on non-target taxa using an approach similar to that used in the Yakima Basin (Pearsons and Hopley 1999; Ham and Pearsons, 2001). The Committees agreed to convene the panel in spring or early summer 2009, and focus this initial effort on HCP Plan Species and the two non-Plan Species, westslope cutthroat trout and lamprey. The Committees identified species interactions, containment objectives for non-target species, and fisheries professionals who possessed the expertise to contribute as panel members. However, this expert panel was never assembled, and instead the Committees directed the Hatchery Evaluation Technical Team (HETT; a work group composed of PUD, agency, tribal, and consultant biologists) to pursue assessment of the hatchery programs potential effects on NTTOC.

The HETT evaluated methods to conduct a risk assessment on NTTOC, and proposed using a combined modeling and a Delphi panel approach, whereby the modeling results would be compared and correlated with the Delphi panel results. The HETT identified the PCD Risk 1 model (Busack et al., 2005; Pearsons and Busack, 2012) to conduct the modeling evaluation. The PCD Risk 1 model is a data intensive, individual-based stochastic model. The HETT determined that the assembled data to be used as inputs for the PCD Risk 1 model would also serve to provide expert panelists the necessary data for them to conduct risk assessments. Hence, the HETT embarked on an extensive effort to gather, organize, and extract the required data from existing datasets, literature, and biologists familiar with the programs and/or particular NTTOC. Ultimately the input data were assembled in a relational database that allowed the data to be output in user-friendly formats for modeling or Delphi panel use. The database also served to hold the modeling results, which could be extracted and summarized as needed.

A report titled *Ecological Risk Assessment of Upper-Columbia Hatchery Programs on Non-Target Taxa of Concern* was drafted in 2013 and finalized in 2014, which included the modeling results to date. The results in the report represent a very extensive effort to model the risk of all the upper Columbia hatchery programs for the identified NTTOC for which data and model runs were available.

References

Busack, C. A., K. P. Currens, T. N. Pearsons, and L. M. Mobrand. 2005. Tools for evaluating ecological and genetic risks in hatchery programs. Final report to Bonneville Power Administration (project 2003-058-00, contract BPA00016399).

Ham, K. D., and T. N. Pearsons. 2001. A practical approach for containing ecological risks associated with fish stocking programs. Fisheries 25(4):15-23.

Mackey, et al. 2014. Ecological Risk Assessment of Upper-Columbia Hatchery Programs on Non-Target Taxa of Concern. Final Report to HCP Hatchery Committees.

Pearsons, T. N. and C. A. Busack. 2012. PCD Risk 1: A tool for assessing and reducing ecological risks of hatchery operations in freshwater. Environmental Biology of Fishes 94:45-65. DOI:10.1007/s10641-011-9926-8.

Pearsons, T. N., and C. W. Hopley. 1999. A practical approach for assessing ecological risks associated with fish stocking programs. Fisheries 24(9):16-23.

HCP Hatchery Committees and Coordinating Committees

Final Statement of Agreement

Annual Broodstock Collection Protocols

Hatchery Committees Approved September 17, 2014
Coordinating Committees Approved October 28, 2014

In fulfillment of requirements of existing and forthcoming Endangered Species Act permits for the Habitat Conservation Plan (HCP) Hatchery Programs, the Wells, Rocky Reach, and Rock Island HCP Hatchery Committees (HCP-HC) agree to develop and submit to the National Marine Fisheries Service (NMFS) annual Broodstock Collection Protocols each year by April 15.

Process and Schedule: The Permit Holders will prepare a draft Broodstock Collection Protocol for review by the HCP-HC and the HCP Coordinating Committees[1] (HCP-CC) no later than 10 days prior to their respective February meetings. Following Committees review and revision, a final Broodstock Collection Protocols will be subject to approval at the March HCP-HC and HCP-CC[1] meetings and submitted to NMFS by April 15.

NMFS Approval: Participation in the development, submission, and approval of the annual Broodstock Collection Protocols within the Committees by the NMFS HCP-HC and HCP-CC[1] representatives will constitute NMFS acceptance and approval of the annual Broodstock Collection Protocols.

[1] HCP-CC approval meets the Wells HCP requirement for approval of broodstock collection and monitoring and evaluation activities involving the Wells Project facilities.

APPENDIX H
2014 ROCKY REACH AND ROCK ISLAND FISH SPILL PLAN

2014 Fish Spill Plan

Rock Island and Rocky Reach Dams

Public Utility District No. 1 of Chelan County

Prepared By:

Thad Mosey
Hydro Fisheries Biologist
and
Steve Hemstrom
Senior Fisheries Biologist
Public Utility District No. 1 of Chelan County
Wenatchee, Washington

Final
March 25, 2014

*For Rock Island fish spill plan during modified operations due to the Wanapum drawdown, please refer to the Interim Fish Passage Plan, Rock Island Hydroelectric Project, FERC No. 943 (Chelan PUD 2014).

Introduction and Summary

In 2014, Public Utility No. 1 of Chelan County (Chelan PUD) will implement spill operations for fish passage at the Rock Island and Rocky Reach and projects. Spill timing and spill percentages are specified by the anadromous Habitat Conservation Plans (HCP) for each respective project. Chelan PUD conducted juvenile project survival studies from 2002 through 2011 at Rocky Reach and Rock Island under varying spill levels in order to achieve HCP survival standards. The Rock Island Project completed multiple survival studies over a nine year period (17 total studies) for spring migrating Plan Species (Steelhead, sockeye, yearling Chinook), first using a 20 percent spill level, then a 10 percent spill level. Rock Island will continue to spill 10 percent of day average flow during the spring outmigration period through at least year 2020. Rocky Reach completed its suite of HCP survival studies for spring migrating Plan Species in 2011 (14 studies), under spill and no-spill operation at the dam. HCP juvenile survival standards were achieved for species tested with a no spill operation (yearling Chinook, steelhead, sockeye). Project spill levels are summarized in Table 3 of this plan. Chelan PUD holds valid Incidental Take Statements (ITS) from NOAA Fisheries (NOAA) and the United States Fish and Wildlife Service (USFWS) for HCP fish spill operations at Rocky Reach and Rock Island.

For the 2014 juvenile outmigration, Chelan PUD will operate the Rocky Reach juvenile fish bypass system (JFBS) starting 1-April for the spring juvenile outmigration of yearling Chinook, steelhead, and sockeye. Spring spill at Rocky Reach Dam will consist of hydraulic spill for reservoir control only. HCP Project survival standards were achieved with bypass-only operations. During the subyearling Chinook outmigration in 2014, Rocky Reach will spill 9 percent of day average river flow for a duration covering 95 percent of subyearling outmigration past the dam. Per the HCPs, Chelan will conduct a subyearling Chinook run-timing verification study with extended bypass operations at both Projects in 2014, with methods approved by the HCP Coordinating Committee (HCP CC).

At Rock Island Dam in 2014, Chelan PUD will operate the Project with a 10 percent day-average spill level for the spring outmigration period. Rock Island has also completed HCP spring Plan Species survival testing for all Plan Species with a 10 percent spill level at the dam and has achieved juvenile survival standards for yearling Chinook, steelhead and sockeye and combined adult-juvenile survival for all three species.

During the summer period in 2014, Rock Island will spill 20 percent of the day-average river flow for the outmigration of sub-yearling summer Chinook. Spill is the primary means of juvenile salmon and steelhead passage at Rock Island per Section 5.4.1(a) of the Rock Island HCP. Spring and summer spill will cover 95 percent of the juvenile outmigration for yearling Chinook, steelhead, sockeye, and subyearling Chinook in 2014.

Rocky Reach Spring Juvenile Bypass Operations

Rocky Reach will operate its JFBS continuously through the spring outmigration period, beginning 1-April, 2014. Daily index sampling (for juvenile steelhead, yearling Chinook, and sockeye) will be performed at the bypass sampling facility to estimate the outmigration percentiles for each species through the spring period. During "index sampling" each day, a total of four 30-minute samples (Table 1) will be taken beginning at the top of each hour, 8 am to 11am. Spring spill for fish passage is not required at Rocky Reach in addition to the JFBS operation, but periods of forced spill may occur under high river flows. Some level of forced spill (river flow above 201 kcfs turbine capacity) normally occurs at Rocky Reach in the spring. Over the past 20 years, forced spill has occurred approximately 28 percent of all hours, April through June.

In 2014, as directed by the HCP, Chelan PUD will conduct bypass operations outside of the normal operating period of 1 April to 31 August to assess subyearling Chinook run-timing and achievement of bypass operations for 95% of the subyearling Chinook outmigration. The HCP Coordinating Committee will develop guidelines for conducting this evaluation in 2014.

Sampling protocols at the Rocky Reach bypass system in 2014 will remain consistent with those used in 2004-2013. Daily sampling in spring and summer periods (Monday through Sunday) will use four 30-minute "index periods" at 0800, 0900, 1000, and 1100 hours (Table 1). The sample target for each 30-minute sample will be 350 smolts during the spring period (yearling Chinook, steelhead, and sockeye combined), and 125 smolts for summer period (subyearling Chinook). If the number of fish collected in the bypass sampling raceway is estimated to reach the maximum number prior to completion of the 30-minute sample, the sampling screen will be retracted from the bypass flume and the number of fish collected in the shortened sample period will be proportionately expanded to the entire 30-minute period.

Table 1. Index sampling times at the Rocky Reach juvenile fish bypass and the number of smolts per sample in 2014. Sample times and sample targets have remained consistent since 2004.

Time	Sample Duration	Number of Smolts	Day of Week
08:00-08:30	30 minutes*	350 (spring) 125 (summer)	Monday-Sunday
09:00-09:30	30 minutes*	350 (spring) 125 (summer)	Monday-Sunday
10:00-10:30	30 minutes*	350 (spring) 125 (summer)	Monday-Sunday
11:00-11:30	30 minutes*	350 (spring) 125 (summer)	Monday-Sunday

*Sample duration may be less than 30 minutes if smolt numbers are met prior to full 30 minute sample time

Rocky Reach Summer Spill Operations

Rocky Reach Dam will spill 9 percent of the estimated day average river flow for the subyearling Chinook outmigration. Spill will commence in late May to early June upon arrival of subyearling Chinook smolts in the Rocky Reach bypass samples. Juvenile run-timing information at Rocky Reach will be used to estimate subyearling Chinook passage percentiles (from the University of Washington's Program RealTime run forecaster) and guide spill operations to cover 95 percent of the summer outmigration. Actual subyearling counts in combination with juvenile passage estimates from the University of Washington's Program RealTime run forecaster will determine spill start and stop dates for the summer spill program.

The HCP guidelines for starting and ending summer spill at Rocky Reach are as follows:

1. Summer spill will start at midnight no later than the day on which the estimated 1-percentile passage point is reached, as indicated by Program RealTime run-forecast model. S*ubyearling* Chinook will be defined as any Chinook having a fork length from 76 mm to 150 mm.

2. Summer spill season will generally end no later than 15-August, but not until subyearling index counts from the juvenile bypass sampling facility are 0.3 percent or less of the cumulative run for three out of any five consecutive days (same protocol used 2004-2013) and Program RealTime is estimating that the 95th percentile passage point has been reached and spill passage has covered at least 95% of the subyearling outmigration

Diel Spill Shaping at Rocky Reach and Rock Island

Daily spill volumes will be shaped within each 24-hour period at Rocky Reach during the summer, and at Rock Island during both spring and summer spill periods (Table 2). Spill shaping attempts to optimize spill water volume to maximize spill passage effectiveness for smolts. The diel spill shape functions to provide either higher or lower spill volume during periods of either higher or lower fish passage. Spill shaping is based on the observed diel (24-hour) passage distributions of smolts at each project during spring and summer (Steig et al. 2009, Steig et al. 2010, Skalski et al. 2008, Skalski et al. 2010, Skalski et al. 2011, Skalski et al. 2012). The different spill percentages and time blocks are shaped such that the summation of water volume from all time blocks within the day equals the volume of water that would have been spilled under a constant, unshaped spill level (for instance spill at 9 percent day-average river flow at Rocky Reach with no shaping). The hourly spill shape in 2014 will remain consistent with previous years, 2004-2013.

Table 2. Fish spill percentages and spill shape for the Rocky Reach spill program, 2014.

Project	Season	Daily Spill Average	Within-Day Spill Levels	Duration (# of hours each day)	Time of Day	Spill Shape %
Rocky Reach	Spring	none	--	--	--	--
Rocky Reach	Summer*	9%	Med	1	00:00-01:00	9.0%
			Low	6	01:00-07:00	6.0%
			Med	2	07:00-09:00	9.0%
			High	6	09:00-15:00	12.0%
			Med	9	15:00-00:00	9.0%

*Spill for subyearling Chinook

2014 Run-Timing Predictions

Chelan PUD utilizes the University of Washington (UW) to provide run-timing predictions and year-end observed values for spring and summer out-migrating percentiles for salmon and steelhead. UW's Program RealTime run-time forecasting model is used for this purpose. Program Real-Time provides daily forecasts and cumulative passage percentiles for steelhead, yearling Chinook, sockeye, and subyearling Chinook at both Rocky Reach and Rock Island. This program enables Chelan PUD to better predict the time when a selected percentage of these species will arrive, and when a given percentage of any stock has passed. The program utilizes daily fish counts from the Rocky Reach bypass sampling facility and the juvenile bypass trap at Rock Island Dam. Estimates of passage percentiles are generated with the model's forecast error and are displayed with the daily predictions at:

http://www.cbr.washington.edu/crisprt/

Historic Run Timing

Estimated mean dam passage dates (first percentile to the 95th percentile) for each species at Rocky Reach and Rock Island are summarized in Table 3. Run-timing dates are estimated from daily index sample counts at the Rocky Reach JFBS, 2004-2013, and from the Rock Island Dam smolt bypass trap, 2000-2013 (Table 3). At Rocky Reach, the subyearling Chinook run generally begins the first week of June, with the one-percentile passage date on 1-June (mean date for years 2004-2013). Rocky Reach subyearling passage reaches the 95th percentile, on average, around 9-August (2004-2013, range: 27-July to 24-August).

Rock Island Dam juvenile salmon and steelhead sampling from the Smolt Monitoring Program (SMP), 2002-2013, indicates that the first percentile (one-percent passage) mean passage date for combined spring migrants (yearling Chinook, steelhead, and sockeye) occurs around 18-April (Table 3). The latest spring spill start date for Rock Island per the HCP is 17-April. The summer outmigration of subyearling Chinook smolts at Rock Island Dam generally begins in early June (although fry are encountered earlier), and on average, reaches the 95th percentile passage point around 8-August (range: 1-August to 18-August, 2002-2013).

Table 3. Spill percentages, bypass operation dates, and mean passage percentile dates (2002-2013) for the 1st and 95th percentile passage points for HCP spring and summer outmigrants at Rocky Reach and Rock Island.

Rocky Reach	**steelhead**	**yearling Chinook**	**sockeye**	**subyearling Chinook**
Percent Spill	0% Spring	0% Spring	0% Spring	9% Summer
1st, 95th percentile Passage Dates	4/16, 5/31	4/16, 5/30	5/6, 5/26	6/1, 8/9
RR Bypass Operating?	Yes 4/1 – 8/31	Yes 4/1 – 8/31	Yes 4/1 – 8/31	Yes 4/1 – 8/31
Rock Island	**steelhead**	**yearling Chinook**	**sockeye**	**subyearling Chinook**
Percent Spill	10% Spring	10% Spring	10% Spring	20% Summer
1st, 95th percentile Passage Dates	4/22, 6/9	4/14, 6/5	4/19, 6/15	6/3, 8/8
RI Bypass Trap Operation	4/1 - 8/31	4/1 - 8/31	4/1 - 8/31	4/1 - 8/31

Source - Rock Island: http://www.cbr.washington.edu/crisprt/index_midcol2_pi.html
Source- Rocky Reach: http://www.cbr.washington.edu/crisprt/index_midcol2_che.html

Rock Island 2014 Spring Spill

In 2014, Rock Island Dam will spill 10 percent of the estimated day average river flow starting no later than 17-April, and will end spill after 95 percent of spring outmigrants have passed the dam (usually the first week of June) and spill passage has been provide for at least 95% of the spring species outmigration. Spill volume will be shaped to maximize spill efficiency (Table 4). Chelan PUD personnel will operate the Rock Island bypass trap, an upper Columbia Smolt Monitoring Program (SMP) site, continuously from 1-April through 31-August, seven days per week to provide daily smolt counts. Index counts will provide the basis to determine the start and end the spring and summer outmigration periods. HCP SOA guidelines to start and end the spring spill program at Rock Island are as follows:

1. The Rock Island spring spill program will begin when the Rock Island daily smolt passage index count exceeds 400 fish for more than 3 days (this corresponds to the approximately 5 percent passage date), or no later than 17-April, as outlined in Section 5.4.1. (a) of the Rock Island HCP.

2. Rock Island spring spill will end following completion of the spring outmigration (95 percent passage point), and subyearling summer Chinook have arrived at the Project.

Rock Island 2014 Summer Spill

Rock Island will spill 20 percent of the estimated daily average river flow for a duration covering 95 percent of the summer out migration of subyearling Chinook. Daily smolt counts from the Rock Island bypass trap will inform decisions on when to start and stop spill. The HCP Coordinating Committee's (HCPCC) agreement guidelines to start and stop the summer spill at Rock Island are outlined as follows:

1. Rock Island summer spill in 2014 will begin immediately after completion of the spring spill. The summer spill level will be 20 percent of day average flow, shaped to increase spill efficiency. Spill will continue for a duration covering 95 percent of the subyearling outmigration.

2. Summer spill will generally end no later than 15-August, or when subyearling counts from the Rock Island trap are 0.3 percent or less of the cumulative run total for any three out of five consecutive-day period, and UW's Program RealTime is estimating 95 percent run completion (same protocol used in 2004-2013).

Table 4. Spill percentages and hourly spill shape for the Rock Island spring and summer fish spill program, 2014.

Project/Season	Daily Spill Average	With-in Day Spill Levels	Duration (# of hours each day)	Time of Day	Spill Shape %
Rock Island Spring*	10%	High	4	0000-0400	12.5
		Med	3	0400-0700	10.0
		Low	5	0700-1200	6.0
		Med	8	1200-2000	10.0
		High	4	2000-2400	12.5
Rock Island Summer**	20%	High	1	0000-0100	23.0
		Med	1	0100-0200	19.0
		low	8	0200-1000	15.0
		Med	1	1000-1100	19.0
		High	13	1100-2400	23.0

*Spring spill for yearling Chinook, steelhead, and sockeye; **summer spill for subyearling Chinook

Spill Program Communication

Chelan PUD's fish spill coordinator will notify the HCP Coordinating Committee (HCPCC) not less than once per week when fish passage numbers indicate that specific triggers for starting or stopping spill are likely to occur in the immediate future. Chelan PUD will notify the HCPCC regarding any unforeseen issues that pertain to the spill program as the season progresses. Communications with the HCPCC on spill information will generally be made by email, pre-scheduled conference calls, and HCPCC monthly meetings.

Literature Cited

Chelan County . 2014. Interim Fish Passage Plan, Rock Island Hydroelectric Project, FERC No. 943. Public Utility District of Chelan County, Wenatchee, WA.

Skalski, J.R., R.L. Townsend, T.W. Steig, and P.A. Nealson. 2012. Survival, Diel Passage, and Migration Dynamics of Yearling Chinook Salmon Smolts at Rocky Reach Dam in 2011. Prepared for Public Utility District of Chelan County, Wenatchee, WA. Columbia Basin Research School of Aquatic and Fishery Sciences, University of Washington. Final Report, January 2012.

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APPENDIX I
2014 ROCKY REACH JUVENILE FISH BYPASS SYSTEM OPERATIONS PLAN

2014 Rocky Reach Juvenile Fish Bypass System Operations Plan

Final Plan

Prepared By:

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February 2014

Introduction

The Public Utility District of Chelan County (District) constructed and installed a permanent fish bypass system (FBS) in 2002/2003. The bypass system is designed to guide juvenile salmon and steelhead away from turbine intakes at Rocky Reach Dam. The system consists of one surface collector entrance (SC) and the intake screen (IS) system in turbine units 1 and 2. Please refer to Mosey (2004) for a detailed description of the bypass production system.

Studies and data collection at the Rocky Reach FBS fall under one of two general categories "Standard Operations" or "Special Operations" for bypass evaluations. Activities and data collection under standard operations include day to day sampling of run-of-river (ROR) fish to evaluate run timing, species composition, and fish condition after passage. Special operations may include additional sampling time to supply fish for marked fish releases.

2014 Evaluation Requirements

Run-of-river fish are collected at the Juvenile Sampling Facility (JSF) to evaluate and provide fish for the following:

1. Run timing of target species:
    a. Provide standardized juvenile capture rate data to supplement Program RealTime (UW) run-timing predictions
    b. Guide decisions about initiating summer fish spill
    c. Verify bypass operations provide protection for 95% of the juvenile summer Chinook outmigration (September operations to be determined by the Rocky Reach Habitat Conservation Plan Coordinating Committee (RR HCP CC))

2. Fish species composition:
    a. Guide decisions about starting or stopping spill
        i. Currently summer fish spill occurs at Rocky Reach.

3. Origin of fish stocks and identification of marked individuals:
    a. PIT tags
    b. Fin clips

4. Fish condition:
    a. Ensure that the bypass system remains safe for migrating juvenile salmon and steelhead by evaluating:
        i. Descale: 20% or more scale loss on either side
        ii. Injury: Scratches, bruises, or hemorrhages
        iii. Mortality: Any fish dead on arrival to sampling facility

2014 Study Methods

For more information about the study methods please refer to Mosey (2004).

Standard Operations:

1. Sampling Periods (1 April to TBD September):
    a. Monday through Sunday
    b. Collections Times
        i. 30 minute maximum **(or)**
            i. 0800-0830
            ii. 0900-0930
            iii. 1000-1030
            iv. 1100-1130
        ii. Target number of fish
            i. 350 spring species
            ii. 125 summer species

2. Fish Condition:
    a. First 100 fish of each species are examined for condition:
        i. Descale
        ii. Injury
        iii. Mortality

3. Species Composition:
    a. ROR fish collected are enumerated by species
    b. Collect data for Program RealTime to determine start and end of spill
    c. Currently summer fish spill occurs at Rocky Reach.

4. Origin of fish stocks and identification of marked individuals:
    a. PIT tags
    b. Fin clips

Special Operations:

1. Marked Fish Releases (Prior 1 April):
    a. Prior to the 1 April system start-up, hatchery yearling Chinook will be used for marked fish releases to determine if the JFBS is causing descale, injury, or mortality.
        i. Releases will be conducted with hatchery summer chinook prior to the 1 April start date to determine if the JFBS is working properly and to help isolate potential sources of descale, injury, and mortality.
        ii. Fish (n = 100/release) of varying sizes will be randomly selected from hatchery chinook. Only those with no scale loss or injury will be marked.
        iii. Marked fish will be systematically released at locations upstream of the sampling screen in the bypass system and into both intake screens in units C1 and C2.
        iv. If potential problems are identified, resolve problems by 1 April system start-up.

2. Marked Fish Releases (1 April to TBD September):

a. A phased approach will be used to evaluate the descaling rate, injury rate, and mortality rate of fish passing through the bypass system. We developed a sampling protocol and threshold percentages (Table 1) for descale, injury and mortality that will trigger study phases.
b. Identify "ambient" rates of descale, injury and mortality.
c. Once the ambient rate is estimated and if further sampling shows descale problems continuing at 5%, (3% for injury, 2% for mortality) *above* ambient level for three consecutive samples.
    i. If variable rates of descale, injury or mortality do occur between species, then collection of yearling chinook, sockeye, or steelhead may be necessary for marked releases.
    ii. Fish (n = 100/release) of varying sizes will be randomly selected at the juvenile facility and only those migrants with no scale loss or injury will be marked.
    iii. Marked fish will be systematically released at locations upstream of the sampling screen in the bypass system until the problem area is isolated.
d. Identify circumstances when we would refer to the RR HCP CC.

e. The District will consult with the RR HCP CC if any abnormal fish conditions (within values outlined in Table 1) are observed in the sample population.

Table 1. Flow diagram of phased approach and threshold values for conducting marked-fish releases in the *juvenile bypass system at Rocky Reach Dam (Skalski and Townsend 2003)*

	Phase 1		Phase 2		Phase 3		Phase 4
Threshold		**5% initl**		**A*+5%**		**A*+15%**	
Descale	Index sampling for for descale rate	→	Mark-releases to est. ambient descale	→	In-system mark-releases to isolate descale problem	→	refer to HCP Coord. Comm.
Threshold		**3% initl**		**A*+3%**		**A*+10%**	
Injury	Index sampling for for inury rate	→	Mark-releases to est. ambient injury	→	In-system mark-releases to isolate injury problem	→	Temp. bypass shutdown refer to HCP Coord. Comm.
Threshold		**2% initl**		**A*+2%**		**A*+4%**	
Mortality	Index sampling for for mortality rate	→	Mark-releases to est ambient mortality	→	In-system mark-releases to isolate mortality problem	→	Temp. bypass shutdown refer to HCP Coord. Comm.

A* = Ambient percentage

3. Collection of Bull Trout:
    a. Document:

        i. Fork Length and weight measurements
        ii. Condition (descale, injury, or mortality)
    b. Allow to recover, then release

Daily Protocol for Fish Collection

Standard Operations:

1. Deploy sampling screen at beginning of each hour (0800, 0900, 1000, 1100 hours).
2. Using direct enumeration to count fish entering the sampling facility
3. Collect for 30 minutes **or** until approximately 350 spring migrants/125 summer migrants have been collected, whichever comes first. RETRACT SCREEN IF 200 TO 300 FISH ARE COLLECTED IN FIRST TWO MINUTES.
4. Retract screen when time period or target number of fish has been reached.
5. Determine species composition of all collected fish in the hourly sample.
6. Scan/examine each fish for PIT tags, fin clips, and acoustic tags.
7. Evaluate fish condition (first 100 fish per species).
8. If needed, collect and hold fish for marked releases (Special Operations).
9. Return to step 1 for next sample period. After the 1100 hour sample, go to step 11.
10. See Special Operations
11. Allow anesthetized fish (examined for species composition and fish condition) to recover in the facility's holding tank for at least 1.5 hours.

Special Operations:

1. If fish are collected for marked fish releases, verify that the required number of target species has been set aside from the four sample periods.
2. If the required number of fish are not collected by the 1100 hour sample period, deploy the sampling screen and repeat steps 2 and 4 under standard operations.
3. Scan/check all anesthetized fish for PIT and acoustic tags.
4. Collect and hold the fish at the facility for transport and/or marking (marked fish releases).
5. Determine species composition for any remaining anesthetized fish and scan for PIT tags.
6. After fish have been collected to meet study needs, estimate the number of fish remaining in the raceway (by species to the extent practical), record the number, and immediately release the fish back into the bypass pipe.
7. Return to step 11 under Standard Operations.

Contingencies:

1. If, after start-up of the bypass system, we encounter any unforeseen problem(s) with fish collection, we will immediately consult with the RR HCP CC on how to correct the problem(s).
2. If we accumulate many fish during a collection period (e.g. just after a hatchery release), we will only handle/sample the number of fish needed to satisfy the

study requirements and then immediately release the remaining fish back into the bypass pipe.

3. If we accumulate many fish during each "index" sample period, we will only evaluate species composition in the first three periods. In the final period, we will evaluate descale and injury, regardless of the number of fish. However, we will be attentive to any injury or descale that may be present among the fish in each of the first three periods. We need to allow enough time (between samples) to gather all species composition information, so that we have representative information on daily passage.

Diversion Screen and Trashrack Cleaning (Units 1 and 2):
During the last week of March, the trashracks in front of Units 1 and 2 (six intakes total) will be cleaned by divers and clammed to remove any dislodged debris. The trash rack cleaning will be repeated as differentials increase across the racks due to debris load. A mid-season cleaning will be scheduled in June. Starting 1 April, the vertical barrier and diversion screens (IS system) will be cleaned one to two times per week or as needed with an automated screen cleaner. Careful observation of trash build up will also be monitored and the screens will be cleaned on a more regular basis if warranted. Frequency of the cleanings may increase depending on debris load during spring run-off and aquatic plant load in the summer. The District will log each screen cleaning, and in the event of high descaling/injury in a single sample, the vertical barrier and diversion screens will be inspected prior to releasing marked fish.

Discussion

The 2014 biological studies at Rocky Reach will encompass the following: 1) a continuing evaluation of the juvenile bypass system, 2) a daily sampling program to monitor fish passage for run timing, and 3) extend operations into September to verify bypass operations are protecting 95% of the juvenile summer Chinook outmigration, with a termination date of operations to be determined by the RR HCP CC. Representatives of various research agencies and the RR HCP CC will be consulted about the development of detailed study plans and protocols. A time line showing important activities and deadlines for these activities has been developed and is presented in Table 2.

Table 2. Tasks and deadlines for the Rocky Reach 2014 biological evaluations.

Task	Deadline
Present 2014 study plan to Committee	**Winter 2013-2014**
Committee discussion/comments on study plan	**Feb. 25, 2014-Mar. 25, 2014**
Pre-season JFB operations testing (marked fish releases prior to 1 April)	March 15, 2014-March 31, 2014
Begin biological evaluation of JFB	April 1, 2014
Complete 2014 biological evaluation	September 30, 2014
Present 2014 evaluation report to Committee	**December 31, 2014**
Committee comments on 2014 report	**February 1, 2015**
Present 2013 report to Committee	March 1, 2014

****Tasks printed in bold text require action by the HCP Coordinating Committee.**

References

Mosey, T. R., S. L. Hemstrom, and J. R. Skalski. 2004. Study Plan for the Biological Evaluation for the Rocky Reach Fish Bypass System-2004. Chelan County Public Utility District, Wenatchee, Washington.

Appendix A

Rocky Reach Surface Collector Operations for July 2014 during C2 Unit Outage

Final Operating Plan for Rocky Reach Surface Collector and C1 Turbine Unit during the C2Turbine unit outage in July 2014

1) RR JFB Surface Collector (SC) will utilize three additional installed SC pumps to increase attraction flow from 6,000 to 6,660 cfs into the SC entrances (3,330 cfs each side) when C2 is removed from service for rotor crack repairs in July 2014.

2) The dewatering screen cleaning system will function normally under the increased entrance flow and the cleaning process should not be affected. The automated screen cleaning routine will be more frequent if increased debris load is encountered.

3) Normal water velocity (Vn) through the dewatering screens in the SC channels will increase proportionally to the SC flow-rate increase, which is approx 11%. Calculations show screen velocity will increase from 0.4 fps to about 0.444 fps (an 11% increase) under the 6,660 SC flow. Water velocity will increase uniformly (no hot spots) across the entire SC dewatering screen surface area as regulated by the tuned screen baffling.

4) RR will increase turbine unit C1 flow, from its normal *soft-limit* set-point of 12.2 kcfs to a *soft-limit* flow of 15.2 kcfs during the C2 outage.

APPENDIX J
FINAL 2014 UPPER COLUMBIA RIVER SALMON AND STEELHEAD BROODSTOCK OBJECTIVES AND SITE-BASED BROODSTOCK COLLECTION PROTOCOLS

STATE OF WASHINGTON
DEPARTMENT OF FISH AND WILDLIFE
Wenatchee Research Office
3515 Chelan Hwy 97-A Wenatchee, WA 98801 (509) 664-1227 FAX (509) 662-6606

December, 2014

To: Craig Busack

From: Mike Tonseth, WDFW

Subject: **FINAL 2014 UPPER COLUMBIA RIVER SALMON AND STEELHEAD BROODSTOCK OBJECTIVES AND SITE-BASED BROODSTOCK COLLECTION PROTOCOLS**

The attached protocol was developed for hatchery programs rearing spring Chinook salmon, summer Chinook salmon and summer steelhead associated with the mid-Columbia HCPs, spring Chinook salmon and steelhead programs associated with the 2008 Biological Opinion for the Priest Rapids Hydroelectric Project (FERC No. 2114) and fall Chinook consistent with Grant County Public Utility District and Federal mitigation obligations associated with Priest Rapids and John Day dams (ACOE funded), respectively. These programs are funded by Chelan, Douglas, and Grant County Public Utility Districts (PUDs) and are operated by the Washington Department of Fish and Wildlife (WDFW).

This protocol is intended to be a guide for 2014 collection of salmon and steelhead broodstocks in the Methow, Okanogan, Wenatchee, and Columbia River basins. It is consistent with previously defined program objectives such as program operational intent (i.e., conservation and/or harvest augmentation), mitigation production levels (HCPs, Priest Rapids Salmon and Steelhead Settlement Agreement), changes to programs as approved by the HCP-HC and PRCC-HSC, and to comply with ESA permit provisions.

Notable in this year's protocols are:

- Continuing for 2014, no age-3 males will be incorporated into spring or summer Chinook programs.

- Implementation of the draft Production Management Plan (Appendix B), for all programs where possible, to ensure mitigation production levels are met and that the permitted production ceiling is not exceeded at release.

- Chelan PUD's 2014 Methow spring Chinook obligation of 60,516 smolts will be met through a combination of a second year pilot of operating the Rocky Reach Trap (RRT) using sort-by-code technology and tangle netting in the Chewuch River. Should the RRT and tangle netting not meet all of the adult requirements, hatchery origin adults from WNFH will be used to meet the production obligation.

- Utilization of genetic sampling/assessment to differentiate Twisp River and Methow Basin natural-origin spring Chinook adults collected at Wells Dam, and CWT interrogation during spawning of hatchery spring Chinook collected at the Twisp Weir, Methow FH and Winthrop NFH to differentiate Twisp and Methow Composite hatchery fish for discrete management of Twisp and Methow Composite production components for the GPUD and DPUD program.

- Collection of only hatchery adult steelhead at Wells Dam/hatchery for Lower Methow safety-net (WFH/MFH), Winthrop NFH conservation, and Wells Hatchery Okanogan and mainstem Columbia safety-net programs.

- Collection of spring Chinook for the Nason Creek and Chiwawa programs using combination of Tumwater Dam, tangle netting, and/or the Chiwawa Weir.

- Targeted collection of 100% of the Wenatchee summer Chinook and Wenatchee hatchery origin steelhead broodstock at Dryden Dam to reduce the number of activities that may contribute to delays in fish passage at Tumwater Dam (some adult collections at Tumwater may be necessary if sufficient adults cannot be acquired at Dryden Dam).

- Targeted collection of 100% of the natural origin steelhead broodstock at Tumwater Dam.

- Collection of summer Chinook broodstock from the Eastbank outfall, sufficient to meet a 576K yearling juvenile Chelan Falls program.

- Collection of surplus hatchery origin steelhead from the Twisp Weir (up to 25% of the required broodstock) to produce the 100K Methow safety-net on-station-released smolts (up to 14 adults). The remainder of the broodstock (37) will be WNFH returns collected at WNFH and/or Methow Hatchery and surplus to the WNFH program needs. Collection of Wells stock may be used if WNFH and Twisp returns are insufficient. The collection of adults will occur in spring of 2015.

- Summer Chinook collections at Wells Dam to support the CJH program may occur if CCT broodstock collection efforts fail to achieve broodstock collection objectives.

- Collection from the Wells Hatchery volunteer channel of Wells summer Chinook to support the YN, Yakima River summer Chinook program.

- Targeted collection of 1,000 adipose present, non-coded wire tagged fall Chinook from the PRD OLAFT.

- Targeted collection of about 400 adipose present, non-coded wire tagged fall Chinook using hook and line efforts in the Hanford Reach.

These protocols may be adjusted in-season, based on actual run monitoring at mainstem dams and/or other sampling locations. Additional adaptive management actions as they relate to broodstock objectives may be implemented as determined by the HCP-HC or PRCC-HSC and within the boundaries of applicable permits.

Above Wells Dam

Spring Chinook

Inclusion of natural-origin fish in the broodstock will be a priority, with natural-origin fish specifically being targeted. Collections of natural-origin fish will not exceed 33% of the Methow Composite (i.e., non-Twisp, including the Methow Program [DPUD and GPUD] and the Chewuch Program [CPUD]) and Twisp natural-origin run escapement consistent with take provisions in Section 10 (a)(1)(A) Permit 1196.

To facilitate BKD management, comply with ESA Section 10 permit take provisions, and to meet programmed production, hatchery-origin spring Chinook will be collected in numbers excess to program production requirements. Based on historical Methow FH spring Chinook ELISA levels above 0.12, the hatchery origin spring Chinook broodstock collection will include hatchery origin spring Chinook in excess to broodstock requirements by approximately 15.7% (based upon the most recent 5-year mean ELISA results for the Methow/Chewuch program; 8% for the Twisp program). For purposes of BKD management and to comply with maximum production levels and other take provisions specified in ESA Section 10 permit 1196, culling will include the destruction of eggs from hatchery-origin females with ELISA levels greater than 0.12 and/or that number of hatchery origin eggs required to maintain production at 163,249 Methow Hatchery, and 60,516 Chelan yearling smolts (223,765 total conservation production). Culling of eggs from natural-origin females will not occur unless their ELISA levels are determined by WDFW Fish Health to be a substantial risk to the program. Progeny of natural-origin females, with ELISA levels greater than 0.12, may be differentially tagged for evaluation purposes. Annual monitoring and evaluation of the prevalence and level of BKD and the efficacy of culling in returning hatchery- and natural-origin spring Chinook will continue and will be reported in the annual monitoring and evaluation report for this program.

WDFW genetic assessment of natural-origin Methow spring Chinook (Small et al. 2007) indicated that Twisp natural-origin spring Chinook can be distinguished, via genetic analysis, from non-Twisp spring Chinook with a high degree of certainty. The Wells HCP Hatchery Committee accepted that Twisp-origin fish could be genetically assigned with sufficient confidence that natural origin collections can occur at Wells Dam. Scale samples and non-lethal tissue samples (fin clips) for genetic analysis will be obtained from adipose-present, non-CWT, non-ventral-clipped spring Chinook (suspected natural-origin spring Chinook) collected at Wells Dam, and origins assigned based on that analysis. Natural-origin fish retained for broodstock will be PIT tagged (pelvic girdle) for cross-referencing tissue samples/genetic analyses. Tissue samples will be preserved and sent to the WDFW genetics lab in Olympia Washington for genetic/stock analysis. Spring Chinook from Wells will be retained at Methow Hatchery and spawned for each program depending on results of DNA analysis.

The number of natural-origin Twisp and Methow Composite (non-Twisp) spring Chinook retained will be dependent upon the number of natural-origin adults returning and the collection objective limiting extraction to no greater than 33% of the natural-origin spring Chinook return to the Methow Basin. Natural origin fish not assigning to the Twisp or Methow Composite (combined, these make up the entire Methow Basin spring Chinook population) will be released back into the Columbia River. Based on the broodstock-collection schedule at Wells Dam (3-day/week, 16 hours/day), extraction of natural-origin spring Chinook is expected to be approximately 33% or less.

Weekly estimates of the passage of Wells Dam by natural-origin spring Chinook will be provided through stock-assessment and broodstock-collection activities. This information will facilitate in-season adjustments to collection composition so that extraction of natural-origin spring Chinook remains less than 33%. Trapping at the Winthrop NFH will be included if needed because of broodstock shortfalls.

Pre-season run-escapement of Methow-origin spring Chinook above Wells Dam during 2014 is estimated at 2,923 spring Chinook, including 2,575 hatchery and 449 natural origin spring Chinook (Table 1 and Table 2). In-season estimates of natural-origin spring Chinook will be adjusted proportional to the estimated returns to Wells Dam at weekly intervals and may result in adjustments to the broodstock collection targets presented in this document.

The following broodstock collection protocol was developed based on BKD management strategies, projected return for BY 2014 Methow Basin spring Chinook at Wells Dam (Table 1 and Table 2), and assumptions listed in Table 3.

The 2014 aggregate Methow spring Chinook broodstock collection will target up to 156 adult spring Chinook (22 Twisp, 134 Methow). Based on the pre-season run forecast, Twisp fish are expected to represent 5% of the adipose present, CWT tagged hatchery adults and 15% of the natural origin spring Chinook passing above Wells Dam (Tables 1 and 2). Based on this proportional contribution and a collection objective to limit extraction to no greater than 33% of the age-4 and age-5 natural-origin spawning escapement to the Twisp, the 2014 Twisp origin broodstock collection will total 19 wild fish, representing 79% of the broodstock necessary to meet Twisp program production of 30,000 smolts. Methow Composite fish are expected to represent 54% of the adipose present CWT tagged hatchery adults and 85% of the natural origin spring Chinook passing above Wells Dam (Tables 1 and 2). Based on this proportional contribution and a collection objective to limit extraction to no greater than 33% of the age-4 and age-5 natural-origin recruits, the 2014 aggregate Methow broodstock collection will total 162 spring Chinook (138 wild and 24 Hatchery). Broodstock collected for the aggregate Methow program represents 100% of the broodstock necessary to meet the Methow FH program production of 133,249 smolts and Chelan PUD's program production of 60,516 smolts. The Twisp River releases will be limited to releasing progeny of broodstock identified as wild Twisp and or known Twisp hatchery origin fish, per ESA Permit 1196. The Grant/Douglas and Chelan PUD releases will include progeny of broodstock identified as wild non-Twisp origin and known Methow Composite hatchery origin fish. Age-3 males ("jacks") will not be collected for broodstock.

Table 1. Brood year 2009-2011 age class-at-return projection for wild spring Chinook above Wells Dam, 2014.

Brood year	Smolt Estimate		Age-at-return: Twisp Basin				Age-at-return: Methow Basin				
	Twisp[1/]	Methow Basin[2/]	Age-3	Age-4	Age-5	Total	Age-3	Age-4	Age-5	Total	SAR[3/]
2009	5,124	31,212	5	26	**13**	44	15	183	**67**	265	0.0085
2010	8,927	50,165	9	**45**	22	76	24	**295**	107	426	0.0085
2011	10,047	36,344	**11**	50	24	85	**18**	214	77	309	0.0085
Estimated 2014 Return			**11**	**45**	**13**	**69**	**18**	**295**	**67**	**380**	

[1/]-*Smolt estimate is based on sub-yearling and yearling emigration (Alex Repp, personal communication).*
[2/]-*Estimated Methow Basin smolt emigration based on Twisp Basin smolt emigration, proportional redd deposition in the Twisp River and Twisp Basin smolt production estimate.*
[3/]- *Mean Twisp NOR spring Chinook SAR to Wells Dam estimated using natural origin PIT tag returns (BY 2006-2008; Charlie Snow, personal communication).*

Table 2. Brood year 2009-2011 age class and origin run escapement projection for UCR spring Chinook at Wells Dam, 2014.

	Projected Escapement: Origin								Total			
	Hatchery				Wild				Methow Basin			
Stock	**Age-3**	**Age-4**	**Age-5**	**Total**	**Age-3**	**Age-4**	**Age-5**	**Total**	**Age-3**	**Age-4**	**Age-5**	**Total**
MetComp	41	1,145	213	**1,399**	18	295	67	**380**	59	1,440	280	**1,779**
%Total				54%				85%				58%
Twisp	18	91	30	**139**	11	45	13	**69**	29	136	43	**208**
%Total				5%				15%				7%
Winthrop (MetComp)	130	833	74	**1,037**					130	833	74	**1,037**
%Total				41%								35%
Total	189	2,069	317	**2,575**	29	340	80	**449**	218	2,409	397	**3,024**

Table 3. Assumptions and calculations to determine the number of broodstock needed for BY 2014 production of 223,765 smolts.

Program Assumptions	Twisp standard	Twisp program	Methow standard	Methow FH program	Chelan program	Total program
Smolt Release		30,000		133,249	60,516	**223,765**
Fertilization-to-release survival	*84.4%[1]*		*83.7%[1]*			
Total egg take target		35,545		159,198	72,301	**267,044**
Egg take (production)						
Cull allowance[2/]	*8.0%*	40,299	*15.7%*	175,453	74,630	282,247
Fecundity[3/]	*3,504H/3,699W*		*3,556H/3,751W*			
Female Target						
Female to male ratio	*1:1*		*1:1*			
Broodstock target						
Pre-spawn survival	*95.9%*		*97.9%*			
Total broodstock collection		**19W** **5H**		**82W** **14H**	**37W** **5H**	**138W** **24H**

[1/] *- Mean values.*

[2/]*-Hatchery origin MetComp. component only, and is based on the projected natural origin collection and assumption that all Twisp (hatchery and wild) and wild MetComp. fish will be retained for production.*

[3/]*-Based on historical age-4 fecundities and expected 2014 return age structure (Table 1).*

<u>Douglas/Grant PUD Activities:</u>

Trapping at Wells Dam will occur at the East and West ladder traps beginning on 01 May, or at such time as the first spring Chinook are observed passing Wells Dam, and continue through 20 June 2014. Broodstock collection and stock assessment sampling activities authorized through the 2014 Douglas PUD Hatchery M&E Implementation Plan will occur simultaneously up to 3-days/week, up to 16 hours/day. Natural origin spring Chinook will be retained from the run, consistent with spring Chinook run timing at Wells Dam (weekly collection quota). Collection goals will be developed by Wells M&E staff to identify the most appropriate spatial and temporal approach to achieving the overall brood target. All natural origin spring Chinook collected at Wells Dam for broodstock will be held at the Methow FH.

To meet Methow FH broodstock collection for hatchery origin Methow Composite and Twisp River stocks, adipose-present coded-wire tagged hatchery fish will be collected at Methow FH, Winthrop NFH, and the Twisp Weir beginning 01 May or at such time as spring Chinook are observed passing Wells Dam and continuing through 20 June (Wells Dam) or 22 August 2014 for the Twisp Weir. Natural origin spring Chinook will be retained at the Twisp Weir as necessary to bolster the Twisp program production so long as the aggregate collection at Wells Dam and Twisp River weir does not exceed 33% of the estimated Twisp River natural origin spawners to maximize pNOS in the Twisp. All hatchery and natural origin fish collected for broodstock at Methow FH, Twisp Weir and Winthrop NFH for the Douglas and Grant County PUD conservation program will be held at the Methow FH. A total of 120 adults (101 wild and 19 hatchery origin) will be targeted to meet the Methow FH production obligation.

Chelan PUD Activities:

To meet Chelan PUD's Methow spring Chinook broodstock obligation (42 total adults; 37 wild and 5 hatchery), Chelan PUD is proposing a two-step approach to collect Methow spring-run Chinook salmon in 2014. The first step consists of testing newly installed sorting technology at the Rocky Reach trap (RRT) to determine if appropriate broodstock could be collected to meet program needs. The second step will consist of a tributary based approach utilizing tangle nets to collect broodstock in the Chewuch River. The following is a description of the two proposed methods.

Rocky Reach Trap

The RRT was used historically to capture listed steelhead and bull trout (in 2002 and 2005-2007, respectively), as part of studies required for implementation of the Rocky Reach License. Based on these previous efforts with steelhead and bull trout, it was determined that select individual fish can be effectively removed at the RRT, without delaying unmarked fish or non-target species. Additionally, based on a 2013 pilot study, externally marked spring Chinook were successfully removed at the RRT, on an individual basis without delaying non-targeted spring Chinook.

In response to results and observations made from conducting the 2013 spring Chinook pilot study, several trap modifications were identified and have been made in early 2014 in an effort to improve operation of the trap and increase the success of each trapping event:

- Replace the solid trap door with a rectangular 1" diameter vertical bar screen with 1" gaps to reduce the changes in water velocity produced by the movement of the solid door, which appeared to deter fish moving into the trap;
- Install underwater lighting and an underwater camera that can capture the view of the trap entrance to enable better viewing of the fish as they move into the trap;
- Install an electrical control pendant for the technician located above the trapping area to allow additional control of the trap door;
- Paint the floor in the viewing window white to create contrast.
- Installation of separation-by-code technology.

2014 will represent a second pilot year to evaluate all of the trap modifications/improvements and to test the efficacy of using separation-by-code technology to target PIT tagged natural origin (NOR) adults for broodstock (and hatchery origin [HOR] adults to the extent needed, to meet the production target).

Separation-by-Code Technology

The RRT trap is operated by use of a manually operated pneumatic gate that directs individual fish to a collection area and a trapping vessel. The trap design mimics a basket; it is lowered into the fish ladder and can remove one fish at a time. To identify broodstock for collection, the fish ladder directly in front of the counting room will be outfitted with a PIT tag detection array. This will provide a total of three PIT tag detection arrays located downstream of the trap in the fish ladder (baffle four, baffle six, and the entrance into the counting room/trap location). The separation-by-code software will rely on a pre-loaded library of PIT tag codes, that when detected by one of the three PIT tag arrays, will send a visual and auditory signal to the trap operator indicating a target fish has been detected. As an identified target fish moves through the baffles of the ladder and subsequent PIT tag arrays (a total distance of roughly 125 feet), three sequential notifications will occur indicating the fish is approaching the trap chamber. A different colored light will be associated with each PIT tag array. Once the last notification occurs, the operator in the counting room will be able to visually observe the target fish, manually open the trap door, and trap the fish. The operator located above the trap will raise the trap and confirm the intended fish was trapped by use of a hand held PIT tag detector loaded with the same library of PIT tag codes.

Upon confirmation that the trapped fish is the intended target fish, the fish will be transferred to a holding tank supplied with recirculating water, directly adjacent to the trap. Eastbank Hatchery staff will be notified that a target fish has been captured and they will transport the fish to the Eastbank Hatchery, directly adjacent to Rocky Reach Dam, via truck mounted holding tank supplied with Eastbank Aquifer water and oxygen.

Trapping will occur up to five days per week (Monday through Friday), and up to eight hours per day (from 7:00 a.m. to 3:00 p.m.), with unrestricted passage during non-trapping periods; based on PIT tag detection between 2006 and 2013, 70% of the PIT-tagged adults move through the Rocky Reach fishway between 7:00 a.m. and 3:00 p.m. Unless the trap operator is attempting to actively trap a target fish, the ladder will be open to passage. Trapping will begin in late April and will continue through about the third week in June (based on the average distribution of the most recent 10 years of data [DART] the first 5 percent of the spring Chinook run passes Rocky Reach by April 18, and the 95 percent passage date is June 17; therefore, 90 percent of the run passes during an approximately 60-day period).

The following PIT-tag codes will be targeted at the RRT in 2014:

- Chewuch River smolt trap, WDFW remote PIT tagging, and USGS PIT array evaluations (natural spring Chinook)
- Mark/recapture evaluations above the mouth of the Twisp River (natural spring Chinook)
- Methow River smolt trap (natural spring Chinook)
- Methow Hatchery MetComp smolts (brood year 2009 and 2010)

Genetic sampling/assessment will be utilized to differentiate Twisp River and non-Twisp River natural-origin spring Chinook adults that were PIT tagged as juveniles at the Methow smolt trap, once transported to Eastbank Hatchery from the RRT. Any adults that are determined to be of Twisp origin could be provided to Douglas PUD for their Twisp spring Chinook conservation program in exchange for a MetComp NOR trapped at Wells Dam (contingent upon agreement with Douglas PUD). All NORs trapped at the RRT and subsequently held at Eastbank Hatchery for genetic sampling will be retained for broodstock. Additionally, up to 45 HOR adults (no age-3 returns would be retained) from the Methow Hatchery MetComp smolt releases will be trapped at the RRT and held at Eastbank Hatchery as contingency broodstock in the event the total number of NORs needed for CPUDs Methow Subbasin conservation program are not available. If it is determined that these HOR adults are not needed to meet Chelan PUD's Methow spring Chinook obligation, the following options are available (the JFP will be responsible for determining the priority and ultimate disposition of these fish): 1) they will be offered to Grant and/or Douglas PUDs if a shortfall exists in their program; 2) they will be offered to the USFWS Winthrop NFH for utilization in their safety net program; or 3) they will be released above Wells Dam or in the Methow River to offset any delays caused by retaining these fish.

Tributary Based Broodstock Collection

If insufficient broodstock are retained from the RRT, measures to collect natural-origin broodstock utilizing tangle netting in the Chewuch will be attempted (provided authorizations and approvals are received). Known or suspected spring Chinook spawning locations will be targeted for tangle netting. Tangle netting activities in the main stem Chewuch River will occur between July 15 and August 15 and not exceed 15 cumulative days of netting. Up to 37 adipose present adult spring Chinook for broodstock will targeted.

Tangle Netting Methodology

Limitations, scope of effort, and details of the tangle netting methodology will be determined by the HCP-HC prior to implementation. Primary wild spring Chinook spawning areas will be identified using historical NOR spawning data. Only those areas (pools) of the river immediately above and below the spawning areas will be targeted for netting versus a randomized approach. Personnel that have experience capturing salmon using tangle nets will conduct the tangle netting. Any spring Chinook captured will be assessed for CWT. All captured Chinook will be retained regardless of mark or origin. Fish tubes filled with water will be utilized to provide transfer from the river to the holding truck. Fish transportation equipment will ensure safe transportation of collected broodstock and will include equipment that is mechanically reliable and that can be disinfected, equipment to monitor dissolved oxygen levels, and salt will be made available if it is needed as a stress reduction measure.

Based on redd survey data the majority of bull trout spawning occurs in the upper Chewuch River above River Mile (RM) 34 and in Lake Creek (RM 4 and RM 7) and limited spawning occurs in Eightmile Creek around RM 1.6. Water temperatures in the Chewuch River below RM 34 exceed the upper range of bull trout spawning temperatures; bull trout utilize the Chewuch River below RM 34 for foraging and overwintering (USFS personal communication 2014). Radio-telemetry data documented bull trout entering spawning areas in the Chewuch subwatershed in early to mid-July (USFWS 2007). This data indicates that the majority of bull trout will likely have moved through areas that will be targeted for tangle netting for Chinook salmon, and increases the likelihood of being able to avoid the capture of bull trout.

Additional measures are to be implemented to minimize of bull trout being exposed to the activity and the severity of effects if exposure occur. Specific conservation measures are:

- Snorkel targeted pools to determine if bull trout are present before deploying nets.
- Deploy nets in configurations that will minimize the likelihood of capturing bull trout if bull trout are associated with concentrations of Chinook.
- Immediately remove bull trout that are caught and release them to locations where they are unlikely to be re-encountered.
- If snorkeling reveals bull trout are present in the targeted pools, snorkel additional pools to look for locations where bull trout are absent or few.
- Release captured bull trout to the nearest upstream pool that is not targeted for netting.
- Remove all nets and equipment from the water when they are not being actively being used.
- Recommend proceeding with netting from downstream to upstream locations, and avoid netting in the vicinity of Eightmile and Lake creeks and above Thirtymile Creek.
- If a bull trout is killed during netting despite implementing these conservation measures, the Service will be contacted immediately to discuss additional minimization measures.

Winthrop National Fish Hatchery

If efforts undertaken through the Rocky Reach trap and tributary based tangle netting fails to yield the full complement of adults needed to meet Chelan's 60,516 spring Chinook obligation, MetComp adults collected at the WNFH outfall may be utilized.

Steelhead

Steelhead programs located upstream of Wells Dam and at Wells Hatchery are presented in Table 4.

Table 4. 2015 brood year Steelhead Programs at Wells Hatchery and Upstream of Wells Dam

Program	Hatchery	Owner	Release Location	Release Target	Broodstock Collection Location
Twisp Conservation	Methow Hatchery (incubation); Wells Hatchery (rearing)	Douglas PUD	Twisp Acclimation Pond	48,000	Twisp WxW
Methow Safety-Net	Wells Hatchery	Douglas PUD	Methow Hatchery	100,000	HxH: Twisp Hatchery (25%) + WNFH Hatchery (75%) or WNFH to make up balance
Mainstem Columbia Safety-Net	Wells Hatchery	Douglas PUD	Wells Hatchery	160,000	HxH: Methow Hatchery returns (1st option); Wells Hatchery/Dam (Wells Stock) (2nd option)
WNFH Conservation Program	WNFH	USFWS	WNFH	100,000	Up to 25 collected at Wells Dam/Hatchery HO only); remaining 25 collected by USFWS
Omak Creek	Wells Hatchery	Grant PUD	Omak Creek	Up to 20,000[1]	Okanogan Basin/Omak Creek (up to 16 wild or hatchery)
Okanogan	Wells Hatchery	Grant PUD	Okanogan Basin	Up to 100,000[1]	Wells Stock collected at Wells Dam/Hatchery or at tributary locations in the Okanogan Basin operated by the CCT

[1/] *The Grant PUD programs will total 100,000 smolts, +-10% (58 broodstock).. , Broodstock collection number, origin, and location, and smolt numbers will be consistent with those detailed in National Marine Fisheries Service (NMFS) letter to Randall Friedlander (CCT) and Jeff Grizzel (GPUD) dated February 27, 2014 and detailed in Table 4 and Table 5 herein.*

Steelhead mitigation programs above Wells Dam (including the USFWS steelhead program at Winthrop NFH) utilize adult broodstock collections at Wells Dam, Twisp Weir, Methow Hatchery volunteer trap, WNFH volunteer trap, and the Omak Creek weir (Table 5) and incubation/rearing at Wells Fish Hatchery (FH) and incubation at Methow Hatchery (Twisp program). The Wells steelhead Program has provided eggs for UCR steelhead reared at Ringold FH, not as a mitigation requirement, but rather an opportunity to reduce the prevalence of early spawn hatchery steelhead in the mitigation component above Wells Dam. However, the Methow steelhead program is shifting to locally collected Twisp wild broodstock (Twisp conservation program), and hatchery origin broodstock representative of the Twisp and WNFH conservation programs (Methow safety-net program). Therefore, surplus broodstock will not be collected for the Methow steelhead programs to address the spawn-timing issue of the Wells stock. The Wells Hatchery Columbia River releases will use returns to the Methow Hatchery volunteer trap to the extent possible, and will be augmented with Wells stock as required to fulfill the program. However, the local collections of broodstock in the Methow Basin will occur in the spring of

2015. To ensure the safety-net programs have broodstock, some broodstock will be collected at Wells Dam in the autumn of 2014, and held at Wells Hatchery. These autumn-collected Wells stock fish will be considered surplus to the spring-collected Methow and Okanogan broodstock, and eggs from these surplus broodstock may be transferred to Ringold Hatchery. In addition, Wells Hatchery may be used for adult management and steelhead removed for adult management may be retained for the Ringold program (Table 5).

Table 5. Broodstock collection locations, number, and origin by program.

Program	**Wells Dam or Hatchery**		**Twisp Weir**		**WNFH**		**Methow Hatchery**		**Omak Creek/Okanogan Basin**	
	H	W	H	W	H	W	H	W	H	W
Twisp Conservation			0	28						
Methow Safety-Net	Up to 62 (backup)		14	0	Up to 62	0				
Mainstem Columbia Safety-Net	94 (backup)	0					94	0		
WNFH Conservation Program	25					96[1]				
Omak Creek									Up to 16[2]	
Okanogan									42	
Okanogan	Up to 58 [4]	0								
Ringold[3]	0	0								
Total	214	0	14	28	62	96	94	0	42	16[2]

[1/-] *Wild origin fish for WNFH program will be collected through USFWS hook and line angling efforts in the Methow in the spring of 2015. The 96 NOR's represents full production (200K) for the 2015 release. Actual number of NORs collected will be dependent upon actual NO returns.*
[2/-] *Wild origin preferred, but hatchery origin broodstock will also be collected to meet target.*
[3/-] *Broodstock derived from adult management at Wells Hatchery and surplus brood collected as backup for Methow and Okanogan programs.*
[4/-] *Back-up collection to assure 100,000 smolt production for the Okanogan Basin due to unknown collection efficacy in the Okanogan River Basin.*

The following broodstock collection protocol was developed based on mitigation program production objectives (Table 6), program assumptions (Table 7), and the probability that sufficient adult steelhead will return in 2014/2015 to meet production objectives absent a preseason forecast at the present time.

Trapping at Wells Dam and/or Wells FH will selectively retain up to 177 hatchery origin steelhead (west [and east, as necessary]ladder collection). Ringold FH production will be based on the availability of surplus eggs/fish resultant from managing any production overruns in DC and GCPUD production. No adults for the Ringold program will be specifically targeted at Wells. In the spring of 2015, 28 wild steelhead will be targeted at the Twisp Weir and transferred to the Methow Hatchery for spawning, incubation, and early rearing (up to 60-d post ponding to facilitate viral testing of progeny resulting from live spawning females for the YN reconditioning program), after which they will be moved to Wells Hatchery for the balance of rearing. In addition, up to 14 surplus hatchery-origin Twisp-stock steelhead (to meet to meet up to 25% of the 100K Methow Safety-Net release) will be targeted at the Twisp Weir and/or Methow Hatchery and either spawned/incubated at Methow FH or moved to Wells Hatchery for spawning. Surplus WNFH hatchery returns will be used to augment the Twisp/Methow hatchery-origin collection if needed. Should there be inadequate surplus steelhead from these two sources, hatchery steelhead (presumed Methow Safety-Net origin) captured at the Methow Hatchery volunteer trap will be used to fulfill the program. Wells stock held at the Wells Hatchery will be used as a final option if broodstock collection at the Twisp Weir, and WNFH and MH traps are unsuccessful. Fifty-eight (58) adult steelhead will be targeted in the Okanogan Basin, including up to 16 natural-origin adults. Additionally, up to 58 adult steelhead will be targeted at Wells Dam/Hatchery as a back-up collection contingency due to unknown broodstock collection efficiencies in the Okanogan River Basin. Omak Creek for a 20K endemic program operated by the CCT and funded by GCPUD as part of their 100K UCR steelhead mitigation obligation. Overall collection for the programs will be 566 fish (a combination of program specific and back-up adults) and limited to no more than 33% of the entire run or 33% of the natural origin return (NOR composition in the broodstock, is estimated at 17% for Douglas and Grant PUD programs only; 40% if the WNFH program is included). Hatchery and natural origin collections will be consistent with run-timing of hatchery and natural origin steelhead at Wells Dam. Trapping at the Wells Dam ladders will occur between 01 August and 31 October, three days per week, up to 16 hours per day, as required to meet broodstock objectives. Trapping will be concurrent with summer Chinook broodstocking efforts through 15 September on the west ladder. Adult return composition including number, origin, age structure, and sex ratio will be assessed in-season at Priest Rapids and Wells dams. Broodstock collection adjustments may be made based on in-season monitoring and evaluation. If collection of adults from the east ladder trap is necessary, access will be coordinated with staff at Wells Dam due to the rotor rewind project.

Table 6. Adult steelhead collection objectives for programs supported through 2014 return year adult steelhead broodstock collected at Wells Dam, Twisp Weir, WNFH, and Okanogan Basin..

Program	**# Smolts**	**# Green eggs**	**% Wild**	**# Wild**	**# Hatchery**	**Total Adults**
DCPUD[1/]	160,000	230,548			94	94
DCPUD[2/]	100,000	144,092			76	76
DCPUD Twisp	48,000	69,164	100%	28		28
GCPUD Okan.[3/]	80,000	115,274			42	42
GCPUD Omak [3/]	20,000	40,000	100%	16		16[4/]
USFWS	50,000	72,046	100%	96		96
Sub-total	**458,000**	**671,124**	40%	**140**	**212**	**352**
Ringold[5/]	180,000	285,714			214	214
Sub-total	**180,000**	**285,714**			**426**	**566**
Grand Total[6/]	**638,000**	**956,838**	**25%**	**140**	**426**	**566**

[1/-]*Mainstem Columbia releases at Wells Dam. Target HxH parental adults as the hatchery component.*

[2/-] *Methow hatchery release of HxH fish produced from either adults returning from the Winthrop conservation program, adults trapped at MFH, and/or surplus hatchery adults from the Twisp weir.*

3/- Okanogan Basin releases as part of GCPUD's 100K summer steelhead obligation
4/- Broodstock targeted is 16 total (8 male/8 female) of mixed origin composition based upon what is trapped.
5/- Eggs/juveniles will be provided to the Ringold program consistent with management of program surpluses up to 180,000 smolts. Adults for the Ringold program will not be specifically targeted at Wells Dam/Hatchery in 2014.
6/- Based on steelhead production consistent with Mid-Columbia HCP's, GCPUD BiOp and Section 10 permit 1395.

Table 7. Program assumptions used to determine the number of adults required to meet steelhead production objectives for programs above Wells Dam.

	Standard	
Program assumptions	**Hatchery**	**Wild**
Pre-spawn survival	94.9%	94.9%
Female : Male ratio	1.0:1.0	1.0:1.0
Fecundity	5,050 1-salt/6,623 2-salt[1]	4,755 1-salt/6,290 2-salt[2]
Fertilization-to-yearling release	69.4%	69.4%

1/-The most recent 5-year mean of age at return for hatchery steelhead is 49.8% 1-salt and 50.2% for 2-salt.
2/-The most recent 5-year mean of age at return for wild steelhead is 52.0% 1-salt and 48.0% for 2-salt.

Summer/fall Chinook

The summer/fall Chinook mitigation program in the Methow River utilizes adult broodstock collections at Wells Dam and incubation/rearing at Eastbank Fish Hatchery. The total production level target is 200,000 summer/fall Chinook smolts for acclimation at Carlton Pond.

The TAC 2014 Columbia River UCR summer Chinook return projection to the Columbia River (Appendix A) and BY 2009, 2010, and 2011 spawn escapement to tributaries above Wells Dam indicate sufficient summer Chinook will return past Wells Dam to achieve full broodstock collection for supplementation programs above Wells Dam. The following broodstock collection protocol was developed based on initial run expectations of summer Chinook to the Columbia River, program objectives, and program assumptions (Table 8).

For 2014, WDFW will retain up to 100 natural-origin summer/fall Chinook at Wells Dam west (and east, if necessary) ladder(s), including 50 females for the Methow summer Chinook program. Collection will be proportional to return timing between 01 July and 15 September. Trapping may occur up to 3-days/week, 16 hours/day. Age-3 males ("jacks") will not be collected for broodstock.

Additionally, in 2014 brood stock collection for Okanogan based summer Chinook programs will fall under the responsibility of the Colville Tribes as part of their overall summer Chinook program. Broodstock collection will be prioritized through purse seine operations, ladder returns to the Chief Joe Hatchery, tangle netting, and the Okanogan weir. Should use of Wells Dam be needed to meet any shortfalls in broodstock, the CCT will notify the HCP-HC and coordinate with Douglas PUD, Grant PUD, and WDFW to facilitate additional effort. Summer Chinook broodstock collection efforts at Wells Dam, should they be required to meet CJH program objectives, will be conducted concurrent with broodstock collection efforts for the Methow summer Chinook program and or steelhead collection efforts for steelhead programs above Wells Dam.

To better assure achieving the appropriate number of females for program production, the collection will utilize ultrasonography to determine the sex of each fish retained for broodstock. If the probability of achieving the broodstock goal is reduced based on passage at the west ladder or actual natural-origin escapement levels, broodstock collections may be expanded to the east ladder trap and/or origin composition will be adjusted to meet the broodstock collection objective. If collection of adults from the east ladder trap is necessary, access will be coordinated with staff at Wells Dam due to the rotor rewind project.

Table 8. Assumptions and calculations to determine the number of broodstock needed for 2014 brood summer/fall Chinook production goals in the Methow River basin and CCT summer programs as needed based upon success of planned broodstocking methods.

Program Assumptions	Metrics	Carlton Pond	CCT/Okanogan
Smolt release		**200,000**	
Fertilization-to-release survival	85.8%		
Eggtake target		**233,100**	
Fecundity	4,982		
Female target		**47**	
Female:male ratio	1:1		
Broodstock target		**94**	
Pre-spawn survival	95.0%		
Total collection target		**100**	**TBD**

Columbia River Mainstem below Wells Dam

Summer/fall Chinook

Summer/fall Chinook mitigation programs that release juveniles directly into the Columbia River between Wells and Rocky Reach dams have traditionally been supported through adult broodstock collections at the Wells Hatchery volunteer channel. For 2014, the broodstock requirement for the Chelan Falls summer Chinook program will be prioritized through broodstock collection of marked summer Chinook in the Eastbank Outfall (EBO). The total production level supported by this collection is up to 576,000 yearlings for the Chelan Falls program.

Collection at the Wells FH volunteer channel will be used to collect the broodstock necessary for the Wells FH yearling (320,000) and sub-yearling (484,000) programs.

Because of CCT concerns about sufficient natural origin fish reaching spawning grounds and to ensure sufficient NOR's being available to meet the CCT summer Chinook program, incorporation of natural origin fish for the Wells program or programs with broodstock originating from the Wells volunteer channel, will be limited to fish collected in the Wells volunteer channel. The following broodstock collection protocol was developed based on mitigation objectives and program assumptions (Table 9).

WDFW will target 544 run-at-large summer Chinook from the volunteer ladder trap at Wells Fish Hatchery outfall for the Wells sub-yearling and yearling programs and up to 160 for the YN 250K-350K egg request for the Yakima summer Chinook program. Additionally, per an HCP HC SOA dated June 20 2012, summer Chinook collection at the Wells volunteer channel may be used to support the Entiat NFH summer Chinook program. Due to fish health concerns associated with the volunteer collection site (warming Columbia River water during late August), the volunteer collection will begin 11 July and terminate by 31 August. Age-3 males ("jacks") will not be collected for broodstock.

Again for 2014, broodstock collection for the Chelan Falls summer Chinook program will be prioritized at the Eastbank Outfall (EBO) using in-channel seining/netting beginning July 1 (or earlier if summer Chinook are detected in the outfall) through September 15. Collection efforts in the EBO in 2013 were sufficient to meet the adult requirements for the Chelan Falls program. If shortfalls in adult needs are expected and the number of females needed to meet program has not been reached by August 15th, the broodstock collection may default to surplus summer Chinook from the Wells Volunteer channel to make up the difference. The 2014 broodstock target for the Chelan Falls program is 322 adults. Age-3 males will not be incorporated into the broodstock. Confirmation of gender will be made at the time of collection using established ultrasonography techniques.

Table 9. Assumptions and calculations to determine the number of broodstock needed for summer/fall Chinook production goals for programs released at or below Wells Dam relying on adult collection at Wells Dam or Wells Hatchery in 2014.

Program Assumptions	**Standard**		**Wells FH**		**Chelan Falls FH[1/]**	**Yakama Nation**	
	Sub-yearling	**Yearling**	**Sub-yearling**	**Yearling**	**Yearling**	**Green eggs**	**Total**
Smolt release			**484,000**	**320,000**	**576,000**		**NA**
Green egg-to-release survival	76.1%	82.7%					NA
Eggtake target			**636,005**	**386,941**	**696,493**	**350,000[4/]**	**2,069,439**
Fecundity	4,475	4,475					
Female target			**142**	**86**	**156**	**78**	**462**
Female:Male ratio	1:1	1:1					
Broodstock target			**284**	**242[3/]**	**312**	**156**	**994**
Pre-spawn survival	97.1%	97.1%					

Total collection target	**294**	**268**	**322**	**160**	**1,026**

[1/]-The Well volunteer trap will only be a fallback broodstock source should efforts to acquire broodstock in the Eastbank outfall not provide sufficient females to meet production objectives.
[2/]-Adults for USFWS summer Chinook program in the Entiat River Basin.
[3/]- Includes 70 adults collected for the Lake Chelan triploid Chinook program.
[4/]- The YN request is for between 250K and 350K eggs.

Wenatchee River Basin

<u>Spring Chinook</u>

In 2014 the Eastbank Fish Hatchery (FH) is expecting to rear spring Chinook salmon for the Chiwawa River and Nason Creek acclimation facilities located on the Chiwawa River and Nason Creek. The program production level target for the Chiwawa program (Chelan PUD obligation) in 2014 is 144,026 smolts, requiring a total broodstock collection of 74 natural origin spring Chinook (Table 10).

The spring Chinook production obligation for Grant PUD in the Wenatchee Basin is 223,670 smolts (Table 10). Grant PUD's production was originally scripted to be met through a combination of 74,556 smolts in the White River and 149,114 smolts at Nason Creek. Consistent with agreements in the PRCC-PC SOA 2013-01, the White River production will be met through progeny produced at Nason Creek through 2026. Because the last brood year of White River captive brood adults were heavily diseased (BKD) and dying at a rate that would have likely not had any viable females remaining at the time of spawning, on February 5, 2014, NMFS issued a letter concurring with fish health recommendations to terminate the last of the adult side of the White River captive brood program. Consequently, the PRCC SOA identified credit of 75,000 smolts from the captive brood program toward meeting the 223K production obligation in 2014 is no longer applicable.

Table 10. Assumptions and calculations to determine the number of broodstock needed for a combined Nason/Chiwawa spring Chinook production goal of 367,696 smolts. For 2014, the Nason Creek production will be met through a combination of smolts produced through the Nason Creek conservation program and backfilling remaining production using HxH Chiwawa progeny at Chiwawa Ponds (contingent upon agreement between Chelan and Grant PUD's).

		Chiwawa	**Nason Creek[1/]**		
Program Assumptions	**Standard**	**Conservation**	**Conservation**	**Safety net**	**Wenatchee Basin Total**
Smolt Release		**144,026**	**125,000**	**98,670**	**367,696**
Fertilization-to-release survival	*85.0%*				
Total egg take target		169,442	147,059	116,082	**432,583**
Egg take (production)					
Cull allowance	*14.9%*			17,296	**449,879**
Fecundity	*4,684 W*				

	4,145 H				
Female Target		36	31	32	**99**
Female to male ratio	*1:1*				
Broodstock target		72W	62W	64H	**198**
Pre-spawn survival	*97.7%W/97.7H*				
Total broodstock collection		**74W**	**64W**	**66H**	**204 (138W;66H)**

[1/-] Because Nason Creek is in its second year, hatchery performance values from the Chiwawa program were used as a surrogate to estimate the adult requirements for Nason Creek.

Inclusion of natural origin fish into the broodstock will be a priority, with natural origin fish specifically being targeted. Consistent with ESA Section 10 Permit 18118 and 18121, natural origin fish collections will not exceed 33 percent of the expected return to the respective tributaries.

Pre-season estimates for age-4 and age-5 adults project a total of 3,263 (931 natural origin (28.5%) and 2,332 hatchery origin [71.5%]) spring Chinook back to Tumwater Dam in the Wenatchee Basin. Approximately 2,947 spring Chinook are destined for the Chiwawa River, of which 615 (20.9%) and 2,332 fish (79.1%) are expected to be natural and hatchery origin spring Chinook, respectively and approximately 233 natural origin spring Chinook are expected back to Nason Creek (Table 11). In-season assessment of the magnitude and origin composition of the spring Chinook return above Tumwater Dam will be used to provide in-season adjustments to hatchery/wild composition and total broodstock collection, consistent with ESA Section 10 Permit 18118 and 18121.

Table 11. Age-4 and age-5 class return projection for wild and hatchery spring Chinook to Tumwater Dam during 2014. Estimates were generated by a recently developed model (WDFW unpublished data).

	Chiwawa Basin			Nason Cr. Basin			Wenatchee Basin to Tumwater Dam		
	Age-4	Age-5	Total	Age-4	Age-5	Total	Age-4	Age-5	Total
Estimated wild return	466	149	**615**	177	56	**233**	706	225	**931**
Estimated hatchery return	1,623	12	**1,635**				2,166	166	**2,332**
Total	2,089	161	**2,250**	177	56	**233**	**2,872**	**391**	**3,263**

Final 2014 Hybrid Broodstock Collection for the *Chiwawa River* Spring Chinook Conservation Program

Step 1: Collect up to 74 (37 females and 37 males) hatchery origin (Chiwawa) adults from Tumwater Dam. This will be sufficient adults to meet the 144,026 aggregated smolt release for the Chiwawa spring Chinook program, in the event insufficient NORs are captured for the program.

Step 2: Target natural origin adults (NOR) at Tumwater Dam that were PIT tagged as juveniles in the Chiwawa River. Use detections at Bonneville Dam and application of a geometric mean conversion to Tumwater Dam (Table 12) to estimate the number of NOR's that can likely be collected for broodstock at Tumwater Dam to reduce the level of tributary effort needed to meet the conservation program.

Table 12. PIT tagged natural origin adults to Tumwater Dam for the most recent 5-years (2009-2013) with conversion rates from Bonneville Dam.

	Detections at Bonneville Dam		Detections at Tumwater Dam			
Return year	Nason	Chiwawa	Nason	Conversion rate	Chiwawa	Conversion rate
2009	3	29	1	0.333	24	0.828
2010	15	78	2	0.133	62	0.795
2011	16	115	12	0.750	81	0.704
2012	7	60	5	0.714	52	0.867
2013	2	29	2	1.000	22	0.759
Mean	8.6	62.2	4.4	0.586	48.2	0.790
Geomean	6.3	53.8	3.0	0.474	42.5	0.788

Step 3: Operate the Chiwawa Weir on a 24-hour up/24-hour down schedule to minimize potential delay of bull trout and spring Chinook and to minimize the total number bull trout trapped/handled beginning June 15 through August 15 (per Section 10 permit 18121). The balance of production not met from NORs acquired through collection of previously PIT tagged fish at TWD and collection of NORs at the Chiwawa Weir for the Chiwawa conservation program will be met through hatchery origin adults collected at TWD (see step 1).

Specific Actions:

- Target up to 74 natural origin spring Chinook (37 females or up to 33% of the NOR component to the Chiwawa River) between 15 June and 15 August, operating the weir a maximum of 15 total days during the 60d window.

- Operate the weir under a 24 hr up/24 hr down to minimize migrational delay of bull trout and spring Chinook.

- If after 15-days of weir operation, 67 bull trout encounters, or 15 August, the NOR broodstock target is not reached, the balance of the mitigation obligation will be met through hatchery fish already retained for the Chiwawa program at TWD.

- Use historic data about NOR spring Chinook timing to the lower Chiwawa array from TWD to determine optimal dates for collection.

- Immediately remove bull trout that are caught at the Chiwawa trap and release them to a site ~10KM upstream of the weir to prevent fallback/impingement and to mitigate for potential delay. Handling and transport will be conducted by WDFW hatchery staff.

- If a bull trout is killed during trapping, despite implementing conservation measures, trapping activities will cease and not continue until additional measures to minimize risks to bull trout can be discussed with the USFWS.

Final 2014 Hybrid Broodstock Collection for the *Nason Creek* Conservation and Safety Net Programs

Step 1: Collect up to 130 (65 females and 65 males) hatchery origin (Chiwawa) adults from Tumwater Dam. This will be sufficient adults to meet the 223,670 aggregated smolt release for the Nason Creek spring Chinook programs (64 for Nason conservation and 66 for Nason safety net).

Step 2: Target natural origin adults at Tumwater Dam that were PIT tagged as juveniles in Nason Creek. Use detections at Bonneville Dam and application of a geometric mean conversion to Tumwater Dam (Table 13) to estimate the number of NOR's that can likely be collected for broodstock at Tumwater Dam to reduce the level of tributary effort needed to meet the conservation program.

Table 13. PIT tagged natural origin adults to Tumwater Dam for the most recent 5-years (2009-2013) with conversion rates from Bonneville Dam.

Return year	Detections at Bonneville Dam		Detections at Tumwater Dam			
	Nason	Chiwawa	Nason	Conversion rate	Chiwawa	Conversion rate
2009	3	29	1	0.333	24	0.828
2010	15	78	2	0.133	62	0.795
2011	16	115	12	0.750	81	0.704
2012	7	60	5	0.714	52	0.867
2013	2	29	2	1.000	22	0.759

Mean	8.6	62.2	4.4	0.586	48.2	0.790
Geomean	6.3	53.8	3.0	0.474	42.5	0.788

Step 3: Conduct tangle netting activities in Nason Creek to meet the balance of the conservation program not met through PIT tagged NOR collections at TWD. Effort, timing, and duration would follow a similar scope as was implemented in 2013. Any shortfall in the Nason Creek conservation program will be met through hatchery origin adults collected at TWD. The safety net portion of the Nason Creek program will be met through 66 of the 130 HORs collected at TWD and acclimated/released from Chiwawa Ponds, for GCPUD's Wenatchee spring Chinook obligation.

Specific Actions:

- Target up to 64 natural origin spring Chinook (32 females or up to 33% of the NO component to Nason Creek) between 15 July and 15 August, netting a maximum of 15 total days during the 30d window. Timing and execution of tangle netting will be determined by evaluating PIT tag detections at the lower Nason PIT tag array to ensure fish are in-basin to support efforts.

- If after 15-days or 15 August the NO broodstock target is not reached, the balance of the mitigation obligation will be met through hatchery fish already retained from the Chiwawa program.

- Use historic data about spring Chinook spawning locations to identify pools where spring Chinook are likely to aggregate.

- Snorkel targeted pools to determine if bull trout are present before deploying nets.

- Deploy nets in configurations that will minimize the likelihood of capturing bull trout if bull trout are associated with aggregations of spring Chinook.

- Immediately remove bull trout that are caught and release them to locations where they are unlikely to be re-encountered.

- Employ personnel for this activity who have experience capturing Chinook salmon using tangle nets, especially personnel with experience avoiding bull trout in the process. Ensure sufficient personnel are present to remove and release captured fish safely and efficiently.

- Snorkel several pools before deploying nets. If snorkeling reveals bull trout are present in the initially targeted pools, snorkel additional pools looking for locations where bull trout are absent or are few in number. Redd surveys for bull trout suggest the abundance of adult bull trout in Nason Creek is quite low (possibly less than 10 individuals). This low abundance increases the likelihood of being able to avoid the capture of bull trout simply by conducting snorkeling reconaissance across several pools. Broad reconaissance may also identify locations where capture of sufficient spring Chinook to meet broodstock needs can be accomplished with the lowest number of net sets.

- Release captured bull trout to the nearest upstream pool that is not targeted for netting.

- If a bull trout is killed during netting, despite implementing these conservation measure, netting activites will cease and not continue until additional measures to minimize risks to bull trout can be discussed with the Service.

Steelhead

The steelhead mitigation program in the Wenatchee Basin use broodstock collected at Dryden and Tumwater dams located on the Wenatchee River. Per ESA section 10 Permit 1395 provisions, broodstock collection will target adults necessary to meet a 50% natural origin – conservation oriented program and a 50% hatchery origin – safety net program, not to exceed 33% of the natural origin steelhead return to the Wenatchee Basin. Based on these limitations and the assumptions listed below (Table 15), the following broodstock collection protocol was developed.

WDFW will retain a total of 130 mixed origin steelhead for broodstock for a smolt release objective of 247,300 smolts (Table 15). The 66 hatchery origin adults will be targeted at Dryden Dam and if necessary Tumwater dam. The 64 natural origin adults will be targeted for collection at Tumwater Dam. Collection will be proportional to return timing between 01 July and 14 November. Collection may also occur between 15 November and 5 December at both traps, concurrent with the Yakama Nation coho broodstock collection activities. Hatchery x wild and hatchery x hatchery parental cross and unknown hatchery parental cross adults will be excluded from the broodstock collection. Hatchery steelhead parental origins will be determined through evaluation of VIE tags, adipose/CWT presence/absence, and PIT tag interrogation during collection. Adult return composition including number, origin, age structure, and sex ratio will be assessed in-season at Priest Rapids and at Dryden Dam. In-season broodstock collection adjustments may be made based on this monitoring and evaluation. To better assure achieving the appropriate females equivalents for program production, the collection will implement the draft Production Management Plan, including ultrasonography to determine the sex of each fish retained for broodstock.

In the event steelhead collections fall substantially behind schedule, WDFW may initiate/coordinated adult steelhead collection in the mainstem Wenatchee River by hook and line. In addition to trapping and hook and line collection efforts, Tumwater and Dryden dams may be operated between February and early April the subsequent spring to supplement broodstock numbers if the fall trapping effort provides fewer than the required number of adults.

Table 15. Assumptions and calculations to determine the number and origin of 2015 brood Wenatchee summer steelhead broodstock needed for Wenatchee Basin program release of 247,300 smolts.

Program Assumptions	Standard	Conservation	Safety Net	Full Program
Smolt Release		**123,650**	**123,650**	**247,300**
Fertilization-to-release survival	*70.2%*			
Egg take target		176,140	176,140	**352,280**
Fecundity	*5,930 H* *5,787 W*			
Female Target		**31**	**30**	**30 H** **31 W**
Female to male ratio	*1:1*			
Broodstock target		**62**	**60**	**122**
Pre-spawn survival	*90.7%H/97.1%W*			
Total broodstock collection		**64**	**66**	**130**

Summer/fall Chinook

Summer/fall Chinook mitigation programs in the Wenatchee River Basin utilize adult broodstock collections at Dryden and Tumwater dams, incubation/rearing at Eastbank Fish Hatchery (FH) and acclimation/release from the Dryden Acclimation Pond. The total production level target for BY 2014 is 500,001 smolts (181,816 GCPUD mitigation and 318,185 CCPUD mitigation).

The TAC 2014 Columbia River UCR summer Chinook return projection to the Columbia River (Appendix A) and BY 2009, 2010 and 2011 spawn escapement to the Wenatchee River indicate sufficient summer Chinook will return to the Wenatchee River to achieve full broodstock collection for the Wenatchee River summer Chinook supplementation program. Review of recent summer/fall Chinook run-timing past Dryden and Tumwater dam indicates that previous broodstock collection activities have omitted the early returning summer/fall Chinook, primarily due to limitations imposed by ESA Section 10 Permit 1347 to minimize impacts to listed spring Chinook. In an effort to incorporate broodstock that better represent the summer/fall Chinook run timing in the Wenatchee Basin, the broodstock collection will front-load the collection to account for the disproportionate collection timing. Approximately 43% of the summer/fall Chinook destined for the upper Basin (above Tumwater Dam) occurs prior to the end of the first week of July; therefore, the collection will provide 43% of the objective by the end of the first week of July. Weekly collection after the first week of July will be consistent with run timing of summer/fall Chinook during the remainder of the trapping period. With concurrence from NMFS, summer Chinook collections at Dryden Dam may begin up to one week earlier. Collections will be limited to a 33% extraction of the estimated natural-origin escapement to the Wenatchee Basin. Based on these limitations and the assumptions listed below (Table 16), the following broodstock collection protocol was developed.

WDFW will retain up to 278 natural-origin, summer Chinook at Dryden and/or Tumwater dams, including 139 females. To better assure achieving the appropriate females for program production, the collection will implement the draft Production Management Plan, including ultrasonography to determine the sex of each fish retained for broodstock. Trapping at Dryden Dam may begin 01 July and terminate no later than 15 September and operate up to 7-days/week, 24-hours/day. Trapping at Tumwater Dam if needed may begin 15 July and terminate no later than 15 September and operate up to 48 hours per week for broodstock related activities.

Table 16. Assumptions and calculations to determine the number of 2014 brood Wenatchee summer Chinook salmon broodstock needed for Wenatchee Basin program release of 500,001 smolts.

Program Assumptions	Standard	Grant PUD	Chelan PUD	Total Wenatchee Program
Smolt Release		**181,816**	**318,185**	**500,001**
Fertilization-to-release survival	*77.8%*			
Egg take target		**233,697**	**408,978**	**642,675**
Fecundity	*5,099*			
Female Target		**46**	**80**	**126**
Female to male ratio	*1:1*			
Broodstock target		**92**	**160**	**252**
Pre-spawn survival	*90.5%*			
Total broodstock collection		**102**	**176**	**278**

Priest Rapids Fall Chinook

Collection of fall Chinook broodstock at Priest Rapids Hatchery will generally begin in early September and continue through about mid-November. Juvenile release objectives specific to Grant PUD (5,599,504 sub-yearlings), Federal (1,700,000 sub-yearlings at PRH + 3,500,000 smolts at Ringold Hatchery – collection of broodstock for the federal programs are conditional upon having contracts in place with the ACOE and concurrence that Section 10 permit coverage exists for the ACOE programs), mitigation commitments. Biological assumptions are detailed in Table 17. Smolt release objectives for Ringold Springs occur as green eggs collected at Priest Rapids FH and incubated at Bonneville prior to eyed-egg transfers to Ringold Springs.

For 2014, up to 1,000 adipose present, non-coded wire tagged (presumed wild) fall Chinook adults will be targeted at the OLAFT (as approved by the PRCC-HSC). Additional NOR adults targeted as a continued pilot evaluation through hook-and-line angling efforts in the Hanford Reach to increase the proportion of natural origin adults in the broodstock to meet integration of the hatchery program will also be incorporated into the program. It is estimated that approximately 400 adults may be collected through the hook-and-line efforts. Close coordination between broodstock collections at the volunteer channel, the OLAFT and through hook-and-line efforts in the Hanford Reach will need to occur so over collection is minimized. Presumed NOR's collected and spawned from either hook-and-line caught broodstock or OLAFT collections will be prioritized for PRH programs (i.e. OLAFT and Hanford Reach fish will be held in a separate raceways from volunteer collected fish, spawned first each week, and to the extent possible segregated and reserved for the GPUD program).

Grant PUD staff will work closely with WDFW hatchery and M&E staff to maintain separation of gametes/progeny of OLAFT and angling collected adults at spawning and through incubation/early rearing.

Based upon the biological assumptions in Table 17, an estimated 3,524 females will need to be spawned to meet the 12,413,223 eggs required to meet the current three up-river bright (URB) programs which rely on adults collected at the Priest Rapids Hatchery volunteer channel trap, hook-and-line efforts on the Hanford Reach, and/or the Priest Rapids Dam off ladder trap (OLAFT).

To increase the probability of incorporating a higher percentage of NOR's from the volunteer channel, adipose present, non-CWT males and females will be prioritized for retention.

Implementation Assumptions

1) Broodstock may be collected at any or all of the following locations/means: the PRD off ladder trap (OLAFT – operated 4-days per week/8 hrs/day to collect up to 1,000 presumed NOR's), hook-and-line angling in the Hanford Reach (actual numbers collected are uncertain but will contribute to the overall brood program and pNOB), and the Priest Rapids Hatchery volunteer channel trap.

2) Assumptions used to determine egg/adult needs is based upon current program performance metrics.

3) Broodstock retained from the volunteer channel will exclude age-2 and 3 males (using length at age; i.e. retain males ≥ 75 cm) to address genetic risks/concerns of younger age-at-maturity males producing offspring which return at a younger age (decreased age-at-maturity) and also decrease the probability of using hatchery origin fish in the broodstock that are skewed towards earlier ages at maturity.

4) Only adipose present, non-CWT males and females will be retained for broodstock from volunteer channel collected broodstock unless a shortage is expected.

5) Only progeny of adipose present, non-wired fish encountered through hook-and-line angling and at the OLAFT will be prioritized for retention into the program.

6) Broodstock collected from the OLAFT and by hook-and-line will exclude age-2 and to the degree possible age-3 fish (<75 cm) to minimize genetic risks/concerns of younger age-at-maturity males producing offspring which return at a younger age (decreased age-at-maturity) and to ensure the highest proportion of NOR's in the collection (e.g. collection of 1 in 5 age-3 fish for broodstock from the OLAFT).

7) All gametes of fish spawned from hook-and-line broodstocking efforts and/or OLAFT collections will be incorporated into the GCPUD program.

8) Should the PRCC-HSC reach consensus, presumptive NO males may be spawned with more than 2 females and estimates of pNOB may be adjusted based upon how many HO females a NO male is crossed (i.e. spawned) with (effective pNOB). Prior to agreement by the HSC, the HSC will consult with geneticists to balance competing genetic risks. -.

Table 17. Assumptions and calculations to determine the number of fall Chinook salmon broodstock needed for a non-actively integrated Priest Rapids program release of 7,299,504 sub-yearling fall Chinook and 3,500,000 sub-yearling smolts for Ringold, in 2014.

Program Assumptions	**Standard**			**Program objective**
Juvenile Production Level				
Grant PUD Mitigation-PUD Funded				**5,325,543 smolts** **273,961 smolts**[3/-]
John Day Mitigation-Federally Funded				**1,700,000 smolts**
John Day Mitigation [1]*-Ringold Springs-ACOE funding.*				**3,500,000 smolts**
Total Program Objectives				**10,799,504 smolts**
Fertilization-to-release survival	*87%*			
Egg take target				**12,413,223**
Fecundity Age-4+(~56%)	*4,300*			1,617
Age-3 (~44%)	*3,680*			1,484
Female Target				**3,101**
Female to male ratio	*2:1*			
Pre-spawn survival	*88%*			
Broodstock target	**Total**	**Volunteer Trap**	**OLAFT**	**ABC**
Females	***3,524***	**2,611**	**670**[4/-]	
Males	***1,762***	**1,311**	**330**[4/-]	
Total broodstock collection	**5,686**[6/-]	**3,922**	**1,000**	**~400**
Estimated NOR's from OLAFT	**540**[2/-]			
Estimated 2014 minimum pNOB	**0.102**[5/-]			

[1/-] As of brood year 2009, Priest Rapids Hatchery is taking sufficient eggs to meet the 3,500,000 sub-yearling smolt release at Ringold-Meseberg Hatchery funded by the ACOE – incubation of this program occurs at Bonneville.

Section 10 permit coverage is still uncertain at this time which may complicate implementation of the 3.5M Ringold program.
[2/-]Estimated NOR's assumes a minimum of 178 wild males using them in the 2:1 F:M ratio and no more than 362 wild females. If the number of wild males is increased (the number of NOR females would decrease).
[3/-]The PRCC-HSC agreed upon smolt production by conversion of the 1M fry obligation.
[4/-]Estimated number of fall Chinook females and males acquired from the OLAFT in 2014.
[5/-]Trap and transport activities at the OLAFT, should they be required during the fall migration period as a result of the Wanapum pool drawdown, could disrupt fall Chinook broodstocking at the OLAFT. If this occurs, pNOB will likely be well below the estimated level. However success of the hook and line effort to collect NOR's may help to offset the loss of NORs from the OLAFT.
6/- Total includes up to 400 adults collected from hook and line collection efforts on the Hanford Reach. No estimate of m:f were made.

Appendix A

Columbia River Mouth Fish Returns Actual and Forecasts**

			2013 Forecast	2013 Return	2014 Forecast
Spring Chinook	**Total Spring Chinook**		**225,000**	**195,200**	**308,000**
	Willamette		59,800	47,300	58,700
	Sandy		6,100	5,700	5,500
	Cowlitz*		5,500	9,500	7,800
	Kalama*		700	1,000	500
	Lewis*		1,600	1,600	1,100
	Select Areas		9,900	7,000	7,400
	Lower River total		**83,600**	**72,100**	**81,000**
	Wind*		3,000	3,600	8,500
	Drano Lake*		4,900	7,300	13,100
	Klickitat*		2,200	1,800	2,500
	Yakima*		7,300	7,100	9,100
	Upper Columbia	Total	14,300	18,000	24,100
	Upper Columbia	*Wild*	*1,600*	*3,600*	*3,700*
	Snake River Spring/Summer	Total	58,200	67,300	125,000
	Snake River	*Wild*	*18,900*	*21,900*	*42,200*
	Upriver Total		**141,400**	**123,100**	**227,000**
Summer Chinook	**Upper Columbia**	**Total**	**73,500**	**67,600**	**67,500**
Sockeye	Wenatchee		44,600	36,000	63,400
	Okanogan		134,500	149,000	282,500
	Snake River	*Wild*	*1,250*	*1,100*	*1,200*
	Total Sockeye		**180,500**	**186,100**	**347,100**
Steelhead					
Winter	Wild winter steelhead	Wild	15,700	15,600	16,100
Upriver Summer (to Bonneville Dam)	Upriver Skamania Index	**Total**	**16,600**	**5,800**	**8,600**
		Wild	*5,300*	*1,700*	*2,300*
	Group A-run Index	**Total**	**291,000**	**214,100**	**241,400**
	Wild		*83,500*	*90,500*	*82,400*
	Group B-run Index	**Total**	**31,600**	**11,500**	**31,000**
		Wild	*7,900*	*2,900*	*6,500*
	Total Upriver Steelhead	**Total**	**339,200**	**231,400**	**281,000**
		Wild	*96,700*	*95,100*	*91,200*

*Return to tributary mouth **Totals may not sum due to rounding 26-Feb-14

Appendix B

DRAFT

Hatchery Production Management Plan

The following management plan is intended to provide life-stage-appropriate management options for Upper Columbia River (UCR) PUD salmon and steelhead mitigation programs. Consistent, significant over-production or under-production risks the PUD's not meeting the production objectives required by FERC and overages in excess of 110% of program release goals violates the terms and conditions set forth for the implementation of programs under ESA and poses potentially significant ecological risks to natural origin salmon communities.
Under RCW 77.95.210 (Appendix A) as established by House Bill 1286, the Washington Department of Fish and Wildlife has limited latitude in disposing of salmon and steelhead eggs/fry/fish. While this RCW speaks more specifically to the sale of fish and/or eggs WDFW takes a broader application of this statute to include any surplus fish and/or eggs irrespective of being sold or transferred.
We propose implementing specific measures during the different life-history stages to both improve the accuracy of production levels and make adjustments if over-production occurs. These measures include (1) Improved Fecundity Estimates, (2) Adult Collection Adjustments, (3) Within-Hatchery Program Adjustments, and (4) Culling.

<u>Improved Fecundity Estimates</u>

A) Develop broodstock collection protocols based upon the most recent 5-year mean in-hatchery performance values for female to spawn, fecundity, green egg to eye, and green egg to release.

B) Use portable ultrasound units to confirm gender of broodstock collected (broodstock collection protocols assume a 1:1 male-to-female ratio). Ultrsonography, when used by properly trained staff will ensure the 1:1 assumption is met (or that the female equivalents needed to meet production objective are collected). Spawning matrices can be developed such that if broodstock for any given program are male limited sufficient gametes are available to spawn with the females.

<u>Adult Collection Adjustments</u>

C) Make in-season adjustments to adult collections based upon a fecundity-at-length regression model for each population/program and origin composition needs (hatchery/wild). This method is intended to make in-season allowances for the age structure of the return (i.e. age-5 fish are larger and therefore more fecund than age-4 fish), but will also make allowances for age-4 fish that experienced more growth through better ocean conditions compared to an age-5 fish that reared in poorer ocean conditions.

Within-Hatchery Program Adjustments

D) At the eyed egg inventory (first trued inventory), after adjustments have been made for culling to meet BKD management objectives, the over production will be managed in one or more of the following actions as approved by the HCP-HC:

- Voluntary cooperative salmon culture programs under the supervision of the department under chapter 77.100 RCW;
- Regional fisheries enhancement group salmon culture programs under the supervision of the department under this chapter;
- Salmon culture programs requested by lead entities and approved by the salmon funding recovery board under chapter 77.85 RCW;
- Hatcheries of federally approved tribes in Washington to whom eggs are moved, not sold, under the interlocal cooperation act, chapter 39.34 RCW; and
- Governmental hatcheries in Washington, Oregon, and Idaho; or
- Culling for diseases such as BKD and IHN, consistent with the Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State; or
- Distribution to approved organizations/projects for research.

E) At tagging (second inventory correction) fish will be tagged up to 110% of production level at that life stage. If the balance of the population combined with the tagged population amounts to more than 110% of the total release number allowed by Section 10 permits then the excess will be distributed in one or more of the following actions as approved by the HCP-HC:

- Voluntary cooperative salmon culture programs under the supervision of the department under chapter 77.100 RCW;
- Regional fisheries enhancement group salmon culture programs under the supervision of the department under this chapter;
- Salmon culture programs requested by lead entities and approved by the salmon funding recovery board under chapter 77.85 RCW;
- Hatcheries of federally approved tribes in Washington to whom eggs are moved, not sold, under the interlocal cooperation act, chapter 39.34 RCW; and

- Transfer to another resource manager program such as CCT, YN, or USFWS program;
- Governmental hatcheries in Washington, Oregon, and Idaho;
- Placement of fish into a resident fishery (lake) zone, provided disease risks are within acceptable guidelines; or
- Culling for diseases such as BKD and IHN, consistent with the Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State; or
- Distribution to approved organizations/projects for research.

F) In the event that a production overage occurs after the above actions have been implemented or considered, and deemed non-viable for fish health reasons in accordance with agency aquaculture disease control regulations (i.e. either a pathogen is detected in a population that may pose jeopardy to the remaining population or other programs if retained or could introduce a pathogen to a watershed where it had not previously been detected) then culling of those fish may be considered.

All, provisions, distributions, or transfers shall be consistent with the department's egg transfer and aquaculture disease control regulations as now existing or hereafter amended. Prior to department determination that eggs of a salmon stock are surplus and available for sale, the department shall assess the productivity of each watershed that is suitable for receiving eggs.

APPENDIX K
2014 ANNUAL FINANCIAL REPORT FOR THIS PLAN SPECIES ACCOUNT

  

PUBLIC UTILITY DISTRICT NO. 1 of CHELAN COUNTY
P.O. Box 1231, Wenatchee, WA 98807-1231 • 327 N. Wenatchee Ave., Wenatchee, WA 98801
(509) 663-8121 • Toll free 1 888 663 8121 • www.chelanpud.org

MEMORANDUM

DATE: **January 6, 2015**

TO: **Becky Gallaher, Natural Resources Program Analyst**
Keith Truscott, Director - Natural Resources

FROM: **Debbie Litchfield, Treasurer/Director – Treasury**

RE: **Rocky Reach Hydro Project Habitat Conservation Plan**
2014 Annual Financial Report, Plan Species Account

In accordance with Section 7.4.3 of the Rocky Reach Habitat Conservation Plan attached is the 2014 year end annual financial report of the Plan Species Account activity completed by Chelan County Public Utility District No. 1.

Chelan County PUD
Rocky Reach Hydroelectric Project
Habitat Conservation Plan
Plan Species Cash Account Activity
Annual Financial Report Per Section 7.4.3
Reporting Period: 2014

Beginning Balance:	**1/1/2014**		**$ 2,217,802.36**
Transfers In:			
Rocky Reach Funding		331,015.00	
Interest Earnings		1,162.76	
Total Transfers In			332,177.76
Transfers Out:			
Payments		(343,470.88)	
Bank Service Fees		(88.50)	
Total Transfers Out			(343,559.38)
Ending Balance:	**12/31/2014**		**$ 2,206,420.74**

The Plan Species Account was established per the Rocky Reach Habitat Conservation Plan, Section 7.4.
Interest earnings shall remain in the Account in accordance with Appendix E, Section 7.4.1.

APPENDIX L
SEPTEMBER 2014 ROCKY REACH AND ROCK ISLAND BYPASS OPERATIONS SUMMARY

Rocky Reach and Rock Island Juvenile Subyearling Chinook Index Counts During Extended Bypass Operations, September 1-15, 2014

Rocky Reach:

Total index count as of 8/31/14: 22,251
Subyearling count Sept. 1-15: 76 (0.34% of total index from 4/1-8/31/14)

Date	# of Sub. Chinook Sampled
9/1/2014	10
9/2/2014	11
9/3/2014	10
9/4/2014	7
9/5/2014	11
9/6/2014	2
9/7/2014	6
9/8/2014	1
9/9/2014	4
9/10/2014	3
9/11/2014	3
9/12/2014	2
9/13/2014	4
9/14/2014	1
9/15/2014	1
Total	**76**

- Daily collections were comprised of four 30 minute samples with no expansion needed, with 23 of the 44 samples collecting zero subyearling Chinook.

Rock Island:

Total index count as of 8/31/14: 34,165

Subyearling count Sept. 1-15: 475 (1.39% of total index from 4/1-8/31/14)

Date	# of Sub. Chinook Sampled	Expanded Count (DART Count)
9/1/2014	18	20
9/2/2014	31	35
9/3/2014	43	110
9/4/2014	36	42
9/5/2014	34	41
9/6/2014	16	29
9/7/2014	10	23
9/8/2014	7	30
9/9/2014	4	8
9/10/2014	7	17
9/11/2014	5	8
9/12/2014	6	10
9/13/2014	7	39
9/14/2014	0	0
9/15/2014	3	63
Total	**227**	**475**

APPENDIX M
2014 WENATCHEE BASIN STEELHEAD RELEASE PROPOSAL

STATE OF WASHINGTON
DEPARTMENT OF FISH AND WILDLIFE
FISH PROGRAM – SCIENCE DIVISION
SUPPLEMENTATION RESEARCH TEAM
3515 Chelan HWY, Wenatchee, WA 98801
Voice (509) 663-9678 FAX (509) 662-6606

March 17, 2014

To: HCP Hatchery Committee

From: Chris Moran, Mike Tonseth, WDFW

Subject: 2014 Wenatchee Basin Steelhead Release Proposal – Updated with summary table.

In early 2013 the HCP-HC approved an evaluation of post-release performance of summer steelhead comparing forced and volitional releases to determine which strategy could maximize survival and to screen for non-migratory juveniles. The evaluation was in response to program changes (e.g. overwinter acclimation and reduced production levels) and lower survival of 2012 releases which were comprised entirely of progeny from WxW parentage.

Preliminary results of the 2013 release evaluations suggest there is little difference in survival performance between forced and volitionally released fish. Mean survival estimates, generated using PIT tag detections to McNary Dam and based on the Cormack-Jolly-Seber (CJS) model (http://www.cbr.washington.edu/dart/query/pit_sum_tagfiles), were 57.5% and 58.9% for volitional and forced releases, respectively (Table 1). However, there was more variability in the survival of volitionally released fish (36.3%-67.8%) than for the forced group (40.0%-58.9%). In addition, since 2009, Blackbird Pond has been used to short term acclimate a portion (up to 50K) of the steelhead smolts annually, to aid in improving homing fidelity of adults back to the Wenatchee River in the absence of overwinter acclimation availability (which first became available for the full program in 2011). In the five years Blackbird Pond has been used to acclimate fish beginning in March, detections of fish leaving the pond during high flows have been less than ideal for determining what proportion (number) had emigrated from the pond. This potentially biases estimates of smolt-to-adult survival which could potentially affect the NNI mitigation component in the future.

Overwinter acclimation has been available for the full Wenatchee steelhead program since 2011 including conducting volitional and forced releases. For volitional releases, fish remaining in the ponds at the end of the volitional period, were trucked planted into the Wenatchee River adjacent to the town of Leavenworth (immediately downstream and right of Blackbird Pond). This was to minimize the potential for non-migrant (residual) interactions with juvenile wild ESA listed spring Chinook and steelhead.

Based upon the release results from 2013, for 2014, WDFW proposes to conduct volitional releases from rearing structures at Chiwawa Ponds (raceway and circulars) consistent with volitional releases in 2013 and truck plant to various locations in Nason Creek, the Chiwawa River, and the upper Wenatchee River throughout the volitional period. At the end of the volitional period at Chiwawa Ponds, the remaining "non-migrants" will be transferred to Blackbird Pond for continued acclimation and volitional release opportunity through approximately mid-late June, after which stop logs will be installed, effectively halting emigration. This methodology allows the District and WDFW to manage for potential residualism consistent with the terms and conditions of Section 10 (a)(1)(A) permit 1395.

Specific details for 2014 are as follows:

- Volitional releases at Chiwawa Ponds (both circulars and raceway) will begin approximately April 16 following the end of the spring Chinook release.

- All volitionally migrating fish (a combination of HxH and WxW) will be truck planted in multiple locations in Nason Creek, the Chiwawa River, and the upper Wenatchee River.

- Fish remaining at Chiwawa Ponds (estimated at about 30K based upon 2013 data), following the end of the volitional period, will be transferred to Blackbird Pond where fish will be allowed additional acclimation and migration opportunities through mid-late June. Actual termination of the volitional release will be based upon PIT detections from the pond.

- Beginning July 1, fish that did not migrate are assumed to be residuals, or likely to residualize; stop logs will be installed at the pond outlet, and any remaining fish will be available for juvenile fishing opportunities in Blackbird Pond as part of Trout Unlimited's activities.

Table 1: 2013 Wenatchee steelhead release dates, apparent survival to McNary Dam, and release number.

Release Location	Release Type	Volitional Start Date	Release Date	Survival to McNary	SE	Release number
U. Wenatchee R.	F	--	24-Apr, 1- May	0.5887	0.1370	39,280
U. Wenatchee R.	V	24-Apr	29-Apr, 1-May	0.5748	0.1393	37,467
Nason Cr.	F[1]		29-April, 13-May	0.4002	0.0745	59,649
Nason Cr.	V	24-Apr	26, 29-April, 6-May	0.3627	0.0482	11,617
Chiwawa R.[2]	V	5/1	1, 6, & 14-May	0.6777	0.3408	47,263
Nason Cr.	NM[3]	22-Apr	6-May	0.1803	0.0894	762
L. Wenatchee R.	NM	24-Apr	15-May	0.1304	0.0768	27,442
All Volitional Releases (pooled)		--	--	0.4037	0.0364	96,347
All Forced Releases (pooled)		--	--	0.4514	0.0645	98,929

[1]Survival estimates for this group were from two releases from Circular 3 and Pond 3 released on April 29th and May 13th respectively.

[2]Survival estimated for this release group were released from Pond 1 and represents 3 release groups. The first two groups were released at the Chiwawa River bridge on May 1st, and 6th; the last group was released at Meadow Creek on May 14th.

[3]NM= Non-Migrant group (i.e. fish remaining after volitional releases have ceased).

Table 2. Projected 2014 release numbers by origin and location including estimates of PIT tags per site.

Release Site	Origin	Release Number	Estimated PIT Tags
Nason Creek	WxW	50,000	2,000
	HxH	30,000	2,400
Chiwawa River	WxW	20,000	800
	HxH	20,000	1,600
Upper Wenatchee	WxW	53,000	2,200
	HxH	53,000	4,200
Black Bird Pond	HxH	25,000	1,900
Total		**251,000**	15,100

APPENDIX N
DRAFT – ADDENDUM TO THE CHELAN COUNTY PUD HATCHERY MONITORING AND EVALUATION IMPLEMENTATION PLAN WENATCHEE SOCKEYE SALMON

Addendum to the Chelan County PUD Hatchery Monitoring and Evaluation Implementation Plan

Wenatchee Sockeye Salmon

2014

Prepared by:

Alene Underwood and Catherine Willard

December 2013

CHELAN COUNTY POWER

Contents

1. Introduction

The Chelan PUD is proposing to conduct monitoring and evaluation (M&E) activities to track key population attributes related to Lake Wenatchee sockeye salmon beginning in 2014 (Table 1). In the absence of a sockeye hatchery program, M&E activities are no longer rooted in the context of evaluating the effects of sockeye salmon supplementation, but instead focus directly on the performance of the natural population, which is a unique departure from historic monitoring obligations. Broadly, the proposed M&E activities cover juvenile and adult life history stages and provide the data necessary to track or estimate viable salmonid population parameters (VSP): abundance, productivity, spatial structure and diversity (McElhaney et al. 2000). The data collected may also have utility in future hatchery compensation recalculation efforts (e.g., Table 2 provides a summary of the data used previously for Lake Wenatchee sockeye recalculation).

Chelan PUD is conducting these M&E activities to support commitments made under the 2011 hatchery recalculation effort, which also included a steelhead production commitment for a sockeye species swap (SOA 2011). This plan describes the specific commitments by juvenile and adult life history stages.

2. Juvenile Monitoring

Chelan PUD will conduct or fund activities to monitor and evaluate the temporal distribution and size of outmigrating sockeye smolts and their contributions to subsequent adult return years (Table 3). Chelan PUD will also develop estimates of smolt production based on adult return data. Collectively, these activities include: (1) funding of the lower Wenatchee River smolt trap concurrent with efforts aimed at evaluating Chelan PUD funded supplemented populations in the Wenatchee River subbasin; (2) providing up to 5,000 PIT tags for natural-origin juveniles encountered during smolt trapping activities at this location; and (3) analyzing historic information to model future smolt production levels based on spawning escapement.

The monitoring data obtained will provide a useful set of tools for evaluating the performance of natural origin sockeye salmon within the basin and downstream and also support the evaluation of VSP parameters [e.g., outmigration timing and size of smolts (diversity); and PIT tagging juveniles for SAR estimates (productivity)].

3. Adult Monitoring

Several M&E activities associated with adult returns of Lake Wenatchee sockeye salmon will be conducted and/or funded by Chelan PUD beginning in 2014 (Table 3). These efforts include (1) continuation of accurate adult counts at Rock Island, Rocky Reach, and Tumwater dams; (2) sampling of scales for age distribution, sex ratio determination, and returns of PIT-tagged adults at Tumwater Dam; (3) reach-specific conversion estimates between Rock Island Dam and spawning grounds in the White and Little Wenatchee rivers (i.e., Rock Island to Tumwater Dam to spawning tributaries); and (4) providing 250 PIT tags to estimate adult spawning escapement in the Little Wenatchee and White rivers utilizing PIT tags and mark-recapture techniques (the software program Sample Size 2.0.7, developed by the University of Washington School of Aquatic and Fisheries Science (P. Westhagen, J. Lady, and J. Skalski) was used to determine the minimum number of tags required (i.e., 250) to estimate adult sockeye escapement at a +/- 7 percent confidence interval). Chelan PUD will adjust the number of PIT-tagged individuals in order to maintain precision in estimates at the lowest rate of interference to migrating populations, if it is warranted due to annual changes in escapement and detection probabilities. In an effort to PIT tag the run at large, adults will be PIT tagged one day per week for six weeks.

Collectively, these data will provide reliable metrics of adult returns and spawning escapement (abundance), recruits-per-spawner (productivity), distribution of spawners among tributaries (spatial structure), and run-timing and age structure for adult immigrants (diversity

Table 1. Chelan PUD's proposed Lake Wenatchee sockeye salmon monitoring and evaluation activities.

Life History Stage	M&E Activity	Entity Performing the Activity	Related analysis	VSP parameter addressed
Juvenile	Concurrent operation of the lower Wenatchee smolt trap to collect juvenile outmigration data	WDWF	Generate distribution of outmigration timing and determine average smolt size.	Diversity
Juvenile	PIT tagging smolts at lower Wenatchee smolt trap (up to 5,000 fish annually) and collecting scale samples	WDWF	Estimate smolt-to-adult returns and estimate juvenile abundance	Productivity
Juvenile	Develop spawner-smolt production estimates	WDWF	Use collected data to quantify the relationship between spawner abundance and smolt production	Productivity
Adult	Rock Island and Rocky Reach Dam adult counts	CPUD	Initial spawner abundance (Okanogan stock separation)	Abundance and spatial structure
Adult	PIT tag subsample (250 adults) of returning adults at Tumwater Dam to support mark-recapture evaluation	WDWF	Calculate spawner abundance and relative distribution in tributaries	Abundance and spatial structure
Adult	Collect and age scales[1] and determine sex via ultrasound from returning adults at Tumwater Dam	WDWF	Estimate age-at-return, sex ratio, and relative productivity of contributing spawner cohorts	Productivity and diversity
Adult	Tumwater Dam adult counts	WDWF	Estimate potential spawner abundance (pre Lake-Wenatchee harvest), potential productivity (recruits/spawner), and run timing distribution	Abundance and diversity
Adult	Operate PIT detection arrays on Little Wenatchee and White River	WDWF	Calculate spawner abundance (post-Lake Wenatchee harvest and other mortality), actual productivity (recruits/spawner), and entry-to-spawning-habitat timing distribution, and spatial spawner distribution	Abundance, productivity, spatial structure, and diversity
All	Data management, analysis, and reporting	BioAnalysts CPUD	------	NA

[1] Scales would be collected concurrently from adults that are PIT tagged at Tumwater Dam

Table 2. Previous use of adult data to calculate hatchery compensation levels for Lake Wenatchee sockeye salmon.

Input Data			Derived Data		
Rock Island Survival	Average Observed Adult Returns	Average Hatchery SAR	Average Expected Adult Returns	Average Adults Owed	Hatchery Compensation
93.27%	**21,045**	**3.31%**	**22,564**	**1,519**	**45,891**

4. References

McElhany, P., M. H. Ruckelshaus, M. J. Ford, T. C. Wainwright, and E. P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of Evolutionarily Significant Units. NOAA Technical Memorandum.

Statement of Agreement (SOA); ChelanPUD Hatchery Compensation, Release Year 2014-2023, approved December 14, 2011.

APPENDIX O
CHELAN COUNTY PUD HATCHERY MONITORING AND EVALUATION IMPLEMENTATION PLAN 2015

Chelan County PUD Hatchery Monitoring and Evaluation Implementation Plan 2015

Prepared by:

Alene Underwood and Catherine Willard

September 2014

Contents

1. INTRODUCTION

The Habitat Conservation Plan (HCP) specifies that a monitoring and evaluation plan will be developed for the hatchery program. The approach to monitoring the hatchery programs was guided by the "*Monitoring and Evaluation Plan for PUD Hatchery Programs: 2013 Update"* (Hillman et al. 2013) and the "*Conceptual Approach to Monitoring and Evaluating the Chelan County Public Utility District Programs*" (Murdoch and Peven 2005).

The purpose of this document is to define the tasks associated with the approved scope of work to implement Chelan PUD's (CPUD's) hatchery monitoring and evaluation (M&E) plan for 2015. Additionally, monitoring and evaluation activities for Lake Wenatchee sockeye in 2015 are included in this document. As monitoring tasks are completed in 2014 and are evaluated for their efficacy, methodologies to accomplish the tasks defined in the 2015 implementation plan may be modified [with Habitat Conservation Plan's Hatchery Committee (HCP-HC) approval].

The work described in this plan has Endangered Species Act (ESA) coverage provided by NFMS Section 10(a)(1)(A) permits 18121 and 1395 and Section 10(a)(1)(B) permit 1347. All activities conducted under this Implementation Plan shall adhere to all terms and conditions as specified in the referenced permits. These permits allow for changes to monitoring or research protocols with the caveat that such modifications are approved by NMFS prior to implementing those changes. Terms and conditions relevant to monitoring and evaluating the hatchery programs have been used to inform the various measurements below and associated scopes of work with entities performing the work. A report summarizing compliance with the terms and conditions set forth under the above-references permits is required for submittal to NMFS; a copy of this completed report will be provided to the HCP HC.

The Implementation Plan includes all four components of the hatchery M&E Program including: (1) aquaculture monitoring; (2) juvenile monitoring; (3) adult monitoring; and (4) data, analysis and reporting. Under each component are study design elements that will be used to inform the overarching program components. Figure 1 illustrates the relationship of the components and study design elements used to address each component. Table 1 depicts which study design element is being performed by entity, and the associated objectives for each study design element as referred to in Hillman et al. 2013. For Lake Wenatchee sockeye salmon, the proposed M&E activities cover juvenile and adult life history stages and provide the data necessary to track or estimate viable salmonid population parameters (VSP) and is described in Section 6.0.

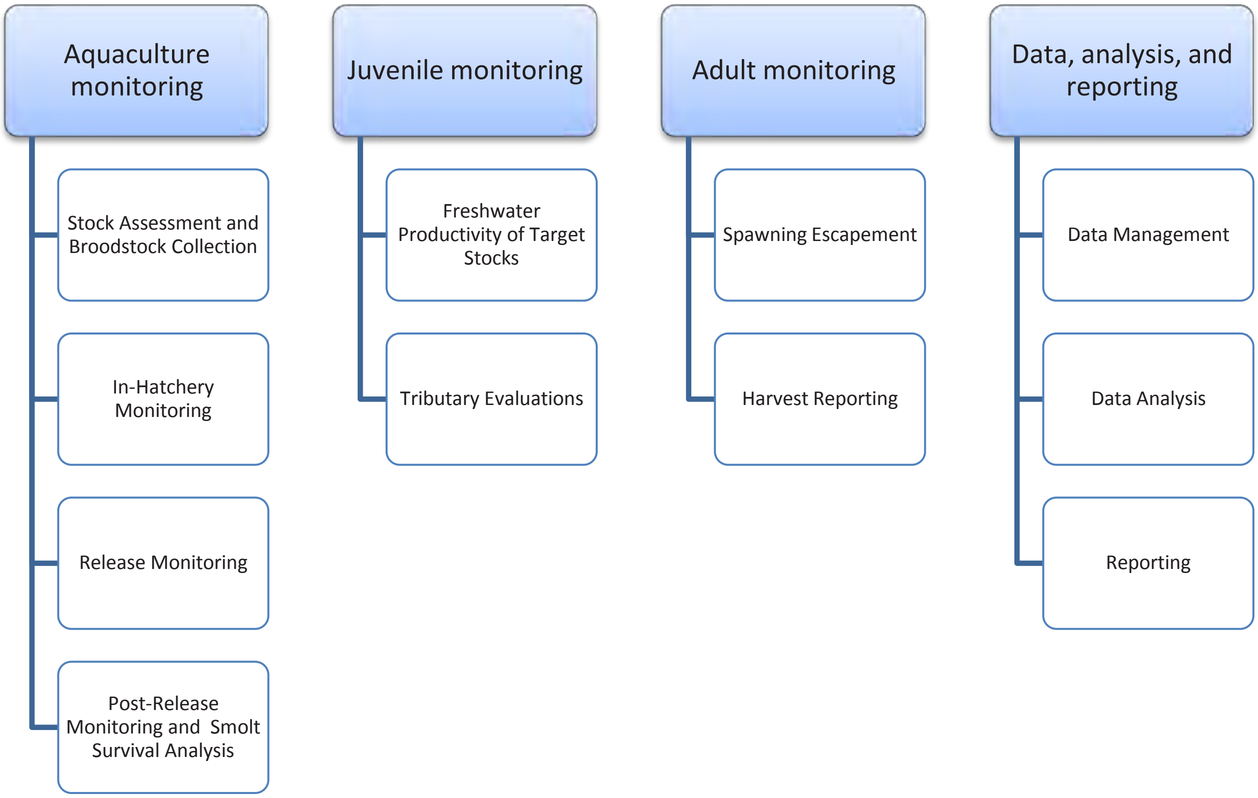

Figure 1. The four components of the hatchery monitoring and evaluation program and the study design elements within each component.

Table 1. Study design elements performed by entity, and the associated objectives for each study design element as referred to in Hillman et al. 2013.

Monitoring and evaluation component	Objectives[1]	Study Design Elements	Chiwawa spring Chinook	Wenatchee summer Chinook	Methow spring Chinook	Chelan Falls summer Chinook[3,4]	Wenatchee Steelhead
Aquaculture Monitoring	3,5,8	Stock assessment and broodstock collection	WDFW	WDFW	WDFW	WDFW	WDFW
	5, 8	In-hatchery monitoring	WDFW CPUD[2]	WDFW CPUD[2]	WDFW CPUD[2]	WDFW CPUD[2]	WDFW CPUD[2]
	9	Release monitoring	WDFW	WDFW	WDFW	WDFW	WDFW
	9	Post-release monitoring and smolt survival analysis	WDFW	WDFW	WDFW	WDFW	WDFW
Juvenile monitoring	2	Freshwater productivity of stocks	WDFW	WDFW	TBD	NA	WDFW
		Tributary evaluations	WDFW	WDFW	TBD	NA	WDFW
Adult monitoring	1,2,3,4,5,6, 8,10	Spawning escapement	CPUD	WDFW	TBD	BioAnalysts	WDFW
	8	Harvest reporting	WDFW	WDFW	TBD	WDFW	WDFW
Data, analysis, and reporting	All	Data management	WDFW BioAnalysts	WDFW BioAnalysts	WDFW BioAnalysts	WDFW BioAnalysts	WDFW BioAnalysts
		Data analysis	WDFW CPUD BioAnalysts	WDFW BioAnalysts	WDFW BioAnalysts	WDFW BioAnalysts	WDFW BioAnalysts
		Reporting	WDFW BioAnalysts	WDFW BioAnalysts	WDFW BioAnalysts	WDFW BioAnalysts	WDFW BioAnalysts

[1] Monitoring questions relative to Objective 7 will be addressed at the next 10 year HCP check-in.
[2] CPUD crews will PIT tag in-hatchery fish.
[3] Because the Chelan summer Chinook program is primarily an augmentation program, monitoring and evaluation efforts focus on straying, release characteristics, and harvest.
[4] Methow summer Chinook (the Carlton program) 2015 monitoring and evaluation activities for will be conducted by Grant County PUD; details of those activities can be found in Grant PUD's 2015 Implementation Plan. Data collected in 2015 will be included in Chelan's 2015 Annual M&E Report.

2. AQUACULTURE MONITORING

The aquaculture monitoring component is comprised of two basic elements: (1) stock assessment and broodstock collection at adult trapping locations and (2) in-hatchery monitoring including spawning, rearing, and release of juveniles. Data collected during these elements primarily support monitoring questions 5.1.1, 5.2.1, 8.1.1, 8.2.1, 8.3.1, 8.3.2, 8.4.1, 9.1.1, 9.2.1, 9.3.1 and 9.4.1, but also contribute data to monitoring questions 3.2.1, and 3.2.2 (Hillman et al. 2013). Table 2 below provides a summary of the variables to be measured in 2015 under the aquaculture monitoring component and what objective the measure(s) supports. The text that follows in this section further describes the activities.

Table 2. Monitoring and Evaluation Plan (Hillman et al. 2013) objectives and the associated measured variables for the aquaculture monitoring component.

Objectives	Measured Variables *(Applicable Study Component(s))*
Objective 3: Determine if the hatchery adult-to adult survival (i.e., hatchery replacement rate, HRR) is greater than the natural adult-to adult survival (i.e., natural replacement rate, NRR) and the target hatchery survival rate.	• Number of hatchery and naturally produced fish collected for broodstock (*Broodstock Collection and Stock Assessment*) • Number of broodstock used by brood year (hatchery and naturally produced fish) (*Broodstock Collection and Stock Assessment*)
Objective 5: Determine if the run timing, spawn timing, and spawning distribution of the hatchery component is similar to the natural component of the target population or is meeting program-specific objectives.	• Ages of hatchery and naturally produced fish sampled via PIT tags or stock assessment monitoring (*Broodstock Collection and Stock Assessment*) • Time (Julian date) of ripeness of hatchery and natural origin steelhead captured for broodstock (*Broodstock Collection and Stock Assessment*)
Objective 8: Determine if hatchery programs have caused changes in phenotypic characteristics of the natural populations.	• Size (length), gender, and total/salt age of broodstock (*Broodstock Collection and Stock Assessment*) • Assess age of fish (*Broodstock Collection and Stock Assessment*) • Length, weight, and age (covariate) of hatchery and natural-origin broodstock after eggs have been removed (*Broodstock Collection and Stock Assessment*) • Number and weight of eggs (*Broodstock Collection and Stock Assessment*)
Objective 9: Determine if hatchery fish were released at the programmed size and number.	• Fork length and weights of random samples of hatchery juveniles at release (*Release Monitoring*) • Monthly individual lengths and weights of random samples of hatchery juveniles (*In-Hatchery Monitoring*) • Numbers of smolts released from the hatchery (*Release Monitoring*)

2.1 Broodstock Collection and Stock Assessment

Broodstock collection and stock assessment for Wenatchee summer steelhead, Wenatchee summer Chinook, Methow spring Chinook, Chelan Falls summer Chinook, and Chiwawa River spring Chinook, hatchery programs will, in most instances, occur concurrent to and consistent with the Broodstock Collection Protocol approved annually by the HCP-HC and relevant permits. Data collection during broodstock collection will be consistent with Murdoch and Peven (2005). A representative sample of fish trapped throughout the entire run, either collected for broodstock or released back to the river, will be sampled for origin, age, sex, size, and migration timing. Biological sampling of all fish trapped will include presence of internal (CWT or PIT) and external (VIE) tags or marks, scales, length, and sex (determined by ultrasound). PIT tags will be injected into all target species (Chinook and steelhead), whether collected for broodstock or released back to the river to monitor for potential fallbacks. All non-target species will be enumerated daily. Measures of central tendency and spread will be calculated and reported for each metric.

2.2 In-Hatchery Monitoring

The in-hatchery monitoring component will begin when adult fish are collected and retained for broodstock and ends when juvenile fish are released. Life stage specific in-hatchery survival and growth rates, disease monitoring, and an estimate of the number of fish released will be collected and analyzed according to Murdoch and Peven (2005). Additional data to be collected includes individual lengths and weights of juveniles during monthly sampling, and the weight of gonadal mass and body of spawned broodstock. Measures of the central tendency and spread will be calculated and reported for each metric.

Fish Marking

All of Chelan PUD's hatchery fish will be coded-wire tagged (CWT) and externally marked or marked as otherwise agreed to by the HCP HC. A comprehensive marking strategy will be developed by the HCP-HC and included as an Addendum to this Plan. The identification of these hatchery-produced fish is needed for a suite of adult metrics and may be used for adult management and/or fisheries as contemplated by the co-managers.

Using methods described in Keller and Murauskas (2012), hatchery fish will be PIT-tagged (Table 3) at Eastbank Hatchery approximately two to four weeks before the fish are transferred to acclimation ponds. Additional PIT-tagging may occur for program specific studies/comparisons as approved by the HCP-HC. The data collected from the PIT-tags will assist in release monitoring, migration timing, juvenile survival, and smolt-to-adult survival. For all fish marking, quality control check will be performed during and immediately following tagging and prior to release.

Table 3. Chelan PUD's hatchery program release goals and recommended number of fish PIT tagged.

Program	Release goals	Number of fish PIT tagged[1]	PIT tag rate (%)
Chiwawa spring Chinook	144,026	10,000[2]	3.5
Wenatchee steelhead	247,300	15,000	6.0
Wenatchee summer Chinook	318,816 (CPUD Program) 181,184 (GPUD Program)	20,600[2]	4.1
Methow spring Chinook	60,516	15,000	24.7
Chelan Falls summer Chinook	576,000	10,000	1.7

[1] Additional PIT tagging may take place for Chelan PUD approved studies and/or comparisons.

[2] Includes a component of PIT-tagged fish for the NOAA size target study and a component for Grant PUD's program.

2.3 Release Monitoring

Hatchery fish will be released during smoltification in the spring, typically between 15 April and 1 June. Whenever possible, the exact release dates will coincide with environmental conditions that promote a rapid emigration that minimizes both the potential negative ecological interactions of hatchery fish with naturally produced fish and predation on hatchery fish by avian or other predators. The default release method will incorporate a volitional approach, as approved by the HCP HC, unless it can be demonstrated other approaches are better. The monitoring data collected for each stock are described below.

Chiwawa and Methow Spring Chinook

Pre-release sampling data will be conducted consistent with Murdoch and Peven (2005), including individual weights to the nearest 0.1 gram. Data collected will support monitoring questions 9.1, 9.2, 9.3 and 9.4 in the updated monitoring and evaluation plan (Hillman et al. 2013). PIT tag monitoring of spring Chinook released in the Chiwawa River will occur during the release period (April). Juvenile Chinook will pass through two 92-cm diameter PIT-tag antennas connected to Allflex 310 readers and Quantitative Sampling Technologies (QST) QuBE data logger. The release location and type (i.e., volitional, forced, or trucked) are recorded for each observation file created and uploaded to the PTAGIS database maintained by the Pacific States Marine Fisheries Commission after each year of release. PIT-tagged fish in each observation (release) file are assumed to represent untagged fish. Observation files contain the PIT tags associated with the original tag files and will be used for analysis (see Post-release Monitoring Section). The total number of fish released will be based on the population size at CWT tagging (100%), subtracting mortality enumerated by hatchery staff that occurred from tagging to release.

Wenatchee Summer Steelhead–

Pre-release sampling will be conducted consistent with Murdoch and Peven (2005), including individual weights to the nearest 0.1 gram. Data collected will support monitoring questions 9.1, 9.2, 9.3 and 9.4 in the updated monitoring and evaluation plan. Monitoring of steelhead released in the Wenatchee River sub-basin will occur during loading of fish into transport trucks, unless fish are released directly into the Chiwawa River. Steelhead will pass through a series of PIT-tag antennas, each connected to a data logger, thereby allowing the creation of a PIT-tag observation file for each truckload of steelhead consisting of unique tag records. The release location (stream and rkm), release type (volitional or forced), and hatchery group (HxH or WxW) will be recorded for each tag file created. PIT-tagged fish in each observation (release) file are assumed to represent untagged fish. However, because PIT-detection efficiency during loading will not be 100%, the number of fish in each truckload will be estimated using volumetric displacement. Observation files contain the PIT tags associated with the original tag files and will be used for analysis (see Post-release Monitoring Section). The total number of fish released will be based on the population size at CWT tagging (100%), subtracting mortality enumerated by hatchery staff that occurred from tagging to release.

Wenatchee and Chelan Falls Summer Chinook

Pre-release sampling will be conducted consistent with Murdoch and Peven (2005), including individual weights to the nearest 0.1 gram. Data collected will support monitoring questions 9.1, 9.2, 9.3 and 9.4 in the updated monitoring and evaluation plan. Should PIT tagging occur, a monitored release strategy consistent with other Chinook stocks (i.e., Chiwawa Spring Chinook) will be implemented. The total number of fish released will be based on the population size at CWT tagging (100%), subtracting mortality enumerated by hatchery staff that occurred from tagging to release.

2.4 Post-Release Monitoring and Survival Analysis

Data will be collected during rearing, acclimation, release, and the emigration period that may prove valuable in explaining variability in adult survival (Murdoch and Peven 2005). Rearing densities have been reported to influence the survival of hatchery fish (Martin and Wertheimer 1989; Banks 1994) and may also be linked to disease prevalence during rearing (Banks 1994; Ogut and Reno 2004). Acclimation of hatchery fish before release has been found to increase survival and reduce stray rates when the duration of the acclimation period is sufficient (Clarke et al. 2010, 2012; Rosenberger et al. 2013). These metrics (i.e., rearing density and acclimation period) will be collected annually to determine their influence on fish survival.

PIT-tagged groups of hatchery fish will be used to estimate survival during their emigration. Variation in survival during the emigration period may also inform observed adult survival rates. Survival during emigration and travel will be estimated using interrogation or release files and the standard Cormack-Jolly-Seber (CJS) estimator. CJS estimates are termed apparent survival estimates because it is unknown whether fish suffered mortality (e.g., size or time of release) or simply failed to emigrate (i.e., residualized or were precocial males). In the latter case, the proportion of PIT-tagged fish detected in the Methow sub-basin, Wenatchee or Columbia rivers after the emigration period is complete may explain variation in smolt survival rates. The post-release performance of PIT-tag groups will be estimated and monitored annually, consistent with methods in Murdoch and Peven (2005). Additionally, precocity of hatchery releases will be evaluated by examining the proportion of PIT tag releases detected in adult fish ladders and tributaries within the same year as release.

3. JUVENILE MONITORING

Data collected during these elements primarily support monitoring questions 2.1.1 and 2.2.1. and the monitoring objectives described in Table 4 (Hillman et al. 2013). Table 4 below provides a summary of the variables to be measured in 2015 under the juvenile monitoring component and what objective the measure supports. The text that follows in this section further describes the activities.

Table 4. Monitoring and Evaluation Plan (Hillman et al. 2013) objectives and the associated measured variables for the juvenile monitoring component.

Objective	Measured Variables *(Applicable Study Component(s))*
Objective 2: Determine if the proportion of hatchery fish on the spawning grounds affects the freshwater productivity of supplemented stocks.	• Number of juveniles (smolts, parr [where appropriate], and emigrants) (*Freshwater Productivity of Supplemented Stocks*)

3.1 Freshwater productivity of Supplemented Stocks

Steelhead, Spring Chinook, and Summer Chinook

The freshwater productivity of supplemented stocks in the Wenatchee sub-basin will be monitored using smolt traps in the Chiwawa River and the lower Wenatchee River consistent with historical trapping efforts. Additionally, a newly derived analytical method which uses PIT-tag mark-recapture data will be utilized that reduces bias and increases precision by including estimates of emigration during the winter non-trapping periods. Up to 3,000 parr will be PIT tagged in the Chiwawa River in the fall, based on the spatial distribution and abundance estimated during parr snorkel surveys, to generate estimates of migration during the non-trapping periods. A random sample of a minimum of 10 percent of fish per remote site will be held in a live box for 24 hours to evaluate tag loss and delayed mortality. Using PIT tagged parr detections at the lower Chiwawa PIT array during the non-trapping period, the total number of PIT-tagged parr that emigrated will be estimated, and then expanded by the tag rate. Overwinter mortality of PIT-tagged parr is assumed to be the same as non-PIT-tagged parr. Overwinter survival estimates of Chiwawa River parr will be derived by estimating survival to the lower Wenatchee PIT tag array and analyses with the TribPit Survival software program and/or estimating survival of fall parr and spring smolts to McNary. PIT-tag mark-recapture trials conducted during the trapping period in the fall will also be used to estimate detection probabilities of the PIT-tag array at a given discharge level. Abundance and variance will be estimated using the same methods as those used in the smolt trap estimate. The estimated abundance and variance from each method and time period (trapping and non-trapping periods) will be summed to estimate a total production estimate.   Under the proposed methodology, unbiased estimates of abundance during the entire migration period will be generated with relatively high precision (PSE < 15%), which is consistent with NOAA Fisheries' recommendations (Crawford and Rumsey 2011). Historical estimates will be revised using the new estimation techniques.

Specific actions to monitor the freshwater productivity of supplemented spring Chinook salmon in the Methow sub-basin have yet to be determined. As these become available, the plan will be amended and presented to the HC by December.

3.2 Tributary Evaluations

Chiwawa River

Snorkel surveys will be utilized to estimate summer parr abundance within the Chiwawa subwatershed. . This approach has been used in the Chiwawa subwatershedsince 1992. In parallel to addressing Objective 2, additional juvenile data can help to assess the habitat carrying capacity in each tributary. This information can add value to the overall M&E plans and help inform management decisions.

Sampling will follow a stratified random sampling design. Landscape classification will be used to stratify streams in the Chiwawa subwatershed that support juvenile Chinook salmon. In the Chiwawa subwatershed, WDFW found that classification "explained" most of the variability in fish numbers caused by geology, land type, valley bottom type, stream state condition, and habitat type (Hillman 2013). The same classification method was used to identify sections of the Little Wenatchee River (reference area) that corresponded to discrete reaches in the supplemented subwatersheds, but that had no release of hatchery Chinook. Consistent with previous efforts, habitat types within each land-class or reach will be identified and quantified annually. At least three units of each habitat type within each reach will be randomly selected for estimating densities of salmon and trout. Thus, overall sampling consists of a stratified-random sampling design, which increases the accuracy and precision of population estimates.

Densities of salmon and trout will be estimated in August and September by direct underwater observation within the randomly-selected habitat units. Underwater methods will follow those described by Thurow (1994), Dolloff et al. (1996), and O'Neal (2007). Habitat surface areas and volumes will be estimated during fish sampling. Numbers of fish counted will be adjusted for detection probabilities using the models published in Hillman et al. (1992). For each habitat type within a state type and reach stratum, the mean density of salmon and trout will be calculated as the ratio of mean numbers to mean area or volume sampled (Cochran 1977). Total numbers of fish will be estimated per habitat type within a state type and reach stratum as the product of mean density of fish in a given habitat type, times total area or volume of that habitat type within the stratum (Cochran 1977). Total numbers of fish within the supplemented subwatershed will be estimated as the sum of all population numbers per habitat type in state type/reach strata. Bootstrapping methods will be utilized to estimate variance and percent errors (based on 95% confidence interval) for total numbers of fish.

4. Adult Monitoring

The adult monitoring component is comprised of two basic elements: (1) estimating spawning escapement and (2) harvest monitoring. Data collected during these elements primarily support monitoring questions 1.1.1, 1.2.1, 2.1.1, 2.2.1, 3.2.1, 3.2.2, 4.1.1, 5.1.1, 5.2.1, 5.3.1, 5.3.2, 6.3.1, but also contribute data to monitoring questions 6.1.1, 6.2.1, 8.1.1, 8.2.1, 8.4.1, 10.1.1, 10.1.2, 10.1.3 and 10.1.4. Table 5 below provides a summary of the variables to be measured in 2015 under the adult monitoring component and what objective the measure(s) supports. The text that follows in this section further describes the activities.

Table 5. Monitoring and Evaluation Plan (Hillman et al. 2013) objectives and the associated measured variables for the adult monitoring component.

Objective	**Measured Variables** *(Applicable Study Component(s))*
Objective 1: Determine if conservation programs have increased the number of naturally spawning and naturally produced adults of the target population and if the program has reduced the natural replacement rate (NRR) of the supplemented population.	• Number of hatchery and naturally produced fish on spawning grounds *(Spawning Escapement Estimates)* • Number of hatchery and naturally produced fish taken for broodstock (*Broodstock Collection and Stock Assessment*) • Number of hatchery and naturally produced fish taken in harvest (if recruitment is to the Columbia) *(Harvest Reporting)*
Objective 2: Determine if the proportion of hatchery fish on the spawning grounds affects the freshwater productivity of supplemented stocks.	• Number of hatchery and naturally produced fish on the spawning grounds (*Spawning Escapement Estimates*) • Number of redds *(Spawning Escapement Estimates)*
Objective 3: Determine if the hatchery adult-to-adult survival (i.e., hatchery replacement rate, HRR) is greater than the natural adult-to-adult survival (i.e., natural replacement rate, NRR) and the target hatchery survival rate.	• Number of hatchery and naturally produced fish on spawning grounds *(Spawning Escapement Estimates)* • Number of hatchery and naturally produced fish harvested *(Harvest Reporting)*
Objective 4: Determine if the proportion of hatchery-origin spawners (pHOS or PNI) is meeting management target.	• Number of hatchery and naturally produced fish on spawning grounds *(Spawning Escapement Estimates)*
Objective 5: Determine if the run timing, spawn timing, and spawning distribution of the hatchery component is similar to the natural component of the target population or is meeting program-specific objectives.	• Time (Julian date) of hatchery and naturally produced salmon carcasses or marked steelhead detected on spawning grounds within defined reaches *(Spawning Escapement Estimates)* • Time (Julian date) of arrival at mainstem projects

Objective	Measured Variables *(Applicable Study Component(s))*
	and within tributaries (e.g., traps, PIT arrays) with the intent to identify biologically significant differences *(Spawning Escapement Estimates)* • Location (GPS coordinates) of female salmon carcasses observed on spawning grounds *(Spawning Escapement Estimates)*
<u>Objective 6:</u> Determine if stray rate of hatchery fish is below the acceptable levels to maintain genetic variation among stocks.	• Number of hatchery fish collected for broodstock (*Broodstock Collection and Stock Assessment*) • Number of hatchery fish taken in fishery (*Harvest Reporting*) • Locations of live and dead strays (used to tease out overshoot) *(Spawning Escapement Estimates)* • Number of hatchery carcasses (PIT-tagged and/or CWT) found in non-target and target spawning areas or number of returning spawners counted via PIT-tag detection or at weirs in close temporal proximity to spawning areas (stray data into the Entiat sub-basin will be obtained from USFWS Fisheries Resource Office-Leavenworth) *(Spawning Escapement Estimates)*
<u>Objective 8:</u> Determine if hatchery programs have caused changes in phenotypic characteristics of natural populations.	• Total and salt (ocean) age and gender of hatchery and naturally produced salmon carcasses collected on spawning grounds *(Spawning Escapement Estimates)* • Whenever possible, age at maturity and sex ratio will be measured at weirs or dams near the spawning stream to avoid the size-related carcass recovery bias on spawning grounds (carcass sampling or ultrasound on live fish) *(Spawning Escapement Estimates)* • Assess age of fish, including harvested fish *(Spawning Escapement Estimates and Harvest Reporting)*
<u>Objective 10:</u> Determine if appropriate harvest rates have been applied to conservation, safety-net, and segregated harvest programs to meet the HCP/SSSA goal of providing harvest opportunities while also contributing to population management and minimizing risk	• Numbers of hatchery fish taken in harvest *(Harvest Reporting)* • Numbers of natural-origin fish taken in harvest *(Harvest Reporting)*

Objective	Measured Variables *(Applicable Study Component(s))*
to natural populations.	

4.1 Spawning Escapement Estimates

Chelan Summer/Fall Chinook

Chinook spawning ground surveys will be conducted in the Chelan River and Methow sub-basin (see Appendix A for survey reaches). Spawning ground surveys will be conducted via foot or raft beginning late September and continuing until spawning has ended (usually mid-November). Frequency of surveys will vary depending on method.

Summer Chinook carcass surveys will be conducted in the Chelan Riverbeginning in September and ending in November consistent with methods described in Murdoch and Peven (2005). A representative sample (i.e., 20%) of spawners as determined by spawner abundance and distribution (typically 100% of the carcasses encountered in the Chelan River) will be sampled. Biological data will include collection of scale samples for age analysis, length measurements (POH and FKL), gender, egg voidance, and a check for tags or marks. DNA samples (five-hole punches from operculum) will be collected as needed to address different objectives. These data will be used to assess length-at-age, size-at-age, egg voidance, origin (hatchery or naturally produced), stray rates, and genetics. All carcass surveys will be conducted within the historical reaches.

Wenatchee Steelhead

The number of hatchery and naturally produced steelhead returning to the Wenatchee sub-basin will be estimated using a PIT tag mark recapture model. The estimated spawner abundance for the Wenatchee steelhead population will be a combination of PIT tag-based tributary and redd-based mainstem Wenatchee River estimates. Steelhead redd counts will be conducted weekly in all major spawning areas in the mainstem Wenatchee River (see Appendix A for survey reaches); minor spawning areas in the mainstem Wenatchee River will be surveyed once, based on the spawn timing in adjacent major spawning areas, to estimate redd abundance at peak spawning. The estimated total number of redds in the Wenatchee River mainstem will be expanded by the sex ratio of the population to estimate spawner abundance. Spawner abundance in tributaries of the Wenatchee River will be estimated using a PIT tag mark recapture model.

Chiwawa and Methow Spring Chinook

Chiwawa spring Chinook and Methow spring Chinook spawning escapement will be estimated based on the total number of redds found in each tributary (Murdoch et al. 2010) using methods described in Murdoch and Peven (2005). Weekly redd and carcass surveys will be conducted simultaneously from the first week of August through September (see Appendix A for survey reaches). Redd-based estimates assume that each female constructs one redd, which WDFW has found to be appropriate for this population (Murdoch et al. 2009). The total number of redds in each reach will be estimated using methods described in Millar et al. (2012) and using the observer efficiency model currently under development by WDFW. Redd counts will be expanded and the number of hatchery and naturally produced fish will be estimated using methods in Murdoch et al. (2010). Carcasses encountered during surveys will be sampled according to methods outlined in Murdoch and Peven (2005). All CWTs (i.e., snout or adipose) from carcasses will be sent to the WDFW lab in Olympia. The CWT lab will extract and read CWTs and submit all required information to RMIS within one year of collection. In addition, all redds and female carcasses will be geo-referenced using hand-held GPS devices. Carcass recovery bias has been detected in the Chiwawa spring Chinook population (Murdoch et al. 2010) and if not corrected will bias estimates of hatchery and naturally produced fish on the spawning grounds. While it may be appropriate to correct for carcass recovery bias for some monitoring questions (e.g., 2.2), when comparisons to reference populations are made in monitoring questions 1.1.and 1.2, carcass bias will not be corrected because other monitoring programs have not corrected for a similar bias.

Wenatchee Summer Chinook

Wenatchee summer Chinook spawning ground counts will begin the last week in September and continue through the end of spawning in November (see Appendix A for survey reaches). Total census redd counts will be conducted by foot or raft depending on stream size, flow, and density of spawners within the stream reach (see Appendix A for survey reaches). All stream reaches will be surveyed once per week. Redd data will be collected using methods described in Murdoch and Peven (2005). Salmon carcass data collected during spawning ground surveys will be consistent with Murdoch and Peven (2005). All CWTs (i.e., snout or adipose) from carcasses will be sent to the WDFW lab in Olympia. The CWT lab will extract and read CWTs and submit all required information to RMIS within one year of collection.

Redd Observer Efficiency and Fish per Redd Value

Estimating redd observer efficiency is a costly and laborious task. Models generated for spring Chinook salmon are not applicable for summer Chinook because of differences in river characteristics of spawning locations. Small unmanned air systems (e.g., four blade helicopter) have been used successfully to document the abundance and distribution of fall Chinook redds in the Snake River (P. Groves, Idaho Power, Pers. comm.). We intend to use this technology to determine the true number of summer Chinook redds in selected reaches of the Wenatchee River. Weekly aerial photos of selected reaches will be digitally overlaid to document existing and newly constructed redds. Weekly ground-based estimates and the true number of redds will be compared in order to determine observer efficiency. Weekly river characteristics (e.g., channel width, water depth, discharge, visibility, and habitat complexity), observer experience, and survey effort will be incorporated into a model to predict observer efficiency in all river reaches. Predicted redd observer efficiency for each river reach will be used to expand ground-based redd counts to estimate the total reach redd count. Aerial photographs and ground-based surveys will also be used to estimate redd life for each river reach. The estimated spawner abundance in the Wenatchee River and an associated level of precision will be calculated using the estimated total redd count for each reach, mean redd life, and the sex ratio of the population similar to methods described in Millar et al. (2012).

4.2 Harvest Reporting

In years when the expected hatchery adult returns are in excess of the levels needed to meet the hatchery program goals (i.e., broodstock and/or escapement), surplus fish may be available for harvest. Harvesting or removal of surplus hatchery fish may have benefits to the natural populations by reducing potential negative ecological and genetic impacts (e.g., density dependent effects, loss of fitness, and loss of genetic variation). The contribution of hatchery fish to fisheries will be monitored using CWT recoveries on a brood-year basis supporting Objective 10.

To obtain the necessary data to determine if the harvest rates are meeting objectives, a statistically valid creel program will be designed and implemented for all sport and/or conservation fisheries in the Upper Columbia River to estimate harvest of hatchery fish from both Chelan and Grant County PUD funded hatchery programs (Murdoch and Peven 2005). Information collected during creel surveys are an integral component to calculating the HRR (Objective 3), particularly given most CWT recoveries for PUD mitigation programs occur in the Upper Columbia River and its tributaries, with the exception of summer Chinook where most CWT recoveries occur in ocean fisheries. Because of considerable time lags in reporting of CWT's to the Regional Marking Information System (RMIS) database, it requires an ongoing query of recovery data until the number of estimated fish does not change.

5. Data Management , Analysis, and Reporting

5.1 Data Management

A Microsoft Access database maintained by WDFW will contain all the monitoring data collected for hatchery evaluations. The database will contain and manage all data associated with aquaculture monitoring, juvenile monitoring, and adult monitoring.

All data entered into the database are evaluated for quality control and quality assurance by WDFW. Quality control checks using analyses such as modified Z-scores, boxplots, and the Generalized Extreme Studentized Deviate Procedure (Iglewicz and Hoaglin 1993) will be conducted for all data entry. In the event outliers are identified, discussion will occur on whether identified outliers are true data points or transcription errors. This process ensures that the data used to test statistical hypotheses are correct and accurate.

5.2 Data Analysis

The analyses proposed are consistent with the Monitoring and Evaluation Plan for PUD Hatchery Programs: 2013 Update (Hillman et al. 2013). Each of the objectives will be addressed using the appropriate statistical tests, as well as graphic analyses that convey relevant information.

5.3 Reporting

An annual M&E report will be generated following the completion of each calendar year and will be available for HCP-HC review by June 1 of the following year. Additionally, monthly progress reports will be made available to the HCP-HC.

6. Lake Wenatchee Sockeye Salmon

The Chelan PUD is proposing to conduct monitoring and evaluation (M&E) activities to track key population attributes related to Lake Wenatchee sockeye salmon in 2015 (Table 6). In the absence of a sockeye hatchery program, M&E activities are no longer rooted in the context of evaluating the effects of sockeye salmon supplementation, but instead focus directly on the performance of the natural population, which is a unique departure from historic monitoring obligations. Broadly, the proposed M&E activities cover juvenile and adult life history stages and provide the data necessary to track or estimate viable salmonid population parameters (VSP): abundance, productivity, spatial structure and diversity (McElhaney et al. 2000). The data collected may also have utility in future hatchery compensation recalculation efforts.

Chelan PUD is conducting these M&E activities to support commitments made under the 2011 hatchery recalculation effort, which also included a steelhead production commitment for a sockeye species swap (SOA 2011). This section of the implementation plan describes the specific commitments by juvenile and adult life history stages.

6.1 Juvenile Monitoring

Chelan PUD will conduct or fund activities to monitor and evaluate the temporal distribution and age/size of out-migrating smolts, and estimate smolt production (Table 6). Smolt production will be estimated from data collected at the lower Wenatchee smolt trap and via back calculations based on collected adult return data (i.e., age-at-return estimates, SARs, and adult escapement to the tributaries). Collectively, these activities include: (1) funding of the lower Wenatchee River smolt trap concurrent with efforts aimed at evaluating Chelan PUD funded supplemented populations in the Wenatchee River sub-basin; (2) tagging up to 5,000 PIT tags for natural-origin juveniles encountered during smolt trapping activities and collecting scale samples at this location; and (3) estimating adult escapement estimates to the tributaries, and collection of adult return data at Tumwater (see the *Adult Monitoring* section for details) to back-calculate smolt production.

The monitoring data obtained will provide a useful set of tools for evaluating the performance of natural origin sockeye salmon within the sub-basin and downstream and also support the evaluation of VSP parameters [e.g., outmigration timing and size (diversity); and PIT tagging juveniles for SAR estimates (productivity)].

6.2 Adult Monitoring

Several M&E activities associated with adult returns of Lake Wenatchee sockeye salmon will be conducted and/or funded by Chelan PUD (Table 6). These efforts include (1) continuation of accurate adult counts at Rock Island, Rocky Reach, and Tumwater dams; (2) sampling of scales for age distribution, sex ratio determination, and returns of PIT-tagged adults at Tumwater Dam; (3) reach-specific conversion estimates between Rock Island Dam and spawning grounds in the White and Little Wenatchee rivers (i.e., Rock Island to Tumwater Dam to spawning tributaries); and (4) providing between 250 to 1,000 PIT tags to estimate adult spawning escapement in the Little Wenatchee and White rivers utilizing PIT tags and mark-recapture techniques (the software program Sample Size 2.0.7, developed by the University of Washington School of Aquatic and Fisheries Science (P. Westhagen, J. Lady, and J. Skalski) was used to determine the minimum number of tags required (i.e., 250) to estimate adult sockeye escapement at a +/- 7 percent confidence interval). Chelan PUD will adjust the number of PIT-tagged individuals in order to maintain precision in estimates at the lowest rate of interference to migrating populations, if it is warranted due to annual changes in escapement and detection probabilities. In an effort to PIT tag the run at large, adults will be PIT tagged at Tumwater consistent with the Tumwater Operations Protocol, daily throughout the run.

Collectively, these data will provide reliable metrics of adult returns and spawning escapement (abundance), recruits-per-spawner (productivity), distribution of spawners among tributaries (spatial structure), and run-timing and age structure for adult immigrants (diversity).

Table 6. Chelan PUD's proposed Lake Wenatchee sockeye salmon monitoring and evaluation activities.

Life History Stage	M&E Activity	Entity Performing the Activity	Related analysis	VSP parameter addressed
Juvenile	Concurrent operation of the lower Wenatchee smolt trap to collect juvenile outmigration data	WDFW	Generate distribution of outmigration timing, estimate smolt production and determine average smolt size.	Diversity and productivity
Juvenile	PIT tagging smolts at lower Wenatchee smolt trap (up to 5,000 fish annually) and collecting/aging scale samples	WDFW	Estimate smolt-to-adult returns.	Productivity
Juvenile	Develop adult return based smolt production estimates	WDFW	Use collected data (i.e., adult age-at-return data, SARs, adult escapement to the tributaries) to back-calculate smolt production.	Productivity
Adult	Rock Island and Rocky Reach Dam adult counts	CPUD	Initial spawner abundance (Okanogan stock separation)	Abundance and spatial structure
Adult	PIT tag subsample (250 adults) of returning adults at Tumwater Dam to support mark-recapture evaluation	WDFW	Calculate spawner abundance and relative distribution among ~~in~~ tributaries	Abundance and spatial structure
Adult	Collect and age scales[1] and determine sex via ultrasound from returning adults at Tumwater Dam	WDFW	Estimate age-at-return, sex ratio, and relative productivity of contributing spawner cohorts	Productivity and diversity
Adult	Tumwater Dam adult counts	WDFW	Estimate potential spawner abundance (pre Lake-Wenatchee harvest), potential productivity (recruits/spawner), and run timing distribution	Abundance and diversity
Adult	Operate PIT detection arrays on Little Wenatchee and White River	WDFW	Calculate spawner abundance (post-Lake Wenatchee harvest and other mortality), actual productivity (recruits/spawner), and entry-to-spawning-habitat timing distribution, and spatial spawner distribution among tributaries	Abundance, productivity, spatial structure, and diversity
All	Data management, analysis, and reporting	BioAnalysts CPUD	------	NA

[1] Scales would be collected concurrently from adults that are PIT tagged at Tumwater Dam.

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Appendix A

Designated survey reaches for Methow subbasin summer Chinook spawning ground surveys.

River	Reach	Code	RM
Methow	Mouth to Methow Bridge	M1	0.0-14.78
	Methow Bridge to Carlton Bridge	M2	14.78-27.17
	Carlton Bridge to Twisp Bridge	M3	27.17-39.55
	Twisp Bridge to MVID	M4	39.55-44.85
	MVID to Winthrop Bridge	M5	44.85-49.80
	Winthrop Bridge to Hatchery Dam	M6	49.80-51.55

Designated survey reaches for Wenatchee River basin summer Chinook spawning grounds surveys. Asterisks denotes reaches where redd observer efficiency will be assessed.

Reach Code	Reach Section	River Mile
W10	Lake Wenatchee to Bridge	54.20-53.58
	Bridge to Swamp *	53.58-52.66
	Swamp to Chiwawa River	52.66-48.39
W9	Chiwawa River to Schugart Flats	48.39-47.93
	Schugart Flats to Old Plain Bridge	47.93-46.21
	Old Plain Bridge to RR Bridge	46.21-41.91
	RR Bridge to RR Tunnel	41.91-39.28
	RR Tunnel to Swing Pool *	39.28-36.67
	Swing Pool to Tumwater Br	36.67-35.55
W8	Tumwater Br to Swiftwater Campground *	35.55-33.50
	Swiftwater Campground to Unimproved Campground	33.50-33.08
	Unimproved Campground to Tumwater Dam	33.08-30.91
W7	Tumwater Dam to Penstock Br	30.91-28.66
	Penstock Br to Icicle Road Br *	28.66-26.43
W6	Icicle Road Br to Icicle Mouth	26.43-25.61
	Icicle Mouth to Boat Takeout *	25.61-24.49
	Boat Takeout to Leavenworth Br	24.49-23.90
W5	Leavenworth Br to Irrigation Flume *	23.90-22.77
	Irrigation Flume to Peshastin Br	22.77-20.00
W4	Peshastin Br to Dryden Dam *	20.00-17.76
W3	Dryden Dam to Williams Canyon	17.76-15.54
	Williams Canyon to Upper Cashmere Br	15.54-10.22
	Upper Cashmere Br to Lower Cashmere Br	10.22-9.49
W2	Lower Cashmere Br to Old Monitor Br *	9.49-7.12
	Old Monitor Br to Sleepy Hollow Br	7.12-3.27
W1	Sleepy Hollow Br to River Bend *	3.27-1.73
	River Bend to Siphon	1.73-1.29
	Siphon to Mouth	1.29-0.45

Designated survey reaches for Wenatchee Basin spring Chinook spawning grounds surveys.

Reach Code	Reach Section	River Mile
Chiwawa River and Tributaries (Rock and Chikamin)		
C7	Buck Cr to Phelps Cr	36.39-33.46
C6	Phelps Cr (Trinity) to Maple Cr Br	33.46-29.64
C5	Maple Cr Br to Atkinson Flats	29.64-26.59
C4	Atkinson Flats to Schaefer Cr	26.59-24.24
C3	Schaefer Cr to Rock Cr Campground	24.24-22.97
R1 - Rock	Mouth to Chiwawa River Road Bridge	0.00-1.05
C2	Rock Cr Campground to Grouse Cr	22.97-12.27
K1 - Chikamin	Mouth to Chiwawa River Road Bridge	0.00-0.68
C1	Grouse Cr to Mouth	12.27-0.00
Nason Creek		
N4	White Pine Creek to Lower R.R. Bridge	16.09-13.68
N3	Lower R.R. Bridge to Hwy 2 Bridge	13.68-9.13
N2	Hwy 2 Bridge to Kahler Cr	9.13-4.46
N1	Kahler Cr to Mouth	4.46-0.00
White River and Tributaries (Panther and Napeaqua)		
H4	Falls to Grasshopper Meadows	21.16-19.78
T1 - Panther	Boulder field to Mouth	0.43-0.00
H3	Grasshopper Meadows to Napeaqua River	19.78-17.59
Q1 - Napeaqua	Take out to Mouth	0.91-0.00
H2	Napeequa River to Sears Cr Bridge	17.59-11.97
H1	Sears Cr Bridge to Mouth	11.97-0.00
Little Wenatchee River		
L3	Rainy Cr to Lost Cr	10.78-6.74
L2	Lost Cr to Old Fish Weir	6.74-2.13
L1	Old Fish Weir to Mouth	2.13-0.00
Upper Wenatchee River		
W10	Lake Wenatchee to Chiwawa River	54.20-48.39
Chiwaukum Creek		
U1	Metal bridge to Mouth	1.0 – 0.0
Icicle River		
I1	Hatchery to Mouth	3.02-0.00
Peshastin Creek and Tributaries (Ingalls Creek)		
D1 - Ingalls	Trailhead to mouth	0.64-0.00
P2	Ingalls Creek to Camas Cr	9.14-5.63
P1	Camas Cr to Mouth	5.63-0.00

Designated survey reaches for Wenatchee River basin steelhead spawning grounds surveys. Asterisks denote index reaches. Spawning escapements in tributaries will be estimates using PIT-tag arrays.

Reach Code	Reach Section	River Mile
W10	Lake Wenatchee to Chiwawa River*	54.20-48.39
W9	Chiwawa River to Tumwater Bridge*	48.39-35.55
W8	Tumwater Br to Swiftwater Campground	35.55-33.50
	Swiftwater Campground to Unimproved Campground*	33.50-33.08
	Unimproved Campground to Tumwater Dam	33.08-30.91
W7	Tumwater Dam to Icicle Road Bridge	30.91-26.43
W6	Icicle Road Br to Leavenworth boat ramp*	26.43-24.49
	Boat Takeout to Leavenworth Bridge	24.49-23.90
W5	Leavenworth Bridge to Peshastin Bridge	23.90-20.00
W4	Peshastin Bridge to Dryden Dam	20.00-17.76
W3	Dryden Dam to Lower Cashmere Bridge	17.76-9.49
W2	Lower Cashmere Bridge to Sleepy Hollow Bridge *	9.49-3.27
W1	Sleepy Hollow Bridge to Mouth	3.27-0.45

Tributary	River mile of PIT tag array
Mission Creek	0.54
Peshastin Creek	1.91
Chumstick Creek	0.31
Icicle River	0.26
Chiwaukum Creek	0.24
Chiwawa River	0.58
Nason Creek	0.52
Little Wenatchee River	1.74
White River	1.65

APPENDIX P
MONITORING AND EVALUATION OF THE CHELAN COUNTY PUD HATCHERY PROGRAMS – 2013

MONITORING AND EVALUATION OF THE CHELAN AND GRANT COUNTY PUDs HATCHERY PROGRAMS

2013 ANNUAL REPORT

June 1, 2014

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PREFACE

This annual report is the result of coordinated field efforts conducted by Washington Department of Fish and Wildlife (WDFW), the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation), Chelan County Public Utility District (Chelan PUD), and BioAnalysts, Inc. An extensive amount of work was conducted in 2006 through 2013 to collect the data needed to monitor the effects of the Chelan and Grant County PUD Hatchery Programs. This work was directed and coordinated by the Habitat Conservation Plan (HCP) Hatchery Committees, consisting of the following members: Bill Gale, U.S. Fish and Wildlife Service (USFWS); Rob Jones, Craig Busack, and Lynn Hatchery, National Marine Fisheries Service (NMFS); Joe Miller, Josh Murauskas, Catherine Willard, and Alene Underwood, Chelan County PUD; Tom Scribner and Keely Murdoch, the Yakama Nation; Mike Tonseth, WDFW; Kirk Truscott, Confederated Tribes of the Colville Reservation (Colville Tribes), and Mike Schiewe, Anchor QEA (Chair). This report also includes monitoring efforts funded by Grant County Public Utility District (Grant PUD). Grant PUD helps fund the spring and summer Chinook monitoring programs. Work funded by Grant PUD was directed and coordinated by the Priest Rapids Coordinating Committee (PRCC) Hatchery Sub-Committee, which consists of the same agency and tribal representatives listed for the HCP Hatchery Committee and replaces Chelan PUD representatives with Grant PUD representatives (Todd Pearsons and Shannon Lowry). Todd Pearsons, Peter Graf, and Shannon Lowry of Grant PUD provided extensive guidance and information.

The approach to monitoring the hatchery programs was guided by the updated monitoring and evaluation plan for PUD hatchery programs (Hillman et al. 2013). Technical aspects of the monitoring and evaluation program were developed by the Hatchery Evaluation Technical Team (HETT), which consisted of the following scientists: Carmen Andonaegui, WDFW; Matt Cooper, USFWS; Steve Hays, Chelan PUD; Tracy Hillman, BioAnalysts; Tom Kahler, Douglas PUD; Russell Langshaw, Grant PUD; Greg Mackey, Douglas PUD; Joe Miller, Anchor QEA; Josh Murauskas, Anchor QEA; Andrew Murdoch, WDFW; Keely Murdoch, Yakama Nation; Todd Pearsons, Grant PUD; and Mike Tonseth, WDFW. The updated plan also directs the analyses of hypotheses developed by the HETT. Most of the analyses outlined in the updated plan will be conducted in the five-year comprehensive reports.

Most of the work reported in this paper was funded by Chelan and Grant PUDs. Bonneville Power Administration purchased the Passive Integrated Transponder (PIT) tags that were used to mark juvenile Chinook and steelhead captured in tributaries. This is the eighth annual report written under the direction of the HCP.

"I often say that when you can measure something and express it in numbers, you know something about it. When you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind. It may be the beginning of knowledge, but you have scarcely in your thoughts advanced to the stage of science, whatever it may be."

Lord Kelvin

SECTION 1: INTRODUCTION

Chelan and Grant PUDs implement hatchery programs as part of their respective agreements related to the operation of Rocky Reach, Rock Island, Wanapum, and Priest Rapids Hydroelectric Projects. The fish resource management agencies developed the following general goal statements for the hatchery programs, which were adopted by the HCP Hatchery Committees and PRCC Hatchery Sub-Committee (hereafter, Hatchery Committees):

1. *Support the recovery of ESA-listed species by increasing the abundance of the natural adult population, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity.*

   Includes the Wenatchee spring Chinook, Wenatchee summer steelhead, and Methow spring Chinook programs.

2. *Increase the abundance of the natural adult population of unlisted plan species, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity. In addition, provide harvest opportunities in years when spawning escapement is sufficient to support harvest.*

   Includes the Wenatchee sockeye, Wenatchee summer/fall Chinook, Methow summer/fall Chinook, Okanogan summer/fall Chinook, and Okanogan sockeye programs.

3. *Provide salmon for harvest and increase harvest opportunities, while segregating returning adults from natural tributary spawning populations.*

   Includes the Chelan Falls summer Chinook program.

Following the development of the Hatchery and Genetic Management Plans (HGMPs), artificial propagation programs are now characterized into three categories. The first type, integrated conservation programs, are intended to support or restore natural populations. These programs focus on increasing the natural production of targeted fish populations. A fundamental assumption of this strategy is that hatchery fish returning to the spawning grounds are reproductively similar to naturally produced fish. The second type, safety-net programs, are extensions of conservation programs, but are intended to function as reserve capacity for conservation programs in years of low returns. The safety-net provides a demographic and genetic reserve for the natural population. That is, in years of abundant returns, they function like segregated programs, and in low return years, they can be managed as conservation programs. Lastly, harvest augmentation programs are intended to increase harvest opportunities while limiting interactions with wild-origin counterparts.

Monitoring is needed to determine if the hatchery programs are meeting the intended management objectives of conservation, safety-net, or harvest augmentation programs. Objectives for hatchery programs are generally grouped into three categories of performance indicators:

1. In-Hatchery Indicators: Are the programs meeting the hatchery production objectives?

2. In-Nature Indicators: How do hatchery fish from the programs perform after release?

a. Conservation Programs:
   - How do the programs affect target population abundance and productivity?
   - How do the programs affect target population long-term fitness?

b. Safety-Net Programs:
   - How do the programs affect target population long-term fitness?

c. Harvest Augmentation Programs:
   - Do the programs provide harvest opportunities?

3. Risk Assessment Indicators: Do the programs pose risks to other populations?

The specific objectives identified in the updated monitoring and evaluation plan are as follows:

1. *Determine if conservation programs have increased the number of naturally spawning and naturally produced adults of the target population and if the program has reduced the natural replacement rate (NRR) of the supplemented population.*
2. *Determine if the proportion of hatchery fish on the spawning grounds affects the freshwater productivity of supplemented stocks.*
3. *Determine if the hatchery adult-to-adult survival (i.e., hatchery replacement rate, HRR) is greater than the natural adult-to-adult survival (i.e., natural replacement rate, NRR) and the target hatchery survival rate.*
4. *Determine if the proportion of hatchery-origin spawners (pHOS or PNI) is meeting management target.*
5. *Determine if the run timing, spawn timing, and spawning distribution of both the hatchery component is similar to the natural component of the target population or is meeting program-specific objectives.*
6. *Determine if stray rate of hatchery fish is below the acceptable levels to maintain genetic variation among stocks.*
7. *Determine if genetic diversity, population structure, and effective population size have changed in natural spawning populations as a result of the hatchery program.*
8. *Determine if hatchery programs have caused changes in phenotypic characteristics of natural populations.*
9. *Determine if hatchery fish were released at the programmed size and number.*
10. *Determine if appropriate harvest rates have been applied to conservation, safety-net, and segregated harvest programs to meet the HCP/SSSA goal of providing harvest opportunities while also contributing to population management and minimizing risk to natural populations*

Two additional objectives that were not explicit in the goals specified above but were included in the updated monitoring and evaluation plan because they relate to goals and concerns of all artificial production programs include:

11. *Determine if the incidence of disease has increased in the natural and hatchery populations.*
12. *Determine if the release of hatchery fish affects non-target taxa of concern (NTTOC) within acceptable limits.*

Objectives in the updated plan have been organized in an hierarchy where productivity indicators are the primary metrics used to assess if conservation and safety-net program goals have been met; harvest rates and effects on non-targeted populations are used for harvest programs. In cases where productivity indicators are not available, or results are equivocal, monitoring indicators may be used to help evaluate the performance of the program. Evaluations of monitoring indicators may not provide sufficiently powerful conclusions on which to base management actions; although they may provide insight as to why a productivity indicator did or did not meet the program goal. Therefore, the relationship between hatchery programs and indicators can be viewed in a chain-of-causation: management actions within the hatchery programs affect the status of monitoring indicators, which in turn influence productivity indicators (Figure 1.1).

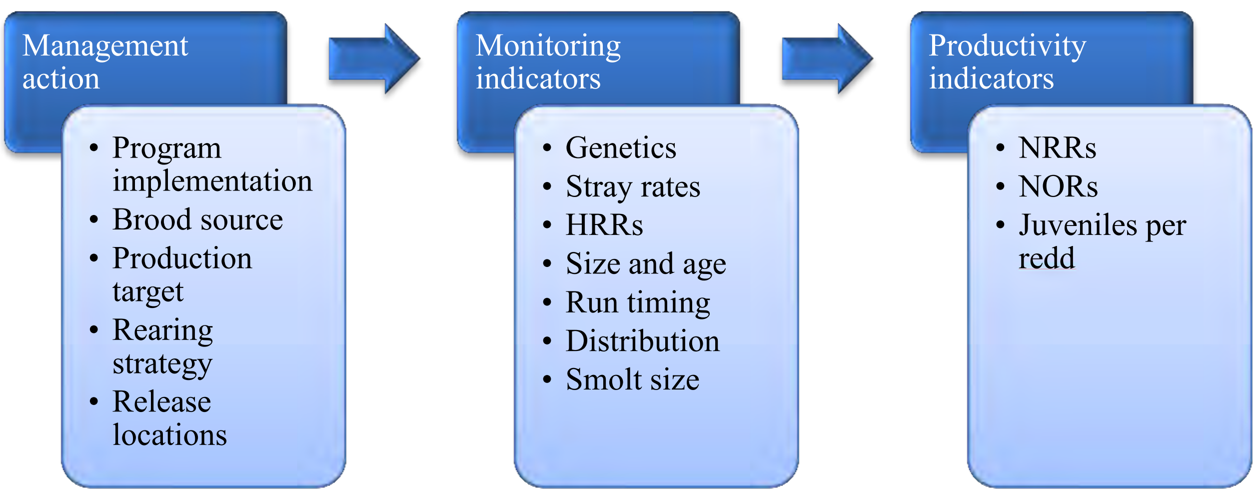


Figure 1.1. Relationship of indicators to the assessment of propagation programs. Management actions affect monitoring indicators, which influence productivity indicators. Monitoring indicators may be used to hypothesize the magnitude of influence on productivity.

Attending each objective is one or more testable hypotheses (see Hillman et al. 2013). Each hypothesis will be tested statistically following the routines identified in the updated monitoring and evaluation plan. Most of these analytical routines will be conducted at the end of five-year monitoring blocks, as outlined in the updated plan.

Both monitoring and productivity indicators will be used to evaluate the success of the hatchery programs. In the event that the statistical power of tests that involve productivity indicators is insufficient to inform sound management decisions, some of the monitoring indicators may be used to guide management. Figure 1.2 shows the categories of indicators associated with each component of monitoring.

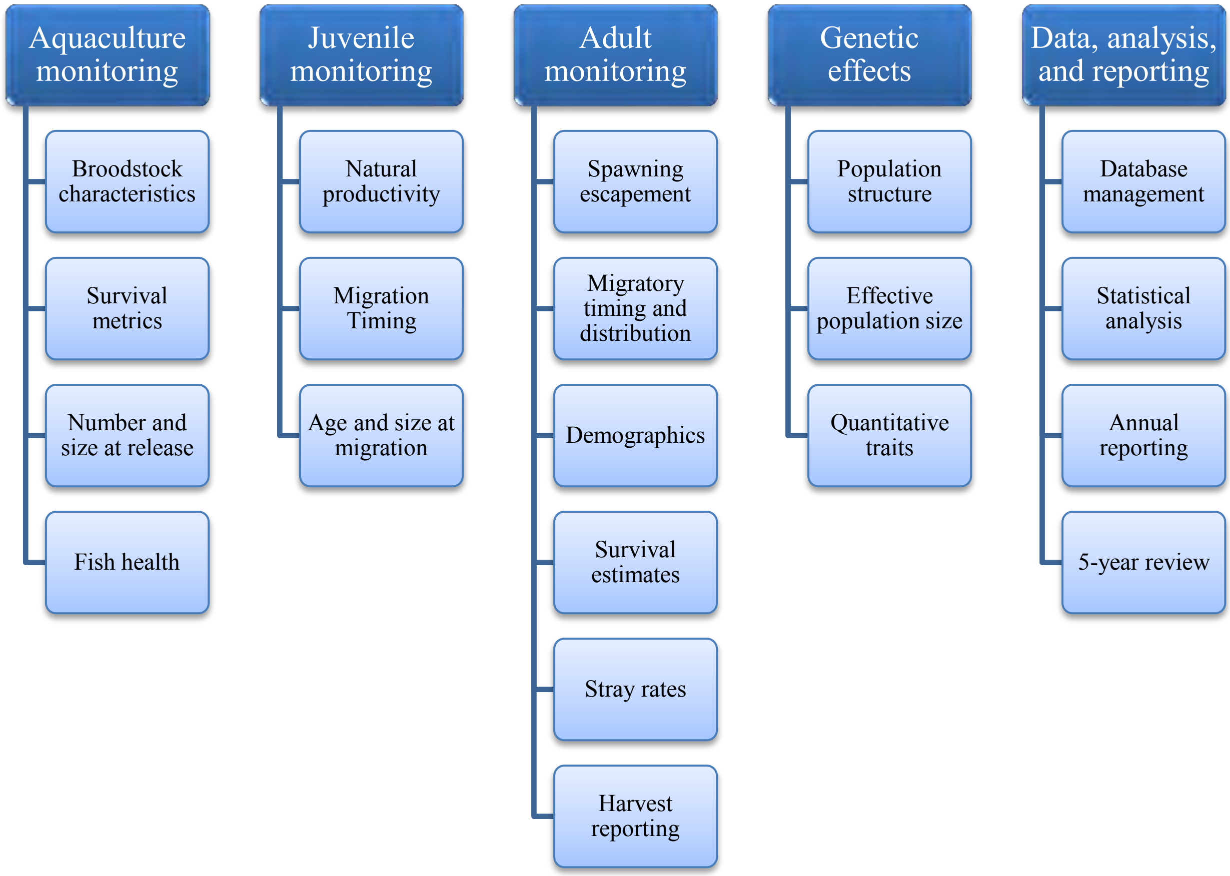


Figure 1.2. Overview of monitoring and evaluation plan categories and components (not including regional objectives).

Throughout each five-year monitoring period, annual reports will be generated that describe the monitoring and evaluation data collected during a specific year. This is the eighth annual report developed under the direction of the Hatchery Committees. The purpose of this report is to describe monitoring activities conducted in 2013. Activities included broodstock collection, collection of life-history information, within hatchery spawning and rearing activities, juvenile monitoring within streams, and redd and carcass surveys. Data from reference areas are not included in this annual report (reference data are in the five-year reports). To the extent currently possible, we have included information collected before 2013.

This report is divided into several sections, each representing a different species or stock (i.e., steelhead, sockeye salmon, spring Chinook, and summer Chinook). For all species we provide broodstock information; hatchery rearing history, release data, and survival estimates; disease information; juvenile migration and productivity estimates; redd counts, distribution, and spawn timing; spawning escapements; and life-history characteristics. For salmon species, we also provide information on carcasses. Beginning in 2013, we added a separate section on Nason Creek spring Chinook. Grant PUD will produce a separate report that describes results of the White River Captive Broodstock program. We retained the Okanogan summer Chinook section even though the Colville Tribes are monitoring summer Chinook there. The Okanogan summer Chinook section includes monitoring information up to 2013. Monitoring results for 2013 and beyond can be found in annual reports prepared by the Colville Tribes to Bonneville Power Administration (BPA).

Finally, we end each section by addressing compliance issues with ESA/HCP mandates. For each Hatchery Program, WDFW and the PUDs are authorized annual take of ESA-listed spring Chinook and steelhead through Section 10 of the Endangered Species Act (ESA), including:

1. ESA Section 10(a)(1)(A) Permit No. 1395, which authorizes the annual take of adult and juvenile endangered upper Columbia River (UCR) spring Chinook and endangered UCR steelhead associated with implementing artificial propagation programs for the enhancement of UCR steelhead. The authorization includes takes associated with adult broodstock collection, hatchery operations, juvenile fish releases, monitoring and evaluation activities, and management of adult returns related to UCR steelhead artificial propagation programs in the UCR region (NMFS 2003a).
2. ESA Section 10(a)(1)(A) Permit No. 18121, which authorizes the annual take of adult and juvenile endangered UCR spring Chinook and endangered UCR steelhead associated with implementing artificial propagation programs in the Chiwawa River for the enhancement of UCR spring Chinook. The authorization includes takes associated with adult broodstock collection, hatchery operations, juvenile fish releases, and monitoring and evaluation activities supporting UCR spring Chinook artificial propagation programs in the UCR region (NMFS 2004).
3. ESA Section 10(a)(1)(A) Permit No. 18118, which authorizes the annual take of adult and juvenile endangered UCR spring Chinook and endangered UCR steelhead associated with implementing artificial propagation programs in Nason Creek for the enhancement of UCR spring Chinook. The authorization includes takes associated with adult broodstock collection, hatchery operations, juvenile fish releases, and monitoring and evaluation activities supporting UCR spring Chinook artificial propagation programs in the UCR region (NMFS 2004).
4. ESA Section 10(a)(1)(A) Permit No. 18120, which authorizes the annual take of adult and juvenile endangered UCR spring Chinook and endangered UCR steelhead associated with implementing artificial propagation programs in the White River for the enhancement of UCR spring Chinook. The authorization includes takes associated with adult broodstock collection, hatchery operations, juvenile fish releases, and monitoring and evaluation activities supporting UCR spring Chinook artificial propagation programs in the UCR region (NMFS 2004).
5. ESA Section 10(a)(1)(A) Permit No. 1347, which authorizes the annual incidental take of adult and juvenile endangered UCR spring Chinook and endangered UCR steelhead through actions associated with implementing artificial propagation programs for the enhancement of non-listed anadromous fish populations in the UCR. The authorization includes incidental takes associated with adult broodstock collection, hatchery operations, juvenile fish releases, and monitoring and evaluation activities associated with non-listed summer Chinook, fall Chinook, and sockeye salmon artificial propagation programs in the UCR region (NMFS 2003b).

SECTION 2: SUMMARY OF METHODS

Sampling in 2013 followed the methods and protocols described in Murdoch and Peven (2005). In this section we only briefly review the methods and protocols. More detailed information can be found in Murdoch and Peven (2005) and the updated monitoring and evaluation plan (Hillman et al. 2013).

2.1 Broodstock Collection and Sampling

Methods for collecting broodstock are described in the Annual Broodstock Collection Protocols (Appendix A in WDFW 2011). Methods for sampling broodstock are described in Appendices A and B in Murdoch and Peven (2005). Generally, broodstock were collected over the migration period (to the extent allowed in ESA-permit provisions) in proportion to their temporal occurrence at collection sites, with in-season adjustments dictated by 2013 run timing and trapping success relative to achieving weekly and annual collection objectives. Pre-season weekly collection objectives are shown in Table 2.1 and assumptions associated with broodstock trapping are provided in Table 2.2.

Table 2.1. Weekly collection objectives for steelhead and Chinook in 2013. No sockeye were collected in 2013.

Collection week beginning day	Chiwawa/Nason Spring Chinook[a]		Wild Wenatchee Summer Chinook	Wild ME/OK Summer Chinook	Wenatchee Steelhead	
	Hatchery	Wild			Hatchery	Wild
2 June						
9 June						
16 June						
23 June	5	5				
30 June	10	10	110	18	1	1
7 Jul	16	16	18	16	1	1
14 Jul	14	14	12	16	2	2
21 Jul	11	11	22	12	2	2
28 Jul	9	9	24	10	3	2
4 Aug	12	12	20	10	3	4
11 Aug	9	9	22	8	3	2
18 Aug			18	6	3	4
25 Aug			10	6	4	4
1 Sep					4	4
8 Sep					4	4
15 Sep					6	6
22 Sep					10	8
29 Sep					10	10
6 Oct					4	4
13 Oct					4	4
20 Oct					2	2
Total	**86**	**86**	**256**	**102**	**66**	**64**

[a] Collection quota based on 1999-2012 average cumulative Tumwater Dam spring Chinook passage (WDFW unpublished data) and pre-season broodstock collection objectives.

Table 2.2. Biological and trapping assumptions associated with collecting broodstock for the Chelan and Grant PUD Hatchery Programs.

Assumptions	Wenatchee Steelhead	Chiwawa Spring Chinook	Nason Spring Chinook	Wenatchee Summer Chinook	ME/OK Summer Chinook
Production level	247,300 yearling smolts	144,026 yearling smolts	125,000 yearling smolts	500,001 yearling smolts	200,000 yearling smolts
Broodstock required	130 adults (not to exceed 33% of population)	74 adults (not to exceed 33% of population)	66 adults (not to exceed 33% of population)	256 adults (not to exceed 33% of the population)	102 adults (not to exceed 33% of the population)
Trapping period	30 June – 26 Oct	23 June – 17 Aug	23 June – 17 Aug	1 Jul – 15 Sep	1 Jul – 15 Sep
# days/week	5	5	5	7	3
# hours/day	24	24	24	24	16
Broodstock composition	50% wild; 50% WxW	Sliding scale; minimum 33% wild (depends on the number of wild fish)	100% wild	100% wild	100% wild
Trapping site	Dryden Dam (Tumwater will be used if weekly quota not achieved at Dryden Dam)	Tumwater Dam	Tumwater Dam	Dryden Dam (Tumwater will be used if weekly quota not achieved at Dryden Dam)	Wells Dam east or west ladder

Several biological parameters were measured during broodstock collection at adult collection sites. Those parameters included the date and start and stop time of trapping; number of each species collected for broodstock; origin, size, and sex of trapped fish; age from scale analysis; and pre-spawn mortality. For each species, trap efficiency, extraction rate, and trap operation effectiveness were estimated following procedures in Appendix B in Murdoch and Peven (2006). In addition, a representative sample of most species trapped but not taken for broodstock were sampled for origin, sex, age, and size (stock assessment). All steelhead trapped were sampled.

2.2 Within Hatchery Monitoring

Methods for monitoring hatchery activities are described in Appendix C in Murdoch and Peven (2005). Biological information collected from all spawned adult fish included age at maturity, length at maturity, spawn timing, and fecundity of females. In addition, all fish were checked for tags and females were sampled for disease.

Throughout the rearing period in the hatchery, fish were sampled for growth, health, and survival. Each month, lengths and weights were collected from a sample of fish and rearing density indices were calculated. In addition, fish were examined monthly for health problems following standard fish health monitoring practices for hatcheries. Various life-stage survivals were estimated for each hatchery stock. These estimates were then compared to the "standard" survival rates identified in Table 2.3 to provide insight as to how well the hatchery operations were performing. Failure to achieve a survival standard could indicate a problem with some part of the hatchery program. However, failure to meet a standard may not be indicative of the overall success of the program to meet the goals identified in Section 1.

Table 2.3. Standard life-stage survival rates for fish reared within the Chelan PUD hatchery programs (from Appendix C in Murdoch and Peven 2005).

Life stage	Standard survival rate (%)
Collection-to-spawning (females)	90
Collection-to-spawning (males)	85
Unfertilized egg-to-eyed	92
Unfertilized egg-to-ponding	98
30 d after ponding	97
100 d after ponding	93
Ponding-to-release	90
Transport-to-release	95
Unfertilized egg-to-release	81

Nearly all hatchery fish from each stock were marked (adipose fin clip) or tagged (coded-wire tag). Different combinations of marks and tags were used depending on the stock. In addition, Chelan PUD personnel PIT tagged about 5,100 WxW juvenile hatchery spring Chinook in June and about 15,300 steelhead (5,100 WxW steelhead and 10,201 HxH steelhead) during September. They tagged about 10,100 Methow (Carlton) summer Chinook in September and about 20,600 Wenatchee summer Chinook (10,303 in raceways and 10,301 in reuse circular ponds) in September. PIT tags will be used to estimate migration timing and survival rates (e.g., smolt-to-adult) outside the hatchery.

Lastly, the size and number of fish released were assessed and compared to programmed production levels. The goal of the program is that numbers released and their sizes should fall within 10% of the programmed targets identified in Table 2.4. However, because of constraints due to run size and proportions of wild and hatchery adults, production levels may not be met every year.

Table 2.4. Targets for fish released from the PUD hatchery programs; CV = coefficient of variation.

Hatchery stock	Release targets	Size targets		
		Fork length (CV)	Weight (g)	Fish/pound
Wenatchee Summer Chinook	500,001	163 (9.0)	45.4	10
Methow Summer Chinook	200,000	163 (9.0)	45.4	10
Chelan Falls Summer Chinook (yearlings)	576,000	161 (9.0)	45.4	10
Chiwawa Spring Chinook	144,026	155 (9.0)	37.8	12
Nason Spring Chinook	223,670	155 (9.0)	37.8	18
Wenatchee Steelhead	247,300	191 (9.0)	75.6	6

2.3 Juvenile Sampling

Juvenile sampling within streams included operation of rotary smolt traps, snorkel observations, and PIT tagging. Methods for sampling juvenile fish are described in Appendix E in Murdoch and Peven (2005).

A smolt trap was located on the Wenatchee River about 5.8 km downstream from the mouth of Lake Wenatchee (Upper Wenatchee Trap), on the Wenatchee River near the Town of Cashmere at RKm 13.4 (Lower Wenatchee Trap), in Nason Creek about 0.9 km upstream from the mouth, and in the Chiwawa River about 1 km upstream from the mouth (Chiwawa Trap). All traps operated throughout the smolt migration period. The Chiwawa Trap operated throughout most of the year (March through November), but not during icing or extreme high flow conditions. The following data were collected at each trap site: water temperature, discharge, number and identification of all species captured, degree of smoltification for anadromous fish, presence of marks and tags, size (fork lengths and weights), and scales from steelhead and sockeye salmon smolts. Trap efficiencies at each trap site were estimated by using mark-recapture trials conducted over a wide range of discharges. Linear regression models relating discharge and trap efficiencies were developed to estimate daily trap efficiencies during periods when no mark-recapture trials were conducted. The total number of fish migrating past the trap each day was estimated as the quotient of the daily number of fish captured and the estimated daily trap efficiency. Summing the daily totals resulted in the total emigration estimate.

Snorkel observations were used to estimate the number of juvenile spring Chinook salmon, juvenile rainbow/steelhead, and bull trout within the Chiwawa River basin. The focus of the study was on juvenile spring Chinook salmon. Sampling followed a stratified random design with proportional allocation of sites among strata. Strata were identified based on unique combinations of geology, land type, valley bottom type, stream state condition, and habitat types. A total of 163 randomly selected sites were surveyed during August (Table 2.5). Counts of fish within each sampling site were adjusted based on detection efficiencies, which were related to water temperature. That is, non-linear models that described relationships between water temperatures and detection efficiencies (Hillman et al. 1992) were used to estimate total numbers of fish within sampling sites. These numbers were then converted to densities by dividing total fish numbers by the wetted surface area and water volume of sample sites. Total numbers within a stratum were estimated as the product of fish densities times the total wetted surface or water volume for the stratum. The sum of fish numbers across strata resulted in the total number of fish within the basin. The calculation of total numbers, densities, and degrees of certainty are fully explained in Hillman and Miller (2004).

Working in collaboration with the Comparative Survival Study (CSS) funded by BPA, crews PIT tagged juvenile wild Chinook, wild and hatchery steelhead, and wild sockeye salmon collected at the smolt traps. The proposed number of wild spring Chinook and steelhead to be tagged at each location is provided in Table 2.6. The goal of this work was to better understand the life-history characteristics of fish in the Wenatchee River basin and to estimate SARs. This in turn improves the ability to detect potential effects of the hatchery program on wild fish.

Table 2.5. Location of strata and numbers of randomly sampled sites within each stratum that were sampled in the Chiwawa River Basin in 2013.

Reach/stratum	River kilometers (RKm)	Number of randomly selected sites
Chiwawa River		
1	0.0-6.1	11
2	6.1-8.9	5
3	8.9-12.7	8
4	12.7-14.3	6
5	14.3-17.4	5
6	17.4-19.0	6
7	19.0-32.2	28
8	32.2-40.9	24
9	40.9-46.4	11
10	46.4-50.1	11
Phelps Creek		
1	0.0-0.6	2
Chikamin Creek (includes Minnow Creek)		
1	0.0-1.5	13
Rock Creek		
1	0.0-1.2	14
Peven Creek (unnamed stream on USGS map)		
1	0.0-0.1	1
Big Meadow Creek		
1	0.0-1.6	8
Alder Creek		
1	0.0-0.1	4
Brush Creek		
1	0.0-0.1	2
Clear Creek		
1	0.0-0.1	4

Table 2.6. Number of wild spring Chinook and steelhead proposed for tagging at different locations within the Wenatchee River basin, 2013.

Sampling location	Target sample size	
	Wild spring Chinook	Wild steelhead
Chiwawa Trap	2,500-8,000	500-2,000
Upper Wenatchee Trap	500-1,000	50-250
Lower Wenatchee Trap	500-1,000	50-250
Total	**3,500-10,000**	**600-2,500**

Survival rates for various juvenile life-stages were calculated based on estimates of seeding levels (total egg deposition), numbers of parr, numbers of emigrants, and numbers of smolts. Total egg deposition was estimated as the product of the number of redds counted in the basin times the mean fecundity of female spawners. Fecundity was estimated from females collected for broodstock using an electronic egg counter. Numbers of emigrants and smolts were estimated at trapping sites and numbers of parr were estimated using snorkel observations only in the Chiwawa River basin. Survival estimates could not be calculated for some stocks (e.g., summer Chinook) because specific life-stage abundance estimates were lacking.

2.4 Spawning/Carcass Surveys

Methods for conducting carcass and spawning ground surveys are detailed in Appendix F in Murdoch and Peven (2005). Information collected during spawning surveys included spawn timing, redd distribution, and redd abundance. Data collected during carcass surveys included sex, size (fork length and postorbital-to-hypural length), scales for aging[1], degree of egg voidance, DNA samples, and identification of marks or tags. The sampling goal for carcasses was 20% of the spawning population. Crews also conducted snorkel surveys to assess the incidence of precociously maturing fish spawning naturally in streams.

Both redd and carcass surveys were conducted in reaches that encompassed the spawning distribution of most populations. Steelhead surveys were the exception. These surveys were conducted within major spawning areas in the basin and therefore may not capture the entire spawning distribution of the population. Steelhead surveys were conducted during March through June in reaches and index areas described in Table 2.7. Total redd counts were estimated by expanding counts within non-index areas by expansion factors developed within index areas.

[1] In this report we use two methods of describing age. One is termed the “European Method.” This method has two digits, separated by a period. The first digit represents the number of winters the fish spent in freshwater before migrating to the sea. The second digit indicates the number of winters the fish spent in the ocean. For example, a fish designated as 1.2 spent one winter in freshwater and two in the ocean. A fish designated as 0.3 migrated to the ocean in its first year and spent three winters in the ocean. The other method describes the total age of the fish (egg-to-spawning adult, i.e., gravel-to-gravel), so fish demarcated as 0.3 or 1.2 are considered 4-year-olds, from the same brood.

Table 2.7. Description of reaches and index areas surveyed for steelhead redds in the Wenatchee River basin.

Stream	Code	Reach	Index/reference area
Wenatchee River	W2	Sleepy Hollow Br to L. Cashmere Br	Monitor Boat Rmp to Cashmere Boat Rmp
	W6	Leavenworth Br to Icicle Rd Br	Leavenworth Boat Ramp to Icicle Ck
	W8	Tumwater Dam to Tumwater Br	Swift Boat Ramp to Tumwater Br
	W9	Tumwater Br to Chiwawa R	Tumwater Br to Plain
	W10	Chiwawa R to Lk Wenatchee	Chiwawa Pump St. to Lk Wenatchee
Peshastin Creek	P1	Mouth to Camas Cr	Kings Br to Camas Cr
	P2A	Camas Cr to Mouth of Scotty Cr	Ingalls Cr to Ruby Cr
	P2	Camas Cr to Mouth of Scotty Cr	FR7620 to Shaser Cr
Ingalls Creek	D1	Mouth to Trailhead RM 1	Mouth to Trailhead RM 1
	D2	Trailhead to Wilderness Bd RM 1.5	Trailhead to Wilderness Bd RM 1.5
Chiwawa River	C1	Mouth to Grouse Cr	Mouth to Rd 62 Br RM 6.4
	C2	Grouse Cr to Rock Cr	Chikamin Cr to Log Jam
Clear Creek	V1	Mouth to Hwy 22	Mouth to Hwy 22
	V2	Hwy 22 to Lower Culvert RM 2	Hwy 22 to Lower Culvert
Nason Creek	N1	Mouth to Kahler Cr Br	Mouth to Swamp Cr
	N3	Hwy 2 Br to Lower RR Br	Hwy 2 Br to Merrit Br
	N4	Lower RR Br to Whitepine Cr	Rayrock to Church Camp
Icicle River	I1	Mouth to Hatchery	Mouth to Boulder Block
Little Wenatchee	L2	Mouth to Lost Cr	Old Fish Weir to Lost Cr
	L3	Lost Cr to Rainy Cr Br	Lost Cr to Rainy Cr Br
White River	H2	Sears Cr Br to Napeequa R	Riprap Bank to Napeequa R
	H3	Napeequa R to Mouth of Panther Cr	Napeequa R to Grasshopper Meadows
Napeequa River	Q1	Mouth to RM 1	Mouth to RM1

Spring Chinook redd and carcass surveys were conducted during August through September in the Chiwawa River (including Rock and Chikamin creeks), Nason Creek, Icicle Creek, Peshastin Creek (including Ingalls Creek), upper Wenatchee River, Little Wenatchee River, and the White River (including the Napeequa River and Panther Creek). Survey reaches for spring Chinook are described in Table 2.8.

Table 2.8. Description of reaches surveyed for spring Chinook redds and carcasses in the Wenatchee River basin.

Stream	Code	Reach	River mile (RM)
Chiwawa River	C1	Mouth to Grouse Creek	0.0-11.7
	C2	Grouse Creek to Rock Creek	11.7-19.3
	C3	Rock Creek to Schaefer Creek	19.3-22.4
	C4	Schaefer Creek to Atkinson Flats	22.4-25.6
	C5	Atkinson Flats to Maple Creek	25.6-27.0
	C6	Maple Creek to Trinity	27.0-30.3
Rock Creek	R1	Mouth to End	0.0-0.5
Chikamin Creek	K1	Mouth to End	0.0-0.5
Nason Creek	N1	Mouth to Kahler Creek Bridge	0.0-3.9
	N2	Kahler Creek Bridge to Hwy 2 Bridge	3.9-8.3
	N3	Hwy 2 Bridge to Lower RR Bridge	8.3-13.2
	N4	Lower RR Bridge to Whitepine Creek	13.2-15.4
Little Wenatchee River	L2	Old Fish Weir to Lost Creek	2.7-5.2
	L3	Lost Creek to Rainy Creek	5.2-9.2
	L4	Rainy Creek to Falls	9.2-Falls
White River	H2	Sears Creek Bridge to Napeequa River	6.4-11.0
	H3	Napeequa River to Grasshopper Meadows	11.0-12.9
Napeequa River	Q1	Mouth to End	0.0-1.0
Panther Creek	T1	Mouth to End	0.0-0.7
Wenatchee River	W8	Tumwater Dam to Tumwater Bridge	30.9-35.6
	W9	Tumwater Bridge to Chiwawa River	35.6-48.4
	W10	Chiwawa River to Lake Wenatchee	48.4-54.2
Icicle Creek	I1	Mouth to Boulder Block	0.0-4.0
Peshastin Creek	P1	Mouth to Camas Creek	0.0-5.9
	P2	Camas Creek to Mouth of Scotty Creek	5.9-16.3
Ingalls Creek	D1	Mouth to Trailhead	0.0-1.0

Surveys for live sockeye and carcass were conducted during August through October in the Little Wenatchee River. Live fish counts were used to estimate spawning escapements using the area-under-the-curve (AUC) method. Mark-recapture methods were used to estimate the spawning escapement of sockeye in the White River basin.

Table 2.9. Description of reaches surveyed for sockeye salmon carcasses and live fish in the Wenatchee River basin.

Stream	Code	Reach	River mile (RM)
Little Wenatchee River	L1	Mouth to Old Fish Weir	0.0-2.7
	L2	Old Fish Weir to Lost Creek	2.7-5.2
	L3	Lost Creek to Rainy Creek	5.2-9.2
White River	H1	Mouth to Sears Creek Bridge	0.0-6.4
	H2	Sears Creek Bridge to Napeequa River	6.4-11.0
	H3	Napeequa River to Grasshopper Meadows	11.0-12.9
Napeequa River	Q1	Mouth to End	0.0-1.0

Wenatchee summer Chinook redd and carcass surveys were conducted during September through November within ten reaches on the Wenatchee River (Table 2.10). Peak redd counts and map redd counts were estimated in the Wenatchee River. Map redd counts were conducted only within index areas, not throughout the entire river. The total number of redds within the Wenatchee River was estimated by expanding peak counts based on map counts. This method is described in Appendix F in Murdoch and Peven (2005).

Table 2.10. Description of reaches and index areas surveyed for summer Chinook redds in the Wenatchee River basin.

Code	Reach	River mile	Index/reference area (RM)
W1	Mouth to Sleepy Hollow Br	0.0-3.3	River Bend to Sleepy Hollow Br (1.7-3.3)
W2	Sleepy Hollow Br to L. Cashmere Br	3.3-9.5	L. Cashmere Br to Old Monitor Br (7.1-9.5)
W3	L. Cashmere Br to Dryden Dam	9.5-17.8	Williams Canyon to Dryden Dam (15.5-17.8)
W4	Dryden Dam to Peshastin Br	17.8-20.0	Dryden Dam to Peshastin Br (17.8-20.0)
W5	Peshastin Br to Leavenworth Br	20.0-23.9	Irrigation Flume to Leavenworth Br (22.8-23.9)
W6	Leavenworth Br to Icicle Rd Br	23.9-26.4	Icicle to Boat Takeout (24.5-25.6)
W7	Icicle Rd Br to Tumwater Dam	26.4-30.9	Icicle Br to Penstock Br (26.4-28.7)
W8	Tumwater Dam to Tumwater Br	30.9-35.6	Swiftwater Campgd to Tumwater Br (33.5-35.6)
W9	Tumwater Br to Chiwawa River	35.6-47.9	Swing Pool to Railroad Tunnel (36.7-39.3)
W10	Chiwawa River to Lake Wenatchee	47.9-54.2	Swamp to Bridge (52.7-53.6)

Summer Chinook redd and carcass surveys were also conducted in the Methow and Chelan rivers during September through November. Total (map) redd counts were conducted in these rivers. Table 2.11 describes the survey reaches on the Methow River. The Colville Tribes conducted summer Chinook redd and carcass surveys in the Okanogan River basin. Those results are reported in a separate report (annual report to BPA).

Table 2.11. Description of reaches surveyed for summer Chinook redds and carcasses on the Methow, Okanogan, and Similkameen rivers.

Stream	Code	Reach	River mile (RM)
Methow River	M1	Mouth to Methow Bridge	0.0-14.8
	M2	Methow Bridge to Carlton Bridge	14.8-27.2
	M3	Carlton Bridge to Twisp Bridge	27.2-39.6
	M4	Twisp Bridge to MVID	39.6-44.9
	M5	MVID to Winthrop Bridge	44.9-49.8
	M6	Winthrop Bridge to Hatchery Dam	49.8-51.6
Okanogan River	O1	Mouth to Mallot Bridge	0.0-16.9
	O2	Mallot Bridge to Okanogan Bridge	16.9-26.1
	O3	Okanogan Bridge to Omak Bridge	26.1-30.7
	O4	Omak Bridge to Riverside Bridge	30.7-40.7
	O5	Riverside Bridge to Tonasket Bridge	40.7-56.8
	O6	Tonasket Bridge to Zosel Dam	56.8-77.4
Similkameen River	S1	Driscoll Channel to Oroville Bridge	0.0-1.8
	S2	Oroville Bridge to Enloe Dam	1.8-5.7

Except for sockeye, total spawning escapements for each population were estimated as the product of total number of redds times the ratio of fish per redd for a specific stock. Fish per redd ratios were estimated as the ratio of males to females sampled at broodstock collection sites and monitoring sites. Total spawning escapement for sockeye salmon in the Little Wenatchee River was estimated using the AUC approach (where escapement = [AUC/redd residence time] x observer efficiency). This method relied on weekly counts of live sockeye and assumed a redd residence time of 11 days (from Hyatt et al. 2006) and an observer efficiency of 100%.[2] In addition, sockeye escapement was estimated using mark-recapture methods. Adult sockeye were PIT tagged at Tumwater Dam and Bonneville Dam[3] and detected in the Little Wenatchee and White rivers with stationary PIT-tag interrogators.

Derived metrics calculated from carcass surveys, broodstock sampling, stock assessments, and harvest records included proportion of hatchery spawners, stray rates, age-at-maturity, length-at-age, smolt-to-adult survival (SAR), hatchery replacement rates (HRR), harvest rates, and natural replacement rates (NRR). The expected SARs and HRRs for different stocks raised in the PUD hatchery programs are provided in Table 2.12. Methods for calculating these variables are described in Appendices D, F, and G in Murdoch and Peven (2005) and in "White Papers" developed by the Hatchery Evaluation Technical Team (HETT) (see Appendices in Hillman et al. 2012).

2 It is unlikely that observer efficiency is 100%. Thus, spawning escapements based on AUC may be biased.

3 Adult sockeye that were tagged at Bonneville Dam and detected at Tumwater Dam were included in the mark-recapture analyses.

Table 2.12. Expected smolt-to-adult (SAR) and hatchery replacement rates (HRR) for stocks raised in the PUD Hatchery Programs.

Program	Number of broodstock	Smolts released	SAR	Adult equivalents	Number of smolts/adult	HRR
Chiwawa Spring Chinook	74	144,026	0.003	432	333	5.8
Nason Creek Spring Chinook	64	125,000	0.003	375	333	5.7
Wenatchee Summer Chinook	256	500,001	0.003	1,500	333	5.9
Methow Summer Chinook	102	200,000	0.003	600	333	5.9
Wenatchee Steelhead	130	247,300	0.010	2,473	100	19.0

Derived data that rely on CWTs (e.g., HRR, SAR, stray rates, etc.) are five or more years behind release information because of the lag time for returning adult fish to enter the fishery and spawning grounds, and the processing of tags. Consequently, complete information on rates and ratios based on CWTs is generally only available for years before 2007.

SECTION 3: WENATCHEE STEELHEAD

3.1 Broodstock Sampling

This section focuses on results from sampling 2012 and 2013 brood years of Wenatchee steelhead, which were collected at Dryden and Tumwater dams. The 2012 brood begins the tracking of the life cycle of steelhead released in 2013. The 2013 brood is included because juveniles from this brood are still maintained within the hatchery.

Origin of Broodstock

A total of 129 Wenatchee steelhead from the 2011 return (2012 brood) were collected at Dryden and Tumwater dams (Table 3.1). About 49% of these were natural-origin (adipose fin present, no CWT, and no elastomer tags) fish and the remaining 51% were hatchery-origin (elastomer tagged and/or adipose fin absent) adults. Origin was determined by analyzing scales and/or otoliths. The total number of steelhead spawned from the 2012 brood was 124 adults (48% natural-origin and 52% hatchery-origin).

A total of 147 steelhead were collected from the 2012 return (2013 brood) at Dryden and Tumwater dams; 63 (43%) natural-origin (adipose fin present, no CWT, and no elastomer tags) and 84 (57%) hatchery-origin (elastomer tagged and/or adipose fin absent) adults. A total of 117 steelhead were spawned; 42% were natural-origin fish and 58% were hatchery fish (Table 3.1). Origin was confirmed by sampling scales and/or otoliths. The high number of hatchery-origin adults was collected to offset mortalities associated with overtreatment at the hatchery.

Table 3.1. Numbers of wild and hatchery steelhead collected for broodstock, numbers that died before spawning, and numbers of steelhead spawned, 1998-2013. Unknown origin fish (i.e., undetermined by scale analysis, no elastomer, CWT, or fin clips, and no additional hatchery marks) were considered naturally produced. Mortality includes fish that died of natural causes typically near the end of spawning and were not needed for the program or were immature fish killed at spawning.

Brood year	Wild steelhead					Hatchery steelhead					Total number spawned
	Number collected	Prespawn loss	Mortality	Number spawned	Number released	Number collected	Prespawn loss	Mortality	Number spawned	Number released	
1998	35	0	0	35	0	43	4	2	37	0	72
1999	58	5	1	52	0	67	1	2	64	0	116
2000	39	2	1	36	0	101	9	12	60	20	96
2001	64	5	8	51	0	114	5	6	103	0	154
2002	99	0	1	96	2	113	1	0	64	48	160
2003	63	10	4	49	0	92	2	0	90	0	139
2004	85	3	0	75	7	132	1	0	61	70	136
2005	95	8	0	87	0	114	7	1	104	2	191
2006	101	5	0	93	3	98	0	0	69	29	162
2007	79	0	2	76	1	97	0	14	58	25	134
2008	104	0	3	77	22	107	0	28	54	25	131
2009	101	2	0	86	13	107	1	4	73	29	159
2010	106	1	1	96	8	105	2	23	75	5	171
2011	104	8	1	91	4	104	13	2	70	0	161

Brood year	Wild steelhead					Hatchery steelhead					Total number spawned
	Number collected	Prespawn loss	Mortality	Number spawned	Number released	Number collected	Prespawn loss	Mortality	Number spawned	Number released	
2012	63	3	0	59	1	66	0	1	65	0	124
2013	63	8	1	49	5	84	9	7	68	0	117
Average	***79***	***4***	***1***	***69***	***4***	***97***	***3***	***6***	***70***	***16***	***139***

Age/Length Data

Broodstock ages were determined from examination of scales and/or otoliths. For the 2012 brood year, both natural-origin and hatchery steelhead consisted primarily of 2-salt adults (Table 3.2). For the 2013 brood year, both hatchery and natural-origin steelhead consisted primarily of 2-salt adults (Table 3.2).

Table 3.2. Percent of hatchery and wild steelhead of different ages (saltwater ages) collected from broodstock, 1998-2013.

Brood year	Origin	Saltwater age		
		1	2	3
1998	Wild	39.4	60.6	0.0
	Hatchery	20.9	79.1	0.0
1999	Wild	50.0	48.3	1.7
	Hatchery	81.8	18.2	0.0
2000	Wild	56.4	43.6	0.0
	Hatchery	67.9	32.1	0.0
2001	Wild	51.7	48.3	0.0
	Hatchery	14.9	85.1	0.0
2002	Wild	55.6	44.4	0.0
	Hatchery	94.6	5.4	0.0
2003	Wild	13.1	85.3	1.6
	Hatchery	29.4	70.6	0.0
2004	Wild	94.8	5.2	0.0
	Hatchery	95.2	4.8	0.0
2005	Wild	22.1	77.9	0.0
	Hatchery	20.5	79.5	0.0
2006	Wild	28.7	71.3	0.0
	Hatchery	60.3	39.7	0.0
2007	Wild	40.3	59.3	0.0
	Hatchery	62.1	37.9	0.0
2008	Wild	65.4	33.7	0.9
	Hatchery	88.8	11.2	0.0
2009	Wild	39.8	57.8	2.4
	Hatchery	23.4	76.6	0.0
2010	Wild	65.2	33.7	1.1

Brood year	Origin	Saltwater age		
		1	2	3
	Hatchery	76.5	23.5	0.0
2011	Wild	27.5	72.5	0.0
	Hatchery	36.0	64.0	0.0
2012	Wild	42.4	52.5	5.1
	Hatchery	40.9	59.1	0.0
2013	Wild	40.7	57.4	1.9
	Hatchery	45.5	54.5	0.0
Average	***Wild***	***45.8***	***53.2***	***0.9***
	Hatchery	***53.7***	***46.3***	***0.0***

There was little difference between mean lengths of hatchery and natural-origin steelhead for both the 2012 and 2013 brood years (Table 3.3). Natural-origin fish were on average 1 to 3 cm larger than hatchery-origin fish of the same age.

Table 3.3. Mean fork length (cm) at age (saltwater ages) of hatchery and wild steelhead collected from broodstock, 1998-2013; N = sample size and SD = 1 standard deviation.

Brood year	Origin	Steelhead fork length (cm)								
		1-Salt			2-Salt			3-Salt		
		Mean	N	SD	Mean	N	SD	Mean	N	SD
1998	Wild	63	15	4	79	20	5	-	0	-
	Hatchery	61	9	4	73	34	4	-	0	-
1999	Wild	65	29	5	74	28	5	77	1	-
	Hatchery	62	54	4	73	12	4	-	0	-
2000	Wild	64	22	3	74	17	5	-	0	-
	Hatchery	60	57	3	71	27	4	-	0	-
2001	Wild	61	33	6	77	31	5	-	0	-
	Hatchery	62	17	4	72	97	4	-	0	-
2002	Wild	64	55	4	77	44	4	-	0	-
	Hatchery	63	106	4	73	6	4	-	0	-
2003	Wild	69	8	6	77	52	5	91	1	-
	Hatchery	66	27	4	75	65	4	-	0	-
2004	Wild	63	73	6	78	4	2	-	0	-
	Hatchery	61	59	3	73	3	1	-	0	-
2005	Wild	59	21	4	74	74	5	-	0	-
	Hatchery	59	23	4	72	89	4	-	0	-
2006	Wild	63	27	5	75	67	6	-	0	-
	Hatchery	61	41	4	72	27	5	-	0	-
2007	Wild	64	31	6	76	46	5	-	0	-
	Hatchery	60	60	4	71	36	5	-	0	-

Brood year	Origin	Steelhead fork length (cm)								
		1-Salt			2-Salt			3-Salt		
		Mean	N	SD	Mean	N	SD	Mean	N	SD
2008	Wild	64	68	4	77	35	4	80	1	-
	Hatchery	60	95	4	72	12	2	-	0	-
2009	Wild	65	33	5	76	48	6	81	2	0
	Hatchery	63	18	4	75	59	5	-	-	-
2010	Wild	64	60	5	74	31	5	76	1	-
	Hatchery	61	53	5	73	23	5	-	-	-
2011	Wild	62	28	5	76	74	5	-	0	-
	Hatchery	60	36	4	74	64	4	-	0	-
2012	Wild	63	25	3	74	31	5	74	3	2
	Hatchery	59	27	3	74	39	4	-	0	-
2013	Wild	61	22	5	77	31	5	74	1	-
	Hatchery	60	35	3	74	42	4	-	0	-
Average	***Wild***	***63***	***35***	***5***	***76***	***40***	***5***	***79***	***1***	***1***
	Hatchery	***61***	***45***	***4***	***73***	***40***	***4***	***-***	***0***	***-***

Sex Ratios

Male steelhead in the 2012 brood year made up about 47% of the adults collected, resulting in an overall male to female ratio of 0.90:1.00 (Table 3.4). For the 2013 brood year, males made up about 48% of the adults collected, resulting in an overall male to female ratio of 0.93:1.00. On average (1998-2013), the sex ratio is slightly less than the 1:1 ratio assumed in the broodstock protocol (Table 3.4).

Table 3.4. Numbers of male and female wild and hatchery steelhead collected for broodstock, 1998-2013. Ratios of males to females are also provided.

Brood year	Number of wild steelhead			Number of hatchery steelhead			Total M/F ratio
	Males (M)	Females (F)	M/F	Males (M)	Females (F)	M/F	
1998	13	22	0.59:1.00	15	28	0.54:1.00	0.56:1.00
1999	22	36	0.61:1.00	35	32	1.09:1.00	0.84:1.00
2000	18	21	0.86:1.00	60	41	1.46:1.00	1.26:1.00
2001	38	26	1.46:1.00	40	74	0.54:1.00	0.78:1.00
2002	32	67	0.48:1.00	81	32	2.53:1.00	1.14:1.00
2003	19	44	0.43:1.00	44	48	0.92:1.00	0.68:1.0
2004	43	42	1.02:1.00	90	42	2.14:1.00	1.58:1.00
2005	36	59	0.61:1.00	46	68	0.68:1.00	0.65:1.00
2006	38	63	0.60:1.00	47	51	0.92:1.00	0.75:1.00
2007	36	43	0.84:1.00	49	48	1.02:1.00	0.93:1.00
2008	61	43	1.42:1.00	68	39	1.74:1.00	1.57:1.00
2009	44	57	0.77:1.00	54	53	1.02:1.00	0.89:1.00

Brood year	Number of wild steelhead			Number of hatchery steelhead			Total M/F ratio
	Males (M)	Females (F)	M/F	Males (M)	Females (F)	M/F	
2010	49	57	0.86:1.00	62	43	1.44:1.00	1.11:1.00
2011	44	60	0.73:1.00	50	54	0.93:1.00	0.82:1.00
2012	30	33	0.91:1.00	31	35	0.89:1.00	0.90:1.00
2013	33	30	1.10:1.00	38	46	0.83:1.00	0.93:1.00
Total	***556***	***703***	***0.79:1.00***	***810***	***734***	***1.10:1.00***	***0.95:1.00***

Fecundity

Fecundities for Wenatchee steelhead in brood years 2012 and 2013 averaged 5,891 and 5,762 eggs per female, respectively (Table 3.5). Mean fecundities for the 2012 and 2013 brood years were also greater than the 5,678 eggs per female assumed in the broodstock protocol.

Table 3.5. Mean fecundity of wild, hatchery, and all female steelhead collected for broodstock, 1998-2013.

Brood year	Mean fecundity		
	Wild	Hatchery	Total
1998	6,202	5,558	5,924
1999	5,691	5,186	5,424
2000	5,858	5,729	5,781
2001	5,951	6,359	6,270
2002	5,776	5,262	5,626
2003	6,561	6,666	6,621
2004	5,118	5,353	5,238
2005	5,545	6,061	5,832
2006	5,688	5,251	5,492
2007	5,840	5,485	5,660
2008	5,693	5,153	5,433
2009	6,199	6,586	6,408
2010	5,458	5,423	5,442
2011	6,276	6,100	6,203
2012	5,309	6,388	5,891
2013	5,749	5,770	5,762
Average	***5,807***	***5,771***	***5,813***

3.2 Hatchery Rearing

Rearing History

Number of eggs taken

From 1998-2011, a total of 493,827 eggs were required to meet the program release goal of 400,000 smolts. This was based on the unfertilized egg-to-release survival standard of 81%. In 2012, the egg take target was reduced to 305,309, which is needed to meet the revised release target of 247,300 smolts. Between 1998 and 2011, the egg take goal was reached 57% of the time (Table 3.6). Since 2011, the target has been reached or exceeded 100% of the time (Table 3.6).

Table 3.6. Numbers of eggs taken from steelhead broodstock, 1998-2012.

Brood year	Number of eggs taken
1998	224,315
1999	303,083
2000	280,872
2001	549,464
2002	503,030
2003	532,708
2004	408,538
2005	672,667
2006	546,382
2007	462,662
2008	439,980
2009	633,229
2010	499,499
2011	522,049
2012	371,151
2013	339,949
Average (1998-2011)	***488,782***
Average (2012-present)	***355,550***

Number of acclimation days

Juvenile steelhead were transferred from Chelan Fish Hatchery to the Chiwawa Ponds in November 2012. In April 2013, about 25,000 steelhead (mix of WxW and HxH fish) were transferred to Black Bird Pond near Leavenworth for acclimation on Wenatchee River water. Fish were acclimated for 22 d before a volitional release was initiated on 24 April. The remainder stayed at the Chiwawa Fish Hatchery until they were volitionally and forced released from the facility during late April to mid-May.

Juvenile Wenatchee steelhead at the Chiwawa Ponds were acclimated and reared on Wenatchee and Chiwawa River water. In the past, Wenatchee steelhead were reared on Columbia River water from January through May before being trucked and released into the Wenatchee River basin (Table 3.7).

Table 3.7. Water source and mean acclimation period for Wenatchee steelhead, brood years 1998-2012.

Brood year	Release year	Parental origin	Water source	Number of Days
1998	1999	H x H	Wenatchee/Chiwawa	36
		H x W	Wenatchee/Chiwawa	36
		W x W	Wenatchee/Chiwawa	36
1999	2000	H x H	Wenatchee/Chiwawa	138
		H x W	Wenatchee/Chiwawa	138
		W x W	Wenatchee/Chiwawa	138
		H x W	Eastbank	0
		W x W	Eastbank	0
2000	2001	H x H	Wenatchee/Chiwawa	122
		H x W	Wenatchee/Chiwawa	122
		H x W	Wenatchee/Chiwawa	122
		W x W	Wenatchee/Chiwawa	122
2001	2002	H x H	Columbia	92
		H x H	Wenatchee/Chiwawa	63
		H x W	Columbia	92
		H x W	Wenatchee/Chiwawa	63
		W x W	Columbia	153
2002	2003	H x H	Columbia	98
		H x W	Columbia	98
		W x W	Columbia	117
2003	2004	H x H	Columbia	88
		H x W	Wenatchee/Chiwawa	84
		W x W	Columbia	148
2004	2005	H x H	Columbia	160
		H x W	Columbia	160
		W x W	Columbia	160
2005	2006	H x H	Columbia	116
		H x W	Columbia	113
		W x W	Columbia	141
2006	2007	Early H x W	Columbia	111
		Late H x W	Columbia	112
		W x W	Columbia	148
2007	2008	Early H x W	Columbia	94-95

Brood year	Release year	Parental origin	Water source	Number of Days
		Late H x W	Columbia	91-93
		W x W	Columbia	138
2008	2009	Early H x W	Columbia	120-121
		Early H x W	Columbia/Wenatchee	120-121/28-95
		Late H x W	Columbia	114-115
		W x W	Columbia	152-153
2009	2010	Early H x W	Columbia	93-94
		Early H x W	Columbia/Wenatchee	99-111
		Early H x W	Wenatchee	31-129
		Late H x W	Columbia	84-87
		W x W	Columbia/Nason	118-120/28
2010	2011	H x H	Wenatchee	188-192
		H x H	Wenatchee	37-87
		H x H	Columbia	181
		W x W	Columbia	148-149
		W x W	Columbia/Nason	113-114/42-101
		W x W	Columbia	148-149
2011	2012	W x W	Wenatchee	160-201
		W x W	Wenatchee	179-188
		W x W	Wenatchee	21-72
		W x W	Nason	56-107
2012	2013	H x H	Wenatchee	168-189
		H x H	Wenatchee	168-225
		W x W	Wenatchee	168-225
		W x W	Wenatchee	168-189
		W x W	Chiwawa	187

Release Information

Numbers released

In 2011, the HCP Hatchery Committee agreed to reduce the Wenatchee summer steelhead program from 400,000 smolts to 247,300 smolts. Based on this new goal and the number of WxW steelhead present, all HxH steelhead were transferred to the Ringold Fish Hatchery to be included in their production program.

The release of 2012 brood Wenatchee steelhead achieved 101% of the 247,300 target goal with about 249,004 smolts released into the Wenatchee and Chiwawa rivers and Nason Creek (Table 3.8). Distribution of juvenile steelhead released in each of the three subbasins was determined by the mean proportion of steelhead redds in each basin. About 28.9% and 19.0% of the steelhead were released in Nason Creek and the Chiwawa River, respectively. The balance of the program was split between the Wenatchee River downstream from Tumwater Dam (21.3%) and the Wenatchee River upstream from the dam (30.8%).

Table 3.8. Numbers of steelhead smolts released from the hatchery, brood years 1998-2012. Before brood year 2011, the release target for steelhead was 400,000 smolts. Beginning with brood year 2011, the release target is 247,300 smolts.

Brood year	Release year	Number of smolts
1998	1999	172,078
1999	2000	175,701
2000	2001	184,639
2001	2002	335,933
2002	2003	302,060
2003	2004	374,867
2004	2005	294,114
2005	2006	452,184
2006	2007	299,937
2007	2008	306,690
2008	2009	327,143
2009	2010	484,772
2010	2011	354,314
2011	2012	206,397
2012	2013	249,004
Average (1998-2010)		***312,649***
Average (2011-present)		***227,701***

Numbers CWT and elastomer tagged

Wenatchee hatchery steelhead from the 2012 brood were marked with coded wire tags (CWT) in the snout. About 48.6% of the juveniles released were also adipose fin clipped (Table 9). No steelhead in the 2012 brood were marked with elastomer tags.

Table 3.9. Release location and marking scheme for the 1998-2012 brood Wenatchee steelhead.

Brood year	Release location	Parental origin	Proportion Ad-clip	VIE color/side	Tag rate	Number released
1998	Chiwawa River	H x H	0.000	Red Left	0.994	52,765
	Chiwawa River	H x W	0.000	Green Left	0.990	37,013
	Chiwawa River	W x W	0.000	Orange Left	0.827	82,300
1999	Wenatchee River	H x H	0.000	Green Left	0.911	45,347
	Wenatchee River	H x W	0.000	Orange Left	0.927	30,713
	Chiwawa River	H x H	0.000	Red Right	0.936	25,622
	Chiwawa River	H x W	0.000	Green Right	0.936	43,379

Brood year	Release location	Parental origin	Proportion Ad-clip	VIE color/side	Tag rate	Number released
	Chiwawa River	W x W	0.000	Orange Right	0.936	30,600
2000	Chiwawa River	H x H	0.000	Red Left	0.963	33,417
	Chiwawa River	H x W	0.000	Green Left	0.963	57,716
	Chiwawa River	H x W	0.000	Green Right	0.949	48,029
	Chiwawa River	W x W	0.000	Orange Right	0.949	45,477
2001	Nason Creek	H x W	0.000	Green Right	0.934	75,276
	Nason Creek	W x W	0.000	Orange Right	0.934	48,115
	Chiwawa River	H x W	0.000	Green Left	0.895	92,487
	Chiwawa River	H x H	0.000	Red Left	0.895	120,055
2002	Chiwawa River	H x H	0.000	Red Left	0.920	156,145
	Chiwawa River	H x W	0.000	Green Left	0.928	33,528
	Nason Creek	W x W	0.000	Orange Right	0.928	112,387
2003	Wenatchee River	H x H	0.000	Red Left	0.968	117,663
	Chiwawa River	H x W	0.000	Green Left	0.927	191,796
	Nason Creek	W x W	0.000	Orange Right	0.962	65,408
2004	Wenatchee River	H x H	0.500	Red Left	0.804	39,636
	Chiwawa River	H x W	0.000	Green Left	0.977	153,959
	Nason Creek	W x W	0.000	Pink Right	0.940	100,519
2005	Wenatchee River	H x H	1.000	Red Left	0.983	104,552
	Wenatchee River	H x W	0.616	Green Left	0.979	190,319
	Chiwawa River	H x W	0.616	Green Left	0.979	18,634
	Chiwawa River	W x W	0.000	Pink Right	0.969	14,124
	Nason Creek	W x W	0.000	Pink Right	0.969	124,555
2006	Wenatchee River	H x W (early)	1.000	Green Right	0.918	66,022
	Wenatchee River	H x W (late)	0.671	Green Left	0.935	92,176
	Chiwawa River	H x W (late)	0.671	Green Left	0.935	41,240
	Chiwawa River	W x W	0.000	Pink Right	0.945	7,500
	Nason Creek	W x W	0.000	Pink Right	0.945	92,999
2007	Wenatchee River	H x W (early)	0.967	Green Right	0.950	64,310
	Wenatchee River	H x W (late)	0.586	Green Left	0.951	97,549
	Chiwawa River	H x W (late)	0.586	Green Left	0.951	43,011
	Chiwawa River	W x W	0.000	Pink Right	0.952	7,026
	Nason Creek	W x W	0.000	Pink Right	0.952	94,794

Brood year	Release location	Parental origin	Proportion Ad-clip	VIE color/side	Tag rate	Number released
2008	Blackbird Pond	HxW (early)	0.917	Green Right	0.910	49,878
	Wenatchee River	H x W (early)	0.917	Green Right	0.910	48,624
	Wenatchee River	H x W (late)	0.595	Green Left	0.908	74,848
	Chiwawa River	H x W (late)	0.595	Green Left	0.908	25,835
	Chiwawa River	W x W	0.000	Pink Right	0.904	25,778
	Nason Creek	W x W	0.000	Pink Right	0.904	102,170
2009	Blackbird Pond	H x W (early)	0.969	Green Right	0.934	50,248
	Wenatchee River	H x W (early)	0.969	Green Right	0.934	105,239
	Wenatchee River	H x W (late)	0.973	Green Left	0.975	27,612
	Wenatchee River	H x W (late)	0.000	Green Left	0.975	45,435
	Chiwawa River	H x W (early)	0.969	Green Right	0.934	23,835
	Chiwawa River	H x W (late)	0.973	Green Left	0.975	33,047
	Chiwawa River	H x W (late)	0.000	Green Left	0.975	54,381
	Nason	W x W	0.000	Pink Right	0.979	145,029
2010	Wenatchee River	H x H	0.994	-	0.984	24,838
	Wenatchee River	H x H	0.994	-	0.984	45,000
	Wenatchee River	H x H	0.994	-	0.984	92,113
	Chiwawa River	W x W	0.000	Pink Right	0.917	81,174
	Nason River	W x W	0.000	Pink R/Pink L	0.884	20,000
	Nason River	W x W	0.000	Pink Right	0.917	91,189
2011	Wenatchee River	W x W	0.985	CWT	0.953	70,885
	Wenatchee River	W x W	0.985	CWT	0.953	24,992
	Wenatchee River	W x W	0.000	CWT	0.987	25,569
	Chiwawa River	W x W	0.985	CWT	0.953	31,050
	Nason River	W x W	0.000	CWT	0.989	18,254
	Nason River	W x W	0.985	CWT	0.953	36,225
2012	Wenatchee River	W x W	0.000	CWT	0.965	14,824
	Wenatchee River	H x H	1.000	AD/CWT	0.920	9,841
	Wenatchee River	W x W	0.000	CWT	0.965	28,362
	Wenatchee River	H x H	1.000	AD/CWT	0.920	76,695
	Chiwawa River	W x W	0.000	CWT	0.965	12,760
	Chiwawa River	H x H	1.000	AD/CWT	0.920	34,503
	Nason River	W x W	0.000	CWT	0.965	43,854

Brood year	Release location	Parental origin	Proportion Ad-clip	VIE color/side	Tag rate	Number released
	Nason River	W x W	0.000	CWT	0.965	28,165

Numbers PIT tagged

Table 3.10 summarizes the number of hatchery steelhead of different parental origins that have been PIT-tagged and released into the Wenatchee River basin.

Table 3.10. Summary of PIT-tagging activities for Wenatchee hatchery steelhead, brood years 2006-2012.

Brood year	Release location	Parental origin	Number of fish tagged	Number of tagged fish that died	Number of tags shed	Number of tagged fish released
2006	Wenatchee River	H x W (early)	10,035	479	24	9,533
	Wenatchee/Chiwawa rivers	H x W (late)	10,031	922	20	9,089
	Chiwawa River/Nason	W x W	10,019	152	352	9,515
2007	Wenatchee River	H x W (early)	10,052	22	10	9,820
	Wenatchee/Chiwawa rivers	H x W (late)	10,063	73	78	9,912
	Chiwawa River/Nason	W x W	10,051	55	1	9,982
2008	Wenatchee River	H x W (early)	10,101	59	15	10,027
	Wenatchee/Chiwawa rivers	H x W (late)	10,104	106	17	9,981
	Chiwawa River/Nason	W x W	10,101	159	80	9,862
2009	Wenatchee/Chiwawa rivers	H x W (early)	10,114	574	11	9,529
	Wenatchee (Blackbird)	H x W (early)	8,100	0	0	8,100
	Wenatchee/Chiwawa rivers	H x W (late)	10,115	271	11	9,833
	Chiwawa pilot	H x W (early)	10,107	532	103	9,472
	Chiwawa River/Nason	W x W	10,101	38	3	10,060
2010	Wenatchee River	HxH	10,100	624	21	9,455
	Chiwawa River/Nason	WxW	10,100	206	0	9,894
	Wenatchee (Blackbird)	HxH	10,101	235	8	9,858
	Wenatchee River	HxH	10,100	46	28	10,026
2011	Wenatchee/Chiwawa/Nason	WxW (circular)	10,101	139	30	9,932
	Wenatchee/Chiwawa/Nason	WxW (raceway)	20,220	121	35	20,064
2012	Wenatchee/Chiwawa/Nason	WxW (circular)	15,244	176	4	15,064
	Nason Creek	HxH (raceway)	10,223	140	13	10,070

2013 Brood Wenatchee HxH (Chiwawa Raceway) Summer Steelhead—A total of 10,201 Wenatchee HxH summer steelhead were tagged at Eastbank Hatchery on 3-6 September 2013.

These fish were tagged in raceway #4. Fish were not fed during tagging or for two days before and after tagging. Fish averaged 75 mm in length and 5.3 g at time of tagging. A total of 10,105 PIT-tagged steelhead were released in April. A total of 84 tagged steelhead died and 12 others shed their tags during the period between tagging and release.

2013 Brood Wenatchee WxW (Chiwawa Circular Ponds) Summer Steelhead—A total of 5,100 Wenatchee WxW summer steelhead were tagged at Chelan Hatchery on 10-12 September 2013. These fish were tagged in raceway #4. Fish were not fed during tagging or for two days before and after tagging. Fish averaged 114 mm in length and 15.0 g at time of tagging. A total of 5,004 PIT-tagged steelhead were released in April. A total of 95 tagged steelhead died and one other shed its tag during the period between tagging and release.

Fish size and condition at release

With the exception of the Blackbird Pond release, all 2012 brood steelhead were trucked and released as yearling smolts in April and May 2013. The Blackbird Pond group was released volitionally beginning on 24 April. The WxW fish did not meet the length or weight target, but exceeded the target for coefficient of variation (CV) for fork length (Table 3.11). The HxH group was combined with the WxW group in Pond 2 once they were transferred to Chiwawa Ponds.

Table 3.11. Mean lengths (FL, mm), weight (g and fish/pound), and coefficient of variation (CV) of steelhead smolts released from the hatchery, brood years 1998-2012. Size targets are provided in the last row of the table.

Brood year	Release year	Parental origin	Fork length (mm)		Mean weight	
			Mean	CV	Grams (g)	Fish/pound
1998	1999	H x H	201	11.1	92.3	5
		H x W	190	12.8	76.9	6
		W x W	173	12.0	55.3	8
1999	2000	H x H	181	8.9	70.6	6
		H x W	187	7.2	75.3	6
		W x W	184	11.3	71.5	6
2000	2001	H x H	218	15.2	122.4	4
		H x W	209	10.6	107.5	4
		W x W	205	10.7	100.9	5
2001	2002	H x H	179	17.4	67.0	7
		H x W	192	15.6	82.8	6
		W x W	206	11.6	102.6	4
2002	2003	H x H	194	13.1	83.0	6
		H x W	191	13.0	77.4	6
		W x W	180	19.1	70.3	7
2003	2004	H x H	191	14.4	73.1	6
		H x W	199	12.9	83.9	5
		W x W	200	11.1	90.1	5
2004	2005	H x H	204	11.3	87.2	6

Brood year	Release year	Parental origin	Fork length (mm)		Mean weight	
			Mean	CV	Grams (g)	Fish/pound
		H x W	202	13.5	71.9	5
		W x W	198	12.4	76.6	6
2005	2006	H x H	215	12.6	116.6	4
		H x W	198	11.8	86.3	5
		W x W	189	15.4	55.3	6
2006	2007	H x H (early)	213	12.1	109.6	4
		H x W (late)	186	11.8	68.3	7
		W x W	178	11.1	58.6	8
2007	2008	H x W (early)	192	17.4	77.1	6
		H x W (late)	179	19.3	63.8	7
		W x W	183	12.3	62.8	7
2008	2009	H x W (early)	184	11.6	68.0	7
		H x W (late)	186	11.6	73.5	6
		W x W	181	13.0	59.7	8
2009	2010	H x W (early)	197	11.3	84.2	5
		H x W (late)	192	11.1	72.7	6
		W x W	190	9.6	70.5	6
2010	2011	H x H	183	14.1	68.9	4
		W x W	188	10.5	68.1	7
2011	2012	H x H	NA	NA	NA	NA
		W x W	156	17.1	45.2	10
2012	2013	H x H / W x W	150	16.1	40.8	11
		H x H / W x W	157	16.4	45.0	10
		W x W	156	18.7	49.0	9
Targets			***198***	***9.0***	***75.6***	***6***

Survival Estimates

Overall survival of Wenatchee steelhead (WxW and HxH) from green (unfertilized) egg to release was below the standard set for the program. This is in large part because of poor unfertilized egg to eyed egg survival (Table 3.12).

The Wenatchee steelhead program, from its inception, has experienced highly variable fertilization rates. It is unknown at this time what mechanisms may be influencing stock performance at these stages.

Table 3.12. Hatchery life-stage survival rates (%) for steelhead, brood years 1998-2012. Survival standards or targets are provided in the last row of the table.

Brood year	Collection to spawning		Unfertilized egg-eyed	Eyed egg-ponding	30 d after ponding	100 d after ponding	Ponding to release	Transport to release	Unfertilized egg-release
	Female	Male							
1998	92.0	100.0	85.5	91.7	99.2	98.8	97.8	99.9	76.7
1999	91.2	100.0	66.9	93.0	95.9	94.9	93.1	99.7	58.0
2000	83.9	96.2	77.6	86.7	99.3	98.9	97.7	99.5	65.7
2001	90.0	100.0	73.0	91.8	99.1	97.8	91.3	99.7	61.1
2002	99.0	100.0	69.2	93.1	95.9	94.4	89.6	89.6	60.0
2003	87.0	96.8	86.3	83.8	97.2	94.8	97.6	85.3	70.4
2004	97.6	98.5	83.4	93.7	97.8	94.1	92.2	99.9	72.0
2005	91.3	95.1	81.3	92.1	95.6	91.8	89.7	99.6	67.2
2006	99.1	95.3	73.2	85.4	95.4	94.6	87.8	98.5	54.9
2007	100.0	100.0	80.3	92.0	95.7	92.7	89.8	99.1	66.3
2008	100.0	100.0	87.1	88.4	99.0	97.4	96.6	99.5	74.4
2009	97.3	100.0	89.0	97.2	96.0	95.2	88.6	96.6	76.6
2010	96.7	100.0	93.8	93.9	91.0	86.2	80.6	96.0	70.9
2011[a]	96.3	94.4	74.2	97.7	96.6	89.5	86.4	98.4	62.7
2012	95.2	98.4	74.7	99.7	97.8	94.0	90.1	98.9	67.1
Average	***94.4***	***98.3***	***79.7***	***92.0***	***96.8***	***94.3***	***91.3***	***97.3***	***66.9***
Standard	***90.0***	***85.0***	***92.0***	***98.0***	***97.0***	***93.0***	***90.0***	***95.0***	***81.0***

[a] Survival estimates are only for WxW steelhead.

3.3 Disease Monitoring

Rearing of the 2012 brood Wenatchee summer steelhead was similar to previous years with fish being held on Chelan spring water, Eastbank well water, and Chelan well water before being transferred for overwinter acclimation at the Chiwawa Ponds. Volitional and non-migratory released fish were released into Nason Creek, Chiwawa River, and the Wenatchee River. There was an increase in mortality in July 2012 because of Steatitis. At that time an effective sunscreen was implemented in an attempt to control Steatitis.

3.4 Natural Juvenile Productivity

During 2013, juvenile steelhead were sampled at the Upper Wenatchee and Chiwawa traps and counted during snorkel surveys within the Chiwawa River basin. Because the snorkel surveys targeted juvenile Chinook salmon, the entire distribution of juvenile steelhead in the Chiwawa River basin was not surveyed. Therefore, the parr numbers presented below represent a minimum estimate.

Parr Estimates

A total of 21,682 (±8.0%) age-0 (<100 mm) and 7,253 (±8.0%) age-1+ (100-200 mm)[4] steelhead/rainbow were estimated in the Chiwawa River basin in August 2013 (Table 3.13 and 3.14). During the survey period 1992-2013, numbers of age-0 and 1+ steelhead/rainbow have ranged from 1,410 to 45,727 and 2,533 to 22,128, respectively, in the Chiwawa River basin (Table 3.13 and 3.14; Figure 3.1). Numbers of all fish counted in the Chiwawa River basin are reported in Appendix A.

Juvenile steelhead/rainbow were distributed primarily throughout the lower seven reaches of the Chiwawa River (downstream from Rock Creek). Their densities were highest in the lower portions of the river and in tributaries. Age-0 steelhead/rainbow most often used riffle and multiple channel habitats in the Chiwawa River, although they also associated with woody debris in pool and glide habitat. In tributaries they were generally most abundant in small pools. Those that were observed in riffles selected stations in quiet water behind small and large boulders or occupied stations in quiet water along the stream margin. In pool and multiple-channel habitats, age-0 steelhead/rainbow used the same kinds of habitat as age-0 Chinook.

Age-1+ steelhead/rainbow most often used pool, riffle, and multiple-channel habitats. Those that used pools were usually in deeper water than subyearling steelhead/rainbow and Chinook. Like age-0 steelhead/rainbow, age-1+ steelhead/rainbow selected stations in quiet water behind boulders in riffles, but the two age groups rarely occurred together. Age-1+ steelhead/rainbow used deeper and faster water than did subyearling steelhead/rainbow.

Table 3.13. Total numbers of age-0 steelhead/rainbow trout estimated in different steams in the Chiwawa River basin during snorkel surveys in August 1992-2013; NS = not sampled.

Sample Year	Chiwawa River	Phelps Creek	Chikamin Creek	Rock Creek	Unnamed Creek	Big Meadow Creek	Alder Creek	Brush Creek	Clear Creek	Total
1992	4,927	NS	NS	NS	NS	NS	NS	NS	NS	**4,927**
1993	3,463	0	356	185	NS	NS	NS	NS	NS	**4,004**
1994	953	0	256	24	0	177	0	0	0	**1,410**
1995	6,005	0	744	90	0	371	40	107	0	**7,357**
1996	3,244	0	71	40	0	763	127	0	0	**4,245**
1997	6,959	224	84	324	0	1,124	58	50	0	**8,823**
1998	2,972	22	280	96	113	397	18	22	0	**3,921**
1999	5,060	20	253	189	0	255	34	27	0	**5,838**
2000	NS	NS	NS	NS	NS	NS	NS	NS	NS	**NS**
2001	35,759	192	1,449	1,826	0	6,345	156	0	0	**45,727**
2002	12,137	0	2,252	889	0	4,948	277	18	0	**20,521**
2003	9,911	296	996	1,166	96	5,366	73	116	0	**18,020**
2004	8,464	110	583	113	40	957	35	78	0	**10,380**
2005	4,852	120	2,931	477	45	2,973	65	0	0	**11,463**
2006	10,669	21	858	872	34	3,647	73	71	0	**16,245**
2007	8,442	53	2,137	348	11	2,955	65	28	34	**14,073**
2008	9,863	0	2,260	859	0	1,987	57	168	36	**15,230**

[4] A steelhead/rainbow trout larger than 200 mm (8 in) was considered a resident trout.

Sample Year	Chiwawa River	Phelps Creek	Chikamin Creek	Rock Creek	Unnamed Creek	Big Meadow Creek	Alder Creek	Brush Creek	Clear Creek	Total
2009	13,231	0	1,183	449	0	2,062	170	67	17	**17,179**
2010	17,572	0	2,870	1,478	5	2,843	182	35	33	**25,018**
2011	35,825	0	1,503	804	0	1,066	56	152	40	**39,446**
2012	21,537	0	1,817	1,501	0	2,164	42	54	19	**27,134**
2013	17,889	0	602	816	0	2,189	44	99	43	**21,682**
Average	***11,416***	***53***	***1,174***	***627***	***18***	***2,242***	***83***	***57***	***12***	***15,682***

Table 3.14. Total numbers of age-1+ steelhead/rainbow trout estimated in different steams in the Chiwawa River basin during snorkel surveys in August 1992-2013; NS = not sampled.

Sample Year	Chiwawa River	Phelps Creek	Chikamin Creek	Rock Creek	Unnamed Creek	Big Meadow Creek	Alder Creek	Brush Creek	Clear Creek	Total
1992	2,533	NS	NS	NS	NS	NS	NS	NS	NS	**2,533**
1993	2,530	0	228	102	NS	NS	NS	NS	NS	**2,860**
1994	4,972	0	476	296	5	107	0	0	0	**5,856**
1995	8,769	0	494	71	0	183	0	0	0	**9,517**
1996	11,381	0	6	27	0	435	0	0	0	**11,849**
1997	6,574	160	0	105	0	66	0	0	0	**6,905**
1998	10,403	0	133	49	0	0	0	0	0	**10,585**
1999	21,779	0	68	201	0	82	0	0	0	**22,130**
2000	NS	NS	NS	NS	NS	NS	NS	NS	NS	**NS**
2001	9,368	16	186	407	0	646	0	0	0	**10,623**
2002	7,200	0	199	165	0	1,526	0	0	0	**9,090**
2003	4,745	362	426	599	0	47	0	0	0	**6,179**
2004	7,700	107	209	0	0	174	0	0	0	**8,190**
2005	4,624	63	957	257	0	287	0	0	0	**6,188**
2006	7,538	76	748	1,186	0	985	0	0	0	**10,533**
2007	6,976	0	945	96	0	431	0	0	0	**8,448**
2008	8,317	0	1,168	298	0	793	0	0	0	**10,576**
2009	4,998	16	320	102	0	167	21	0	5	**5,629**
2010	8,324	32	366	393	0	780	21	0	0	**9,916**
2011	13,329	0	415	470	0	689	0	0	0	**14,903**
2012	7,671	0	285	410	0	210	0	0	0	**8,576**
2013	6,439	0	0	48	0	766	0	0	0	**7,253**
Average	***7,913***	***42***	***381***	***264***	***0***	***441***	***2***	***0***	***0***	***9,043***

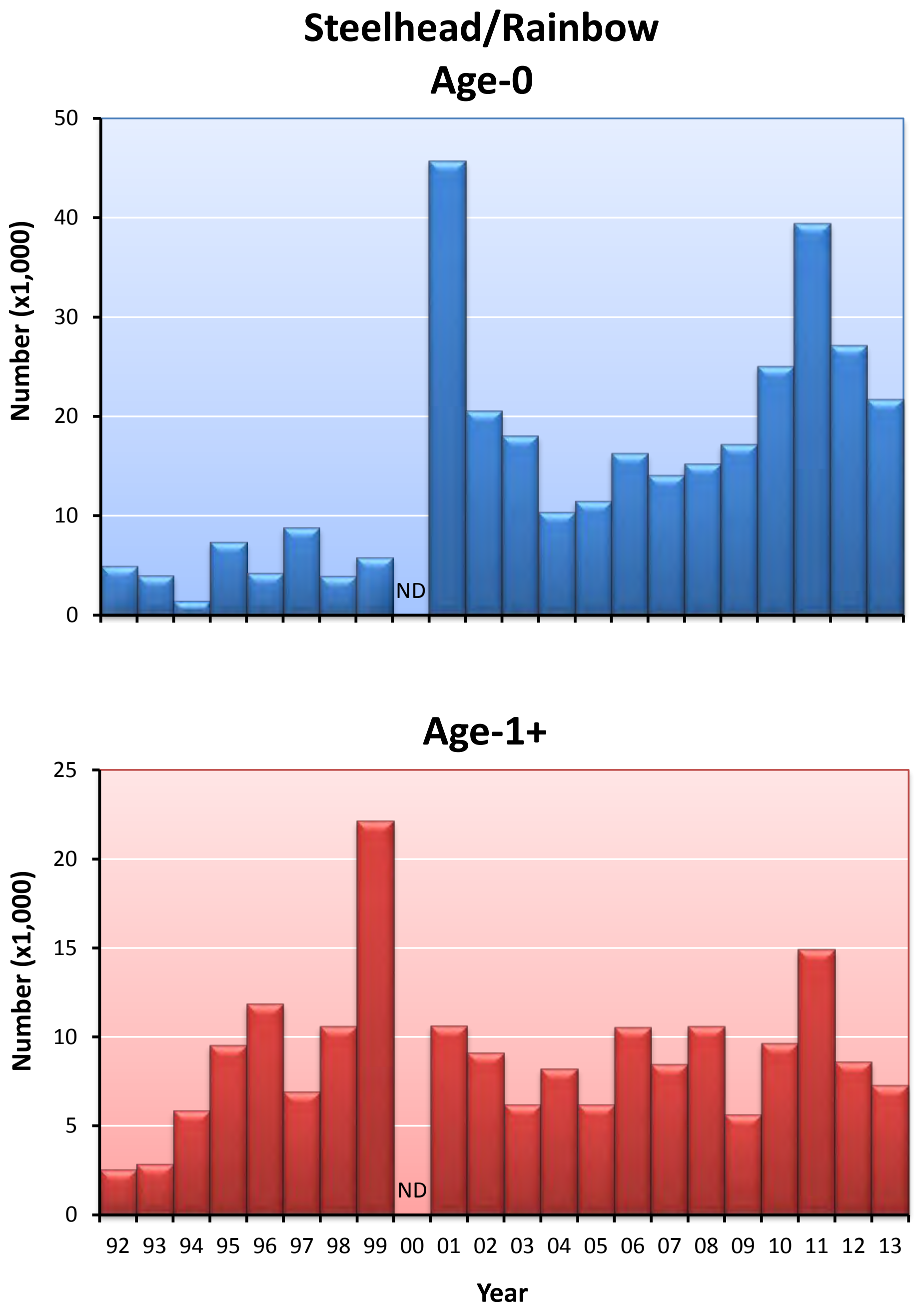


Figure 3.1. Numbers of subyearling and yearling steelhead/rainbow trout within the Chiwawa River Basin in August 1992-2013; ND = no data.

Emigrant and Smolt Estimates

Numbers of steelhead smolts and emigrants were estimated at the Chiwawa, Upper Wenatchee, and Lower Wenatchee traps in 2013.

Chiwawa Trap

The Chiwawa Trap operated between 22 February and 21 November 2013. During that time period the trap was inoperable for 16 days because of high river flows, debris, snow/ice, or mechanical failure. The trap operated in two different positions depending on stream flow; lower position at flows greater than 12 m^3/s and an upper position at flows less than 12 m^3/s. Monthly captures of all fish collected at the Chiwawa Trap are reported in Appendix B.

A total of 85 wild steelhead/rainbow smolts, 1,539 hatchery smolts, and 1,949 wild parr were captured at the Chiwawa Trap. Most (91%) of the hatchery smolts were collected in May, while most (91%) of the wild steelhead smolts were captured during April and May (Figure 3.2). Although steelhead/rainbow parr emigrated throughout the sampling period, most emigrated during April through June and August through October (Figure 3.2). No mark-recapture efficiency trials were conducted with steelhead/rainbow at the Chiwawa Trap to estimate total population sizes.

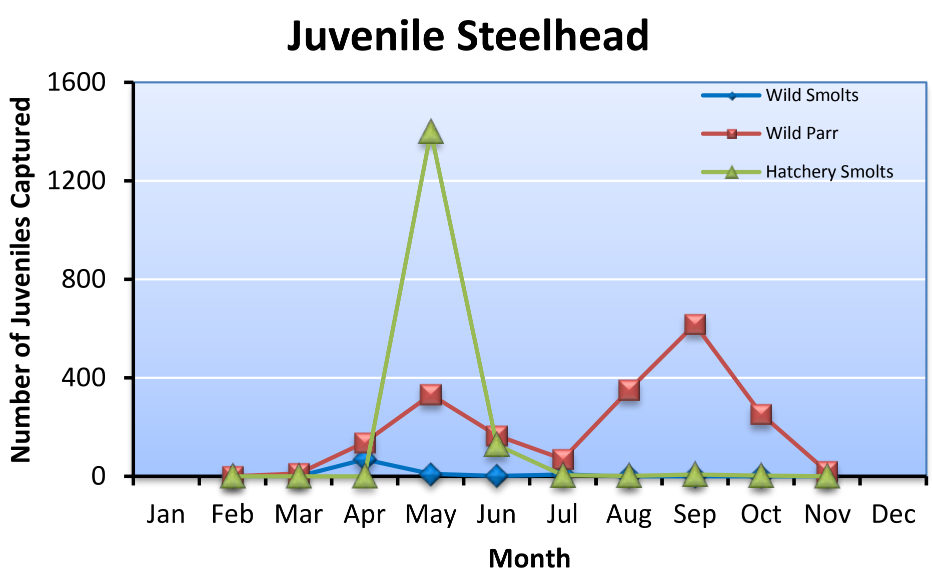


Figure 3.2. Monthly captures of wild smolts, wild parr, and hatchery smolt steelhead/rainbow at the Chiwawa Trap, 2013.

Upper Wenatchee Trap

The Upper Wenatchee Trap operated between 3 March and 30 June 2013. During the four-month sampling period the trap was inoperable for 18 days because of high discharge and debris. The trap captured a total of three wild steelhead/rainbow smolts, 24 hatchery smolts, 69 wild parr, and 468 wild fry. Monthly captures of all fish collected at the Upper Wenatchee Trap are reported in Appendix B.

Lower Wenatchee Trap

The Lower Wenatchee Trap operated between 13 February and 31 October 2013. During that time period the trap was inoperable for 22 days because of high river flows, debris, snow/ice, or major hatchery releases. During the nine-month sampling period, a total of 537 wild steelhead parr, 173 wild steelhead smolts, and 819 hatchery steelhead were captured at the trap. No mark-recapture trials were conducted with juvenile steelhead and therefore there are no estimates for emigrant steelhead. Monthly captures of all fish collected at the Lower Wenatchee Trap are reported in Appendix B.

PIT Tagging Activities

As part of the Comparative Survival Study (CSS), a total of 2,934 juvenile steelhead/rainbow trout (2,932 wild and two hatchery) were PIT tagged and released in 2013 in the Wenatchee River basin (Table 3.15a). Most of these were tagged at the Chiwawa Trap. Few were tagged and released at the Upper Wenatchee trap. See Appendix C for a complete list of all fish captured, tagged, lost, and released.

Table 3.15a. Numbers of wild and hatchery steelhead/rainbow trout that were captured, tagged, and released at different locations within the Wenatchee River basin, 2013. Numbers of fish that died or shed tags are also given.

Sampling Location	Species and Life Stage	Number held	Number of recaptures	Number tagged	Number died	Shed Tags	Total released	Percent mortality
Chiwawa Trap	Wild Steelhead/Rainbow	1,360	7	1,228	0	0	1,228	0.00
	Hatchery Steelhead/Rainbow	0	0	0	0	0	0	--
	Total	**1,360**	**7**	**1,228**	**0**	**0**	**1,228**	**0.00**
Upper Wenatchee Trap	Wild Steelhead/Rainbow	45	1	43	0	0	43	0.00
	Hatchery Steelhead/Rainbow	0	0	0	0	0	0	--
	Total	**45**	**1**	**43**	**0**	**0**	**43**	**0.00**
Middle Wenatchee Remote	Wild Steelhead/Rainbow	895	43	852	2	0	850	0.22
	Hatchery Steelhead/Rainbow	2	0	2	0	0	2	0.00
	Total	**897**	**43**	**854**	**2**	**0**	**852**	**0.22**
Lower Wenatchee Trap	Wild Steelhead/Rainbow	632	15	614	1	0	613	0.16
	Hatchery Steelhead/Rainbow	0	0	0	0	0	0	--
	Total	**632**	**15**	**614**	**1**	**0**	**613**	**0.16**
Total:	**Wild Steelhead/Rainbow**	**2,932**	**66**	**2,737**	**3**	**0**	**2,734**	**0.10**
	Hatchery Steelhead/Rainbow	**2**	**0**	**2**	**0**	**0**	**2**	**0.00**
Grand Total:		**2,934**	**66**	**2,739**	**3**	**0**	**2,736**	**0.10**

Numbers of steelhead/rainbow PIT-tagged and released as part of CSS during the period 2006-2013 are shown in Table 3.15b.

Table 3.15b. Summary of the numbers of wild and hatchery steelhead/rainbow trout that were tagged and released at different locations within the Wenatchee River basin, 2006-2013.

Sampling Location	Species and Life Stage	Numbers of PIT-tagged steelhead/rainbow released							
		2006	2007	2008	2009	2010	2011	2012	2013
Chiwawa Trap	Wild Steelhead/Rainbow	1,366	832	1,431	1,127	930	1,012	1,011	1,228
	Hatchery Steelhead/Rainbow	0	3	2	1	2	1	2	0
	Total	**1,366**	**835**	**1,433**	**1,128**	**932**	**1,013**	**1,013**	**1,228**

Sampling Location	Species and Life Stage	Numbers of PIT-tagged steelhead/rainbow released							
		2006	2007	2008	2009	2010	2011	2012	2013
Chiwawa Remote	Wild Steelhead/Rainbow	33	167	94	35	99	0	0	0
	Hatchery Steelhead/Rainbow	1	47	35	43	64	0	0	0
	Total	**34**	**214**	**129**	**78**	**163**	**0**	**0**	**0**
Upper Wenatchee Trap	Wild Steelhead/Rainbow	21	37	24	46	69	82	70	43
	Hatchery Steelhead/Rainbow	0	0	0	0	0	0	0	0
	Total	**21**	**37**	**24**	**46**	**69**	**82**	**70**	**43**
Nason Creek Remote	Wild Steelhead/Rainbow	174	452	255	459	318	0	0	0
	Hatchery Steelhead/Rainbow	26	75	87	197	32	0	0	0
	Total	**200**	**527**	**342**	**656**	**350**	**0**	**0**	**0**
Upper Wenatchee Remote	Wild Steelhead/Rainbow	413	1,001	21	7	30	0	0	0
	Hatchery Steelhead/Rainbow	2	64	26	23	9	0	0	0
	Total	**415**	**1,065**	**47**	**30**	**39**	**0**	**0**	**0**
Middle Wenatchee Remote	Wild Steelhead/Rainbow	0	0	981	867	1,517	0	0	850
	Hatchery Steelhead/Rainbow	0	0	11	5	57	0	0	2
	Total	**0**	**0**	**992**	**872**	**1,574**	**0**	**0**	**852**
Lower Wenatchee Remote	Wild Steelhead/Rainbow	0	0	102	69	0	0	0	0
	Hatchery Steelhead/Rainbow	0	0	10	9	0	0	0	0
	Total	**0**	**0**	**112**	**78**	**0**	**0**	**0**	**0**
Peshastin Creek Remote	Wild Steelhead/Rainbow	0	0	0	92	307	0	0	0
	Hatchery Steelhead/Rainbow	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**92**	**307**	**0**	**0**	**0**
Lower Wenatchee Trap	Wild Steelhead/Rainbow	131	461	285	227	465	0	0	613
	Hatchery Steelhead/Rainbow	0	0	0	1	0	0	0	0
	Total	**131**	**461**	**285**	**228**	**465**	**0**	**0**	**613**
Total:	**Wild Steelhead/Rainbow**	**2,138**	**2,950**	**3,193**	**2,929**	**3,735**	**1,094**	**1,081**	**2,734**
	Hatchery Steelhead/Rainbow	**29**	**189**	**171**	**279**	**164**	**1**	**2**	**2**
Grand Total:		**2,167**	**3,139**	**3,364**	**3,208**	**3,899**	**1,095**	**1,083**	**2,736**

3.5 Spawning Surveys

Surveys for steelhead redds were conducted during March through early June, 2013, in the Wenatchee River (including Beaver Creek), Chiwawa River (including Meadow, Alder, Chikamin, and Clear creeks), Nason Creek (including Mahar, Coulter, and an un-named stream), Icicle Creek, and Peshastin Creek (including Mill Creek). Surveys were conducted in both index and non-index areas throughout the Wenatchee River basin (see Appendix D for more details).

Redd Counts

A total of 472 steelhead redds were estimated in the Wenatchee River basin in 2013 (Table 3.16). This is about a 13.7% increase over the estimate in 2012 (see Appendix D). Most spawning occurred in the Wenatchee River (42.3%), Nason Creek (28.6%), and Peshastin Creek (13.1%) (Table 3.16; Figure 3.3). Icicle Creek contained 10.2% of all redds in the Wenatchee River basin. The number of redds estimated in the Chiwawa River basin was below average for that area.

Table 3.16. Numbers of steelhead redds estimated within different streams/watersheds within the Wenatchee River basin, 2001-2013; NS = not sampled. Redd counts beginning in 2004 have been conducted within the same areas and with the same methods. Therefore, comparing redd numbers before 2004 with estimates since may not be valid.

Survey year	Number of steelhead redds							
	Chiwawa	Nason	Little Wenatchee	White	Wenatchee River[a]	Icicle	Peshastin	Total
2001	25	27	NS	NS	116	19	NS	**187**
2002	80	80	1	0	315	27	NS	**503**
2003	64	121	5	3	248	16	15	**472**
2004	62	127	0	0	151	23	34	**397**
2005	162	412	0	2	459	8	97	**1,140**
2006	19	77	NS	0	191	41	67	**395**
2007	11	78	0	1	46	6	17	**159**
2008	11	88	NS	1	100	37	49	**286**
2009	75	126	0	0	327	102	32	**662**
2010	74	270	4	3	380	120	118	**969**
2011	77	235	2	0	323	180	115	**932**
2012	8	158	0	0	137	47	65	**415**
2013	27	135	NS	NS	200	48	62	**472**
Average[b]	***53***	***171***	***1***	***1***	***231***	***61***	***66***	***583***

[a] Includes redds in Beaver and Chiwaukum creeks.
[b] The average is based on estimates from 2004 to present.

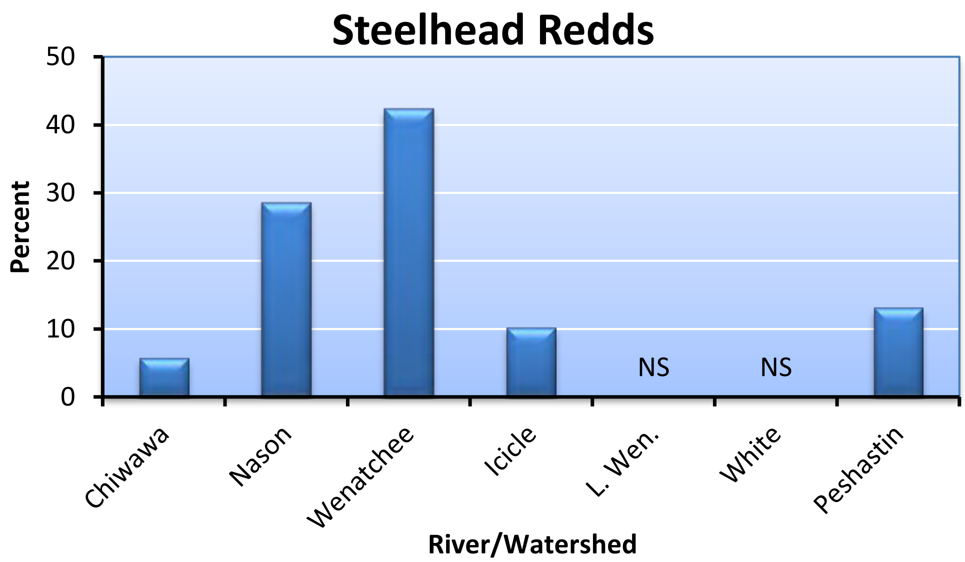


Figure 3.3. Percent of the total number of steelhead redds counted in different streams/watersheds within the Wenatchee River basin during March through early June, 2013. NS = not sampled.

Redd Distribution

Steelhead redds were not evenly distributed among reaches within survey streams in 2013 (Table 3.17). Out of the 27 redds found in the Chiwawa River basin, 12 occurred in Reach 1. There were four redds observed in Clear Creek. There was also one redd observed in Chickamin Creek. There were no redds observed in Alder and Big Meadow creeks.

All of the steelhead spawning in the Nason Creek basin occurred in Nason Creek, primarily in Reaches 3 and 4. No spawning was observed in the tributaries. Spawning activity in Peshastin Creek basin was confined to Peshastin Creek, with no redds observed in Mill Creek.

Wenatchee River redds were observed on the mainstem, with the exception of one redd on Beaver Creek. About 70.3% of the spawning in the Wenatchee River occurred upstream from Tumwater Dam (Table 3.17).

Table 3.17. Numbers and percentages of steelhead redds counted within different streams/watersheds within the Wenatchee River basin during March through early June, 2013.

Stream/watershed	Reach	Number of redds	Percent of redds within stream/watershed
Chiwawa	Chiwawa 1 (C1)	12	44.4
	Chiwawa 2 (C2)	8	29.6
	Chikamin Creek	1	3.7
	Meadow Creek	2	7.4
	Alder Creek	0	0.0
	Clear Creek	4	14.8
	Total	**27**	**100.0**
Nason	Nason 1 (N1)	32	23.7
	Nason 2 (N2)	2	1.5

Stream/watershed	Reach	Number of redds	Percent of redds within stream/watershed
	Nason 3 (N3)	83	61.5
	Nason 4 (N4)	18	13.3
	Un-named Creek	0	0.0
	Roaring Creek	0	0.0
	Coulter Creek	0	0.0
	Mahar Creek	0	0.0
	Total	**135**	**100.0**
Icicle	Icicle (I1)	46	95.8
	Icicle (I2)	2	4.2
	Total	**48**	**100.0**
Peshastin	Peshastin 1 (P1)	42	67.7
	Peshastin 2 (P2)	-	-
	Peshastin 3 (P3)	8	12.9
	Peshastin 4 (P4)	12	19.4
	Mill Creek	0	0.0
	Total	**62**	**100.0**
Wenatchee	Wenatchee 1 (W1)	0	0.0
	Wenatchee 2 (W2)	26	13.0
	Wenatchee 3 (W3)	0	0.0
	Wenatchee 4 (W4)	0	0.0
	Wenatchee 5 (W5)	0	0.0
	Wenatchee 6 (W6)	4	2.0
	Wenatchee 7 (W7)	0	0.0
	Wenatchee 8 (W8)	6	3.0
	Wenatchee 9 (W9)	79	39.5
	Wenatchee 10 (W10)	84	42.0
	Beaver Creek	1	0.5
	Total	**200**	**100.0**

Spawn Timing

Steelhead began spawning during the second week of March in Icicle Creek, third week of March in the Wenatchee River, and the fourth week of March in Peshastin Creek, Chiwawa River, and Nason Creek. Spawning activity appeared to begin once the mean daily stream temperature reached about 4.8°C and was observed in water temperatures ranging from 2.0 - 7.0°C. Steelhead spawning peaked during the third week of April in the Icicle River, the fourth week of April in the Wenatchee River, Peshastin Creek, and Chiwawa River, and the second week of May in Nason Creek (Figure 3.4).

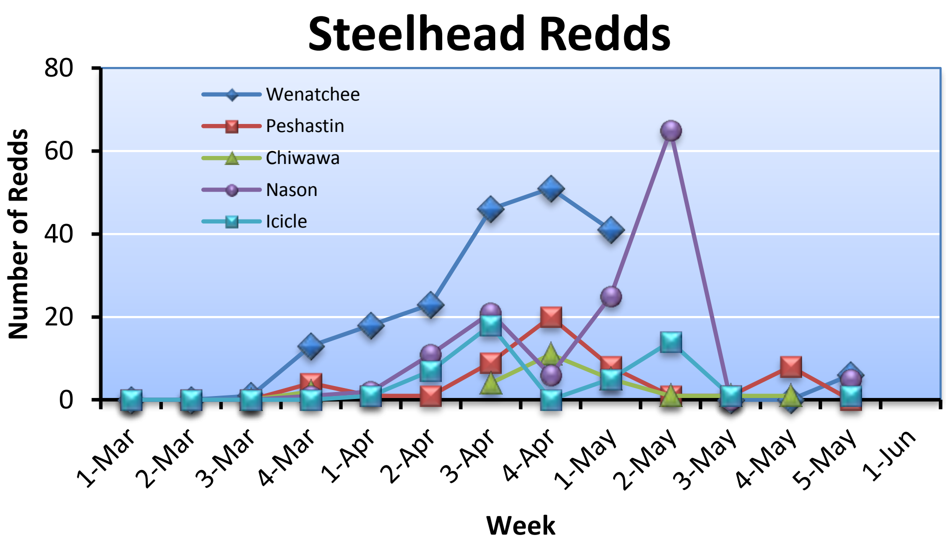


Figure 3.4. Numbers of steelhead redds counted during different weeks in different index areas within the Wenatchee River basin, March through early June 2013.

Spawning Escapement

Spawning escapement for steelhead upstream from Tumwater Dam was calculated as the number of redds (upstream from the dam) times the fish per redd ratio (based on sex ratios estimated at Tumwater Dam using video surveillance). The estimated fish per redd ratio for steelhead in 2013 was 1.65 (Table 3.18). Multiplying this ratio by the total number of redds upstream from the dam resulted in a total spawning escapement of 470 steelhead (Table 3.18). This means that of the 1,087 steelhead counted at Tumwater, about 43% of them were estimated to have spawned upstream from the dam. This estimate was higher than the average of 50%.

The low estimated spawning escapement in 2013 may have resulted from the difficult survey conditions that biologists experienced in that year. That is, poor survey conditions may have obscured redds and high spring flows prevented post-peak surveys to be conducted in some areas. The effect of other factors, such as pre-spawning mortality, fallback, and illegal harvest remain unknown.

Table 3.18. Numbers of steelhead counted at Tumwater Dam, fish/redd estimates (based on male-to-female ratios estimated at Tumwater Dam), numbers of steelhead redds counted upstream from Tumwater Dam, total spawning escapement upstream from Tumwater Dam (estimated as the total number of redds times the fish/redd ratio), and the proportion of the Tumwater Dam count that made up the spawning escapement.

Survey year	Total count at Tumwater Dam	Fish/redd	Number of redds			Spawning escapement	Proportion of Tumwater count that spawned
			Index area	Non-index area	Total redds		
2001	820	2.08	118	19	137	285	0.35
2002	1,720	2.68	296	179	475	1,273	0.74
2003	1,810	1.60	353	88	441	706	0.39
2004	1,869	2.21	277	92	369	815	0.44

Survey year	Total count at Tumwater Dam	Fish/redd	Number of redds			Spawning escapement	Proportion of Tumwater count that spawned
			Index area	Non-index area	Total redds		
2005	2,650	1.61	828	136	964	1,552	0.59
2006	1,053	2.05	192	34	226	463	0.44
2007	657	1.94	105	29	134	260	0.40
2008	1,328	2.81	124	35	159	447	0.34
2009	1,781	1.83	284	107	391	716	0.40
2010	2,270	2.33	546	95	641	1,494	0.66
2011	1,130	1.79	427	33	460	823	0.73
2012	1,055	2.00	273	22	295	590	0.56
2013	1,087	1.65	276	9	285	470	0.43
Average[a]	***1,488***	***2.02***	***333***	***59***	***392***	***763***	***0.50***

[a] The average is based on estimates from 2004 to present.

3.6 Life History Monitoring

Life history characteristics of steelhead were assessed by examining fish collected at broodstock collection sites, examining videotape at Tumwater Dam, and by reviewing tagging data and fisheries statistics. Some statistics could not be calculated at this time because few fish have been tagged with CWTs. Steelhead released from the hatchery have received elastomer tags, CWTs, and about 25,134 of the 2012 brood were PIT tagged. With the placement of remote PIT tag detectors in spawning streams in 2007 and 2008, statistics such as origin on spawning grounds, stray rates, and SARs can be estimated more accurately in the future.

Migration Timing

Sampling at Tumwater Dam indicates that steelhead migrate throughout the year; however, the migration distribution is bimodal, indicating that steelhead migrate past Tumwater Dam in two pulses: one pulse during summer-autumn the year before spawning and another during winter-spring the year of spawning (Figure 3.5). Most steelhead passed Tumwater Dam during July through October and April. The highest proportion of both wild and hatchery fish migrated during October.

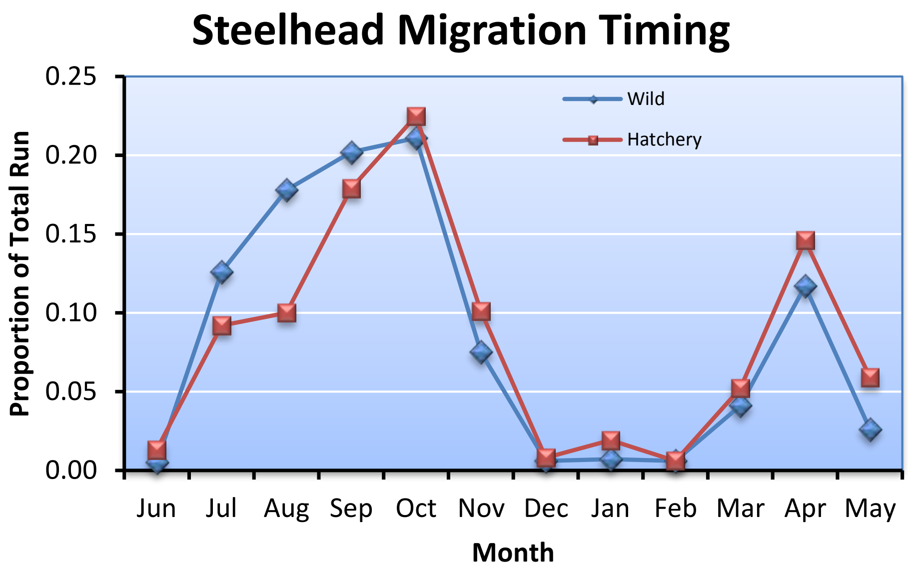


Figure 3.5. Proportion of wild and hatchery steelhead sampled at Tumwater Dam for the combined brood years of 1999-2013.

Because the migration of steelhead is bimodal, we estimated migration statistics separately for each migration pulse (i.e., summer-autumn migration and winter-spring migration). That is, we compared migration statistics for wild and hatchery steelhead passing Tumwater Dam during the summer-autumn period independent of those for the winter-spring migration period. We estimated the week and month that 10%, 50% (median), and 90% of the wild and hatchery steelhead passed Tumwater Dam during the two migration periods. We also estimated the mean weekly and monthly migration timing for wild and hatchery steelhead.

Overall, there was little difference in migration timing of wild and hatchery fish enumerated at Tumwater Dam (Table 3.19a and b; Figure 3.5). For both the summer-autumn and winter-spring migration periods, wild and hatchery steelhead arrived at the dam during the same week and month. The mean and median migration timing for wild and hatchery steelhead were also similar. However, during the summer-autumn migration period, on average, wild steelhead appeared to end their migration about one week earlier than hatchery steelhead.

Table 3.19a. The week that 10%, 50% (median), and 90% of the wild and hatchery steelhead passed Tumwater Dam during their summer-autumn migration (June through December) and during their winter-spring migration (January through May), 1999-2013. The average week is also provided for both migration periods. Migration timing is based on video sampling at Tumwater. The presence of eroded fins and/or missing adipose fins was used to distinguish hatchery fish from wild fish during video monitoring at Tumwater Dam. Estimates also include steelhead collected for broodstock.

Spawn year	Origin	Steelhead Migration Time (week)									
		Summer-Autumn Migration (Jun-Dec)					Winter-Spring Migration (Jan-May)				
		10%	50%	90%	Mean	Sample size	10%	50%	90%	Mean	Sample size
1999	Wild	27	32	47	35	81	12	16	17	15	29
	Hatchery	25	31	47	34	47	12	16	18	15	27
2000	Wild	31	36	41	36	238	11	14	18	14	40

Spawn year	Origin	Steelhead Migration Time (week)									
		Summer-Autumn Migration (Jun-Dec)					Winter-Spring Migration (Jan-May)				
		10%	50%	90%	Mean	Sample size	10%	50%	90%	Mean	Sample size
	Hatchery	31	34	41	36	194	12	14	16	14	69
2001	Wild	29	34	41	35	391	13	15	17	15	84
	Hatchery	30	38	41	36	227	12	16	17	15	156
2002	Wild	29	39	46	38	810	13	14	17	14	181
	Hatchery	35	42	46	41	610	12	15	18	15	124
2003	Wild	30	33	40	35	731	3	9	16	9	193
	Hatchery	30	35	51	37	372	3	9	15	9	538
2004	Wild	30	40	45	39	644	13	16	18	16	222
	Hatchery	29	40	44	38	677	11	17	19	16	361
2005	Wild	30	39	43	38	986	10	15	17	15	206
	Hatchery	27	38	42	36	1,112	12	16	18	15	377
2006	Wild	29	40	43	39	428	12	15	17	15	191
	Hatchery	29	41	43	39	334	4	13	16	12	181
2007	Wild	30	36	41	35	277	11	17	17	15	108
	Hatchery	29	38	43	36	90	11	17	18	16	214
2008	Wild	30	38	43	38	397	13	15	18	16	123
	Hatchery	33	41	45	40	554	14	18	19	17	311
2009	Wild	30	37	46	37	338	13	15	19	15	87
	Hatchery	29	35	46	36	1,133	13	16	19	16	229
2010	Wild	31	37	45	38	648	11	15	18	15	171
	Hatchery	31	40	45	40	1,207	12	16	19	16	309
2011	Wild	29	36	44	36	797	13	17	19	17	118
	Hatchery	31	39	45	39	991	15	18	19	18	240
2012	Wild	31	34	41	35	642	15	20	20	17	83
	Hatchery	32	39	43	38	715	15	19	19	17	223
2013	Wild	31	36	43	37	755	13	16	18	15	55
	Hatchery	31	42	45	40	1,431	16	17	18	16	210
Average	***Wild***	***30***	***36***	***43***	***37***	***544***	***12***	***15***	***18***	***15***	***126***
	Hatchery	***30***	***38***	***44***	***38***	***646***	***12***	***16***	***18***	***15***	***238***

Table 3.19b. The month that 10%, 50% (median), and 90% of the wild and hatchery steelhead passed Tumwater Dam during their summer-autumn migration (June through December) and during their winter-spring migration (January through May), 1999-2013. The average month is also provided for both migration periods. Migration timing is based on video sampling at Tumwater. The presence of eroded fins and/or missing adipose fins was used to distinguish hatchery fish from wild fish during video monitoring at Tumwater Dam. Estimates also include steelhead collected for broodstock.

Spawn year	Origin	Steelhead Migration Time (month)									
		Summer-Autumn Migration (Jun-Dec)					Winter-Spring Migration (Jan-May)				
		10%	50%	90%	Mean	Sample size	10%	50%	90%	Mean	Sample size
1999	Wild	7	8	11	8	81	3	4	4	4	29
	Hatchery	6	8	11	8	47	3	4	4	4	27
2000	Wild	8	9	10	9	238	3	4	5	4	40
	Hatchery	8	8	10	9	194	3	4	4	4	69
2001	Wild	7	8	10	8	391	3	4	4	4	84
	Hatchery	7	9	10	9	227	3	4	4	4	156
2002	Wild	7	9	11	9	810	3	4	4	4	181
	Hatchery	9	10	11	10	610	3	4	5	4	124
2003	Wild	7	8	10	8	731	1	3	4	3	193
	Hatchery	7	8	12	9	372	1	3	4	2	538
2004	Wild	7	10	11	9	644	3	4	4	4	222
	Hatchery	7	10	10	9	677	3	4	5	4	361
2005	Wild	7	9	10	9	986	3	4	4	4	206
	Hatchery	7	9	10	9	1,112	3	4	5	4	377
2006	Wild	7	10	10	10	428	3	4	4	4	191
	Hatchery	7	10	10	9	334	1	3	4	3	181
2007	Wild	7	9	10	9	277	3	4	4	4	108
	Hatchery	7	9	10	9	90	3	4	5	4	214
2008	Wild	7	9	10	9	397	3	4	5	4	123
	Hatchery	8	10	11	10	554	4	4	5	4	311
2009	Wild	7	9	11	9	338	3	4	5	4	87
	Hatchery	7	8	11	9	1,133	3	4	5	4	229
2010	Wild	8	9	11	9	648	3	4	5	4	171
	Hatchery	8	10	11	10	1,207	3	4	5	4	309
2011	Wild	7	9	11	9	797	4	4	5	4	118
	Hatchery	8	9	11	9	991	4	5	5	5	240
2012	Wild	8	8	10	9	642	4	4	5	4	83
	Hatchery	8	9	10	9	715	4	4	5	4	223
2013	Wild	8	9	10	9	755	4	4	5	4	55
	Hatchery	8	10	11	10	1,431	4	4	5	4	210
Average	***Wild***	***7***	***9***	***10***	***9***	***544***	***3***	***4***	***4***	***4***	***126***

Spawn year	Origin	Steelhead Migration Time (month)									
		Summer-Autumn Migration (Jun-Dec)					Winter-Spring Migration (Jan-May)				
		10%	50%	90%	Mean	Sample size	10%	50%	90%	Mean	Sample size
	Hatchery	*7*	*9*	*11*	*9*	*646*	*3*	*4*	*5*	*4*	*238*

Age at Maturity

Nearly all steelhead broodstock collected at Tumwater and Dryden dams lived in saltwater 1 to 2 years (saltwater age) (Table 3.20; Figure 3.6). Very few saltwater age-3 fish returned and those that did were wild fish. On average, there was a difference between the saltwater age at return of wild and hatchery fish. A greater number of wild fish returned as saltwater age-2 fish than did hatchery fish. In contrast, a greater number of hatchery fish returned as saltwater-1 fish than did wild fish.

Table 3.20. Proportions of wild and hatchery steelhead broodstock of different ages collected at Tumwater and Dryden dams, 1998-2013. Age represents the number of years the fish lived in salt water.

Sample year	Origin	Saltwater age			Sample size
		1	2	3	
1998	Wild	0.39	0.61	0.00	35
	Hatchery	0.21	0.79	0.00	43
1999	Wild	0.50	0.48	0.02	58
	Hatchery	0.82	0.18	0.00	67
2000	Wild	0.56	0.44	0.00	39
	Hatchery	0.68	0.32	0.00	101
2001	Wild	0.52	0.48	0.00	64
	Hatchery	0.15	0.85	0.00	114
2002	Wild	0.56	0.44	0.00	99
	Hatchery	0.95	0.05	0.00	113
2003	Wild	0.13	0.85	0.02	63
	Hatchery	0.29	0.71	0.00	92
2004	Wild	0.95	0.05	0.00	85
	Hatchery	0.95	0.05	0.00	132
2005	Wild	0.22	0.78	0.00	95
	Hatchery	0.21	0.79	0.00	114
2006	Wild	0.29	0.71	0.00	101
	Hatchery	0.60	0.40	0.00	98
2007	Wild	0.40	0.59	0.00	79
	Hatchery	0.62	0.38	0.00	97
2008	Wild	0.65	0.34	0.01	104
	Hatchery	0.89	0.11	0.00	107
2009	Wild	0.40	0.58	0.20	83

Sample year	Origin	Saltwater age			Sample size
		1	2	3	
	Hatchery	0.23	0.77	0.0	77
2010	Wild	0.65	0.34	0.01	92
	Hatchery	0.77	0.23	0.00	98
2011	Wild	0.28	0.73	0.00	102
	Hatchery	0.36	0.64	0.00	100
2012	Wild	0.42	0.53	0.05	59
	Hatchery	0.41	0.59	0.00	66
2013	Wild	0.41	0.57	0.02	54
	Hatchery	0.45	0.55	0.00	77
Average	***Wild***	***0.46***	***0.52***	***0.02***	***72***
	Hatchery	***0.57***	***0.43***	***0.00***	***89***

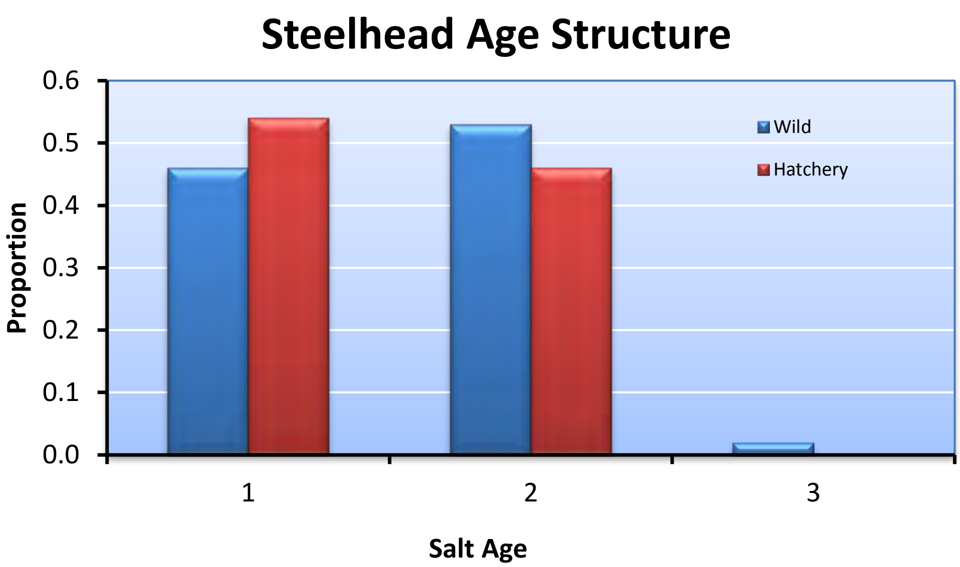


Figure 3.6. Proportions of wild and hatchery steelhead of different saltwater ages sampled at Tumwater Dam for the combined years 1998-2013.

Size at Maturity

On average, hatchery steelhead collected at Tumwater and Dryden dams were about 3 cm smaller than wild steelhead (Table 3.21). This may be related to the fact that more wild steelhead return as saltwater age-2 fish than hatchery steelhead.

Table 3.21. Mean fork length (cm) at age (saltwater ages) of hatchery and wild steelhead collected from broodstock, 1998-2013; N = sample size and SD = 1 standard deviation.

Return year	Origin	Steelhead fork length (cm)								
		1-Salt			2-Salt			3-Salt		
		Mean	N	SD	Mean	N	SD	Mean	N	SD
1998	Wild	63	15	4	79	20	5	-	0	-
	Hatchery	61	9	4	73	34	4	-	0	-
1999	Wild	65	29	5	74	28	5	77	1	-
	Hatchery	62	54	4	73	12	4	-	0	-
2000	Wild	64	22	3	74	17	5	-	0	-
	Hatchery	60	57	3	71	27	4	-	0	-
2001	Wild	61	33	6	77	31	5	-	0	-
	Hatchery	62	17	4	72	97	4	-	0	-
2002	Wild	64	55	4	77	44	4	-	0	-
	Hatchery	63	106	4	73	6	4	-	0	-
2003	Wild	69	8	6	77	52	5	91	1	-
	Hatchery	66	27	4	75	65	4	-	0	-
2004	Wild	63	73	6	78	4	2	-	0	-
	Hatchery	61	59	3	73	3	1	-	0	-
2005	Wild	59	21	4	74	74	5	-	0	-
	Hatchery	59	23	4	72	89	4	-	0	-
2006	Wild	63	27	5	75	67	6	-	0	-
	Hatchery	61	41	4	72	27	5	-	0	-
2007	Wild	64	31	6	76	46	5	-	0	-
	Hatchery	60	60	4	71	36	5	-	0	-
2008	Wild	64	68	4	77	35	4	80	2	-
	Hatchery	60	95	4	72	12	2	-	0	-
2009	Wild	65	33	5	76	48	6	81	2	0
	Hatchery	63	18	4	75	59	5	-	0	-
2010	Wild	64	60	5	74	31	5	76	1	-
	Hatchery	61	53	5	73	23	5	-	0	-
2011	Wild	62	28	5	76	74	5	-	0	-
	Hatchery	60	36	4	74	64	4	-	0	-
2012	Wild	63	25	3	74	31	5	74	3	2
	Hatchery	59	27	3	74	39	4	-	0	-
2013	Wild	61	22	5	77	31	5	74	1	-
	Hatchery	60	35	3	74	42	4	-	0	-
Average	***Wild***	***64***	***35***	***5***	***76***	***40***	***5***	***80***	***1***	***1***
	Hatchery	***61***	***45***	***4***	***73***	***40***	***4***	***-***	***0***	***-***

Contribution to Fisheries

Nearly all harvest on Wenatchee steelhead occurs within the Columbia basin. Harvest rates on steelhead in the Lower Columbia River fisheries (both tribal and non-tribal) are generally less than 5-10% (NMFS 2004). WDFW regulates steelhead harvest in the Upper Columbia. Under certain conditions, WDFW may allow a harvest on hatchery steelhead (adipose fin clipped fish). The intent is to reduce the number of hatchery steelhead that exceed habitat seeding levels in spawning areas and to increase the proportion of wild steelhead in spawning populations.

Origin on Spawning Grounds

At this time, origin of steelhead (wild or hatchery) on spawning grounds cannot be determined precisely. However, based on scales collected during steelhead run composition sampling at Dryden Dam in 2012 (2013 spawners), naturally produced steelhead made up about 27.5% of the escapement. The abundance of hatchery fish in the upper Wenatchee Basin was controlled at Tumwater Dam. A total of 1,236 hatchery fish were killed resulting in an escapement of 1,087 steelhead comprising 69% (N = 745) wild-origin fish.

Straying

Stray rates of Wenatchee steelhead can be estimated by examining the locations where PIT-tagged hatchery steelhead were last detected. PIT tagging of steelhead began with brood year 2005, which allows estimation of stray rates by brood return. These data only provide estimates for brood years 2005 through 2009, because later brood years are still rearing in the ocean. The target for brood year stray rates should be less than 5%.

Based on PIT-tag analyses, on average, about 26% of the hatchery steelhead returns were last detected in streams outside the Wenatchee River basin (Table 3.22). The numbers in Table 3.22 should be considered rough estimates because they are not based on confirmed spawning (only last detections) and the numbers have not been adjusted for detection efficiencies, which currently do not exist for most PIT-tag detection arrays in tributaries. What these data do indicate is that large numbers of hatchery steelhead from the Wenatchee program have wandered or strayed into the Entiat and Methow rivers, and also into the Deschutes and Tucannon rivers. About 34% of the fish were last detected at Wells Dam.

Table 3.22. Number and percent of hatchery-origin Wenatchee steelhead that homed to target spawning areas and the target hatchery program, and number and percent that strayed to non-target spawning areas and hatchery programs for brood years 2005 to 2009. Estimates were based on last detections of PIT-tagged hatchery steelhead. Percent strays should be less than 5%.

Brood Year	Homing				Straying			
	Target streams		Target hatchery		Non-target stream		Non-target hatchery	
	Number	%	Number	%	Number	%	Number	%
2005	80	75.5	0	0.0	26	24.5	0	0.0
2006	71	61.7	1	0.9	43	37.7	0	0.0
2007	171	60.6	0	0.0	111	39.4	0	0.0
2008	79	88.8	0	0.0	10	11.2	0	0.0
2009	182	84.3	0	0.0	34	15.7	0	0.0

Brood Year	Homing				Straying			
	Target streams		Target hatchery		Non-target stream		Non-target hatchery	
	Number	%	Number	%	Number	%	Number	%
Average	***117***	***74.2***	***0***	***0.2***	***45***	***25.7***	***0***	***0.0***

At this time, we cannot estimate among population stray rates by return year, because we have no estimates of detection efficiencies for PIT-tag interrogation sites within different tributaries. These data are needed to estimate the total number of Wenatchee steelhead that stray into areas outside the Wenatchee River basin. Finally, for the same reason, we cannot evaluate within population stray rates.

Genetics

Genetic studies were conducted to determine the potential effects of the Wenatchee Supplementation Program on natural-origin summer steelhead in the Wenatchee River basin (Seamons et al. 2012; the entire report is appended as Appendix E). Temporal collections of tissue samples from Wenatchee hatchery-produced and natural-origin adults sampled at Dryden and Tumwater dams and from natural-origin juveniles from three Wenatchee River tributaries and the Entiat River were surveyed for genetic variation with 132 genetic (single nucleotide polymorphism loci; SNPs) markers. Peshastin Creek and the Entiat River served as no-hatchery-outplant controls. Genetic data were interrogated for the presence or absence of spatial and temporal trends in allele frequencies, genetic distances, and effective population size.

Allele Frequencies—Changes to the summer steelhead hatchery supplementation program had no detectable effect on genetic diversity of wild populations. On average, hatchery-origin adults had higher minor allele frequencies (MAF) than natural-origin adults, which may simply reflect the mixed ancestry of hatchery adults. Both hatchery and natural-origin adults had MAF similar to juveniles collected in spawning tributaries and in the Entiat River. There was no temporal trend in allele frequencies or observed heterozygosity in adult or juvenile collections and allele frequencies in control populations were no different than those still receiving hatchery outplants. This suggests that the hatchery program has had little effect on allele frequencies since broodstock sources changed in 1998 from mixed-ancestry broodstock collected in the Columbia River to using broodstock collected in the Wenatchee River.

Genetic Distances—As intended, interbreeding of Wenatchee River hatchery and natural-origin adults reduced the genetic differences between Wells Hatchery adults and Wenatchee River natural-origin adults observed in the first few years after changing the broodstock collection protocol. Although there were detectable genetic differences between hatchery and natural-origin adults, the magnitude of that difference declined over time. Hatchery adults were genetically different from natural-origin adults and juveniles based on pair-wise F_{ST} and principal components analysis, most likely because of the smaller effective population size (N_{b}) in the hatchery population (see below). Pair-wise F_{ST} estimates and genetic distances between hatchery and natural-origin adults collected the same year declined over time suggesting that the interbreeding of hatchery and natural-origin adults in the hatchery (and presumably in the wild) is slowly homogenizing Wenatchee River summer steelhead. Analyses using brood year were inconclusive because of limitations in the data.

Effective Population Size—Although the effective population size of the Wenatchee River hatchery steelhead program was consistently small, it does not appear to have caused a reduction in the effective population size of wild populations. On average, estimates of N_b were much lower and varied less for hatchery adults than for natural-origin adults and juveniles. Estimates of N_b for hatchery adults declined from the earliest brood years to a stable new low value after broodstock practices were changed in 1998. There was no indication that this had any effect on N_b in natural-origin adults and juveniles; N_b estimates for natural-origin adults and juveniles were, on average, higher and varied considerably over the 1998-2010 time period and showed no temporal trend.

Proportion of Natural Influence

Another method for assessing the genetic risk of a supplementation program is to determine the influence of the hatchery and natural environments on the adaptation of the composite population. This is estimated by the proportion of natural-origin fish in the hatchery broodstock (pNOB) and the proportion of hatchery-origin fish in the natural spawning escapement (pHOS). The ratio pNOB/(pHOS+pNOB) is the Proportion of Natural Influence (PNI). The larger the ratio (PNI), the greater the strength of selection in the natural environment relative to that of the hatchery environment. In order for the natural environment to dominate selection, PNI should be greater than 0.50, and important integrated populations should have a PNI of at least 0.67 (HSRG/WDFW/NWIFC 2004).

For brood years 2001-2013, the PNI was less than 0.67 (Table 3.23), suggesting that the hatchery environment has a greater influence on adaptation of Wenatchee steelhead than does the natural environment.

Table 3.23. Proportionate natural influence (PNI) of the Wenatchee steelhead supplementation program for brood years 2001-2013. PNI was calculated as the proportion of naturally produced steelhead in the hatchery broodstock (pNOB) divided by the proportion of hatchery steelhead on the spawning grounds (pHOS) plus pNOB. NOS = number of natural-origin steelhead on the spawning grounds; HOS = number of hatchery-origin steelhead on the spawning grounds; NOB = number of natural-origin steelhead collected for broodstock; and HOB = number of hatchery-origin steelhead included in hatchery broodstock.

Brood year	Spawners[a]			Broodstock			PNI
	NOS	HOS	pHOS	NOB	HOB	pNOB	
2001	158	127	0.45	51	103	0.33	0.43
2002	731	542	0.43	96	64	0.60	0.59
2003	355	350	0.50	49	90	0.35	0.42
2004	371	445	0.55	75	61	0.55	0.50
2005	690	862	0.56	87	104	0.46	0.45
2006	253	210	0.45	93	69	0.57	0.56
2007	145	115	0.44	76	58	0.57	0.56
2008	168	279	0.62	77	54	0.59	0.48
2009	171	545	0.76	86	73	0.54	0.42
2010	524	970	0.65	96	75	0.56	0.46
2011	351	472	0.57	91	70	0.57	0.50
2012	381	209	0.35	59	65	0.48	0.57

Brood year	Spawners[a]			Broodstock			PNI
	NOS	HOS	pHOS	NOB	HOB	pNOB	
2013	322	148	0.31	49	68	0.42	0.57
Average	***355***	***406***	**0.51**	***76***	***73***	**0.51**	**0.50**

[a] Proportions of natural-origin and hatchery-origin spawners were determined from video tape at Tumwater Dam. Therefore, these PNI estimates are appropriate for steelhead spawning upstream from Tumwater Dam. They may not represent PNI for steelhead spawning downstream from Tumwater Dam.

Natural and Hatchery Replacement Rates

Natural replacement rates (NRR) were calculated as the ratio of natural-origin recruits (NOR) to the parent spawning population (spawning escapement). Natural-origin recruits are naturally produced (wild) fish that survive to contribute to harvest (directly or indirectly), to broodstock, and to spawning grounds. We do not account for fish that died in route to the spawning grounds (migration mortality) or died just before spawning (pre-spawn mortality) (see Appendix B in Hillman et al. 2012). For brood years 1998-2004, NRR for summer steelhead in the Wenatchee River basin averaged 0.88 (range, 0.10-3.10) if harvested fish were included in the estimate (Table 3.24).

Hatchery replacement rates (HRR) are the hatchery adult-to-adult returns and were calculated as the ratio of hatchery-origin recruits (HOR) to the parent broodstock collected. These rates should be greater than the NRRs and greater than or equal to 19.2 (the calculated target value in Murdoch and Peven 2005). In nearly all years, HRRs were greater than NRRs (Table 3.24). HRRs exceeded the estimated target value of 19.2 in one of the seven years.

Table 3.24. Broodstock collected, spawning escapements, natural and hatchery-origin recruits (NOR and HOR), and natural and hatchery replacement rates (NRR and HRR with harvest) for summer steelhead in the Wenatchee River basin, brood years 1998-2004.

Brood year	Broodstock Collected	Spawning Escapement	Harvest included			
			HOR	NOR	HRR	NRR
1998	78	602	148	1,867	1.89	3.10
1999	125	343	1,944	334	15.55	0.97
2000	120	1,030	312	878	2.60	0.85
2001	178	1,655	10,335	1,050	58.06	0.66
2002	162	5,000	1,905	515	11.76	0.13
2003	155	2,598	956	504	6.17	0.27
2004	140	2,948	1,127	827	8.05	0.33
Average	***137***	***2,025***	***2,390***	***854***	***14.87***	***0.88***

Smolt-to-Adult Survivals

Smolt-to-adult ratios (SARs) are calculated as the number of returning hatchery adults divided by the number of tagged hatchery smolts released. SARs are generally based on CWT returns. However, Wenatchee steelhead have not been extensively tagged with CWTs. Therefore, elastomer-tagged fish were used to estimate SARs from release to capture at Priest Rapids Dam.

SARs (not adjusted for tag loss) for Wenatchee steelhead ranged from 0.0009 to 0.0308 (mean = 0.0078) for brood years 1996-2006 (Table 3.25).

Table 3.25. Smolt-to-adult ratios (SARs) for Wenatchee hatchery steelhead, 1996-2006. Estimates were based on elastomer tags recaptured at Priest Rapids Dam. SARs were not adjusted for tag loss after release.

Brood year	Number of tagged smolts released	SAR
1996	348,693	0.0034
1997	429,422	0.0041
1998	172,078	0.0009
1999	175,661	0.0111
2000	184,639	0.0017
2001	335,933	0.0308
2002	302,060	0.0063
2003	374,867	0.0025
2004	294,114	0.0038
2005	452,184	0.0107
2006	299,937	0.0100
Average	***306,326***	***0.0078***

3.7 ESA/HCP Compliance

Broodstock Collection

Collection of brood year 2012 broodstock for Wenatchee steelhead at Tumwater and Dryden dams began on 2 July and ended on 29 October 2011 and represented a slightly shortened collection duration from the 1 July to 12 November collection period identified in the 2011 broodstock collection protocol. The broodstock collection protocols specified and achieved a total collection of 129 steelhead, including 63 natural-origin steelhead.

About 1,309 steelhead were handled and released (or surplused) at Tumwater Dam and at Dryden Dam during brood year 2011 Wenatchee steelhead broodstock collection. Most were hatchery-origin fish handled at Tumwater Dam and ultimately surplused to meet the pHOS objective upstream from Tumwater Dam. Fish released at Dryden Dam were released because the weekly quota for hatchery or wild steelhead had been attained, but not both, or because they were non-target (red/green VIE tagged), or they were unidentifiable hatchery-origin steelhead. All steelhead released were allowed to fully recover from the anesthesia and released immediately upstream from the trap sites.

In addition to steelhead encountered at Dryden Dam during steelhead broodstock collection, an estimated 224 spring Chinook salmon were captured and released unharmed immediately upstream from the trap facility. Consistent with ESA Section 10 Permit 1395 impact minimization measures, all ESA species handled at this site were subject of water-to-water transfers.

Hatchery Rearing and Release

The 2012 brood Wenatchee steelhead reared throughout all life-stages without significant mortality (defined as >10% population mortality associated with a single event). However, the 2012 brood had poor fertilization to eyed-egg survival resulting in an unfertilized-to-release survival of 67.1%, which was less than the program target of 81% (see Section 3.2).

Juvenile rearing occurred at three separate facilities including Eastbank Fish Hatchery, Chelan Falls Fish Hatchery, and Chiwawa Ponds. Multiple facilities were used to take advantage of variable water temperatures to manipulate growth of juveniles from different parental crosses. Typically, wild steelhead spawn later than their hatchery cohort and are therefore reared at Chelan Falls Fish Hatchery on warmer water to accelerate their growth so they achieve a size at release similar to HxH parental cross progeny reared on cooler water at Eastbank Fish Hatchery. All parental cross groups received final rearing and over-winter acclimation at Chiwawa Ponds on Wenatchee River and Chiwawa River surface water before direct release (scatter planting) in the Wenatchee River basin.

The 2012 brood steelhead smolt release in the Wenatchee River basin totaled 249,004 smolts, representing about 100.7% of the program target of 247,300 smolts identified in the Rocky Reach and Rock Island Dam HCPs and in ESA Section 10 Permit 1395. As specified in ESA Section 10 Permit 1395, all steelhead smolts released were externally marked or tagged and a representative number were PIT tagged (see Section 3.2).

Hatchery Effluent Monitoring

Per ESA Permits 1196, 1347, 1395, 18118, 18119, and 18121, permit holders shall monitor and report hatchery effluents in compliance with applicable National Pollution Discharge Elimination Systems (NPDES) (EPA 1999) permit limitations. There was one NPDES violation reported at PUD Hatchery facilities during the period 1 January 2012 through 31 December 2013. NPDES monitoring and reporting for Chelan PUD Hatchery Programs during 2013 are provided in Appendix F.

Smolt and Emigrant Trapping

Per ESA Section 10 Permit No. 1395, the permit holders are authorized a direct take of up to 20% of the emigrating steelhead population and a lethal take not to exceed 2% of the fish captured (NMFS 2003). Based on the estimated wild steelhead population (smolt trap expansion) and hatchery juvenile steelhead population estimate (hatchery release data) for the Wenatchee River basin, the reported steelhead encounters during the 2013 emigration complied with take provisions in the Section 10 permit and are detailed in Table 3.26. Additionally, juvenile fish captured at the trap locations were handled consistent with provisions in ESA Section 10 Permit 1395 Section B.

Table 3.26. Estimated take of Upper Columbia River steelhead resulting from juvenile emigration monitoring in the Wenatchee River basin, 2013. NA = not available.

Trap location	Population estimate				Number trapped				Total	Take allowed by Permit
	Wild	Hatchery[b]	Parr	Fry	Wild	Hatchery	Parr	Fry		
Chiwawa Trap										
Population	NA	31,050	NA	NA	183	1,664	1,738	242	3,827	
Encounter rate	NA	NA	NA	NA	NA	0.0536	NA	NA	0.1235	0.20
Mortality [b]	NA	NA	NA	NA	0	1	15	4	20	
Mortality rate	NA	NA	NA	NA	0.0000	0.0006	0.0086	0.0165	0.0052	0.02
Upper Wenatchee Trap										
Population	NA	54,479	NA	NA	5	65	127	1,105	1,302	
Encounter rate	NA	NA	NA	NA	NA	0.0012	NA	NA	0.0239	0.20
Mortality [b]	NA	NA	NA	NA	0	0	2	3	5	
Mortality rate	NA	NA	NA	NA	0.0000	0.0000	0.0157	0.0027	0.0038	0.02
Lower Wenatchee Trap										
Population	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Encounter rate	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.20
Mortality [b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Mortality rate	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.02
Wenatchee River basin Total										
Population	NA	206,397	NA	NA	188	1,729	1,865	1,347	5,129	
Encounter rate	NA	NA	NA	NA	NA	0.0084	NA	NA	0.0249	0.20
Mortality [b]	NA	NA	NA	NA	0	1	17	7	25	
Mortality rate	NA	NA	NA	NA	0.0000	0.0006	0.0091	0.0052	0.0049	0.02

[a] 2012 smolt release data for the Wenatchee River basin.

[b] Mortality includes trapping and PIT-tag mortalities.

Spawning Surveys

Steelhead spawning ground surveys were conducted in the Wenatchee River basin during 2013, as authorized by ESA Section 10 Permit No. 1395. Because of the difficulty of quantifying the level of take associated with spawning ground surveys, the Permit does not specify a take level associated with these activities, even though it does authorize implementation of spawning ground surveys. Therefore, no take levels are reported. However, to minimize potential effects to established redds, wading was restricted to the extent practical, and extreme caution was used to avoid established redds when wading was required.

Stock Assessment at Priest Rapids Dam

Upper Columbia River steelhead stock assessment sampling at Priest Rapids Dam (PRD) is authorized through ESA Section 10 Permit No. 1395 (NMFS 2003). Permit authorizations include interception and biological sampling of up to 10% of the Upper Columbia River steelhead passing PRD to determine upriver adult population size, estimate hatchery to wild ratios, determine age-class contribution, and evaluate the need for managing hatchery steelhead consistent with ESA recovery objectives, which include fully seeding spawning habitat with naturally produced Upper Columbia River steelhead supplemented with artificially propagated steelhead (NMFS 2003). The 2011-2012 run-cycle report (BY 2011) for stock assessment sampling at Priest Rapids Dam was compiled under provisions of ESA Section 10 Permit 1395. Data and reporting information are included in Appendix G.

SECTION 4: WENATCHEE SOCKEYE SALMON

4.1 Broodstock Sampling

The Wenatchee sockeye program was terminated in 2012. Thus, no broodstock have been collected since 2011 and the release of juvenile sockeye into Lake Wenatchee in 2012 (2011 brood) was the last. Therefore, this section presents the history of the program and tracks the juveniles from the 2011 brood that were released as parr into Lake Wenatchee in 2012. Some of these fish began their smolt migrations in 2013.

Origin of Broodstock

Wenatchee sockeye broodstock have not been collected since 2011. Table 4.1 shows the history of the number of broodstock that were collected during the period 1989 to 2011.

Table 4.1. Numbers of wild and hatchery sockeye salmon collected for broodstock, numbers that died before spawning, and numbers of sockeye spawned, 1989-2011. Unknown origin fish (i.e., undetermined by scale analysis, no CWT or fin clips, and no additional hatchery marks) were considered naturally produced. Mortality includes sockeye that died of natural causes typically near the end of spawning and were not needed for the program, surplus sockeye killed at spawning, sockeye that died but were not recovered from the net pens, and sockeye that may have jumped out of the net pens.

Brood year	Wild sockeye					Hatchery sockeye					Total number spawned
	Number collected	Prespawn loss	Mortality	Number spawned	Number released	Number collected	Prespawn loss	Mortality	Number spawned	Number released	
1989	299	93	47	115	44	0	0	0	0	0	115
1990	333	7	7	302	17	0	0	0	0	0	302
1991	357	18	16	199	124	0	0	0	0	0	199
1992	362	18	5	320	19	0	0	0	0	0	320
1993	307	79	21	207	0	0	0	0	0	0	207
1994	329	15	9	236	69	5	0	0	5	0	241
1995	218	5	7	194	12	3	0	0	3	0	197
1996	291	2	0	225	64	20	0	0	0	20	225
1997	283	12	3	192	76	19	0	0	19	0	211
1998	225	37	25	122	41	6	0	0	6	0	128
1999	90	7	1	79	3	60	0	0	60	0	139
2000	256	19	1	170	66	5	0	0	5	0	175
2001	252	27	10	200	15	8	1	0	7	0	207
2002	257	0	1	256	0	0	0	0	0	0	256
2003	261	12	9	198	42	0	0	0	0	0	198
2004	211	13	12	177	9	0	0	0	0	0	177
2005	243	29	12	166	36	0	0	0	0	0	166
2006	260	2	4	214	40	0	0	0	0	0	214
2007	248	15	3	210	20	0	0	0	0	0	210
2008	258	4	11	243	0	2	0	0	2	0	245
2009	258	5	14	239	0	3	0	3	0	0	239
2010	256	3	0	198	55	0	0	0	0	0	256
2011	204	0	8	196	0	0	0	0	0	0	196
Average	***263***	***18***	***10***	***203***	***33***	***6***	***0***	***0***	***5***	***1***	***210***

Age/Length Data

Ages of sockeye were determined from scales and otoliths collected from broodstock and are shown in Table 4.2.

Table 4.2. Percent of hatchery and wild sockeye salmon of different ages (total age) collected from broodstock, 1994-2011.

Return year	Origin	Total age		
		4	5	6
1994	Wild	57.3	41.7	1.0
	Hatchery	40.0	60.0	0.0
1995	Wild	77.3	20.7	2.0
	Hatchery	66.7	33.3	0.0
1996	Wild	65.8	34.2	0.0
	Hatchery	0.0	0.0	0.0
1997	Wild	86.5	13.5	0.0
	Hatchery	57.9	42.1	0.0
1998	Wild	9.9	88.6	1.5
	Hatchery	66.7	33.3	0.0
1999	Wild	21.8	74.7	3.5
	Hatchery	90.0	8.3	1.7
2000	Wild	97.7	2.3	0.0
	Hatchery	100.0	0.0	0.0
2001	Wild	69.9	29.6	0.5
	Hatchery	71.4	28.6	0.0
2002	Wild	31.6	67.6	0.8
	Hatchery	0.0	0.0	0.0
2003	Wild	2.6	90.5	6.9
	Hatchery	0.0	0.0	0.0
2004	Wild	97.5	2.0	0.5
	Hatchery	0.0	0.0	0.0
2005	Wild	74.2	25.8	0.0
	Hatchery	0.0	0.0	0.0
2006	Wild	34.0	65.5	0.5
	Hatchery	0.0	0.0	0.0
2007	Wild	1.9	88.4	9.7
	Hatchery	0.0	0.0	0.0
2008	Wild	95.0	4.0	1.0
	Hatchery	100.0	0.0	0.0
2009	Wild	78.5	21.5	0.0

Return year	Origin	Total age		
		4	5	6
	Hatchery	100.0	0.0	0.0
2010	Wild	67.4	32.6	0.0
	Hatchery	0.0	0.0	0.0
2011	Wild	53.7	44.3	2.0
	Hatchery	0.0	0.0	0.0
Average	***Wild***	***56.8***	***41.5***	***1.7***
	Hatchery	***38.5***	***11.4***	***0.1***

Lengths and ages of sockeye sampled during the life of the program are provided in Table 4.3.

Table 4.3. Mean fork length (cm) at age (total age) of hatchery and wild sockeye salmon collected for broodstock, 1994-2011; SD = 1 standard deviation.

Return year	Origin	Sockeye fork length (cm)								
		Age-4			Age-5			Age-6		
		Mean	N	SD	Mean	N	SD	Mean	N	SD
1994	Wild	56	125	3	55	91	3	54	2	3
	Hatchery	57	2	1	56	3	1	-	0	-
1995	Wild	51	153	2	55	41	4	54	4	5
	Hatchery	53	2	4	59	1	-	-	0	-
1996	Wild	52	146	4	53	76	3	-	0	-
	Hatchery	-	0	-	-	0	-	-	0	-
1997	Wild	50	166	3	53	26	5	-	0	-
	Hatchery	54	11	4	59	8	2	-	0	-
1998	Wild	51	13	4	55	117	3	53	2	3
	Hatchery	52	4	2	55	2	8	-	0	-
1999	Wild	52	19	4	50	65	4	56	3	1
	Hatchery	50	54	3	56	5	4	56	1	-
2000	Wild	52	167	2	54	4	3	-	0	-
	Hatchery	54	5	1	-	0	-	-	0	-
2001	Wild	54	151	3	56	65	4	58	1	-
	Hatchery	51	5	5	55	2	4	-	0	-
2002	Wild	54	77	2	56	165	4	57	2	0
	Hatchery	-	0	-	-	0	-	-	0	-
2003	Wild	54	5	4	60	172	2	60	13	4
	Hatchery	-	0	-	-	0	-	-	0	-
2004	Wild	53	192	3	56	4	3	63	1	-
	Hatchery	-	0	-	-	0	-	-	0	-
2005	Wild	51	132	3	57	46	4	-	0	-
	Hatchery	-	0	-	-	0	-	-	0	-

Return year	Origin	Sockeye fork length (cm)								
		Age-4			Age-5			Age-6		
		Mean	N	SD	Mean	N	SD	Mean	N	SD
2006	Wild	52	70	3	56	135	4	54	2	3
	Hatchery	-	0	-	-	0	-	-	0	-
2007	Wild	57	4	2	58	182	5	58	20	5
	Hatchery	-	0	-	-	0	-	-	0	-
2008	Wild	52	245	3	52	11	3	62	2	6
	Hatchery	53	2	3	-	-	-	-	-	-
2009	Wild	54	197	3	59	54	4	-	-	-
	Hatchery	54	2	1	-	-	-	-	-	-
2010	Wild	56	130	2	57	63	4	-	-	-
	Hatchery	-	-	-	-	-	-	-	-	-
2011	Wild	55	109	2	59	90	3	61	4	3
	Hatchery	-	-	-	-	-	-	-	-	-
Average	***Wild***	***53***	***116***	***3***	***55***	***78***	***4***	***57***	***3***	***3***
	Hatchery	***53***	***5***	***3***	***57***	***2***	***4***	***56***	***1***	***-***

Sex Ratios

Sex ratios of wild and hatchery sockeye collected during the life of the program are presented in Table 4.4.

Table 4.4. Numbers of male and female wild and hatchery sockeye collected for broodstock, 1989-2011. Ratios of males to females are also provided.

Return year	Number of wild sockeye			Number of hatchery sockeye			Total M/F ratio
	Males (M)	Females (F)	M/F	Males (M)	Females (F)	M/F	
1989	162	137	1.18:1.00	0	0	-	1.18:1.00
1990	177	156	1.13:1.00	0	0	-	1.13:1.00
1991	260	97	2.68:1.00	0	0	-	2.68:1.00
1992	180	182	0.99:1.00	0	0	-	0.99:1.00
1993	130	177	0.73:1.00	0	0	-	0.73:1.00
1994	162	167	0.97:1.00	1	4	0.25:1.00	0.95:1.00
1995	102	116	0.88:1.00	1	2	0.50:1.00	0.87:1.00
1996	150	161	0.93:1.00	0	0	-	0.93:1.00
1997	139	144	0.97:1.00	10	9	1.11:1.00	0.97:1.00
1998	115	110	1.05:1.00	2	4	0.50:1.00	1.03:1.00
1999	22	68	0.32:1.00	37	23	1.61:1.00	0.65:1.00
2000	155	101	1.53:1.00	3	2	1.50:1.00	1.53:1.00
2001	114	138	0.83:1.00	4	4	1.00:1.00	0.83:1.00
2002	128	129	0.99:1.00	0	0	-	0.99:1.00

Return year	Number of wild sockeye			Number of hatchery sockeye			Total M/F ratio
	Males (M)	Females (F)	M/F	Males (M)	Females (F)	M/F	
2003	161	100	1.61:1.00	0	0	-	1.61:1.00
2004	108	103	1.05:1.00	0	0	-	1.05:1.00
2005	130	113	1.15:1.00	0	0	-	1.15:1.00
2006	130	130	1.00:1.00	0	0	-	1.00:1.00
2007	127	121	1.05:1.00	0	0	-	1.05:1.00
2008	127	131	0.97:1.00	1	1	1.00:1.00	0.97:1.00
2009	133	125	1.06:1.00	0	3	0.00:1.00	1.04:1.00
2010	127	129	0.98:1.00	0	0	-	0.98:1.00
2011	106	98	1.08:1.00	0	0	-	1.08:1.00
Total	***2,074***	***2,017***	***1.03:1.00***	***58***	***48***	***1.21***	***1.03:1.00***

Fecundity

Fecundities of sockeye collected during the life of program are presented in Table 4.5.

Table 4.5. Mean fecundity of female sockeye salmon collected for broodstock, 1989-2011. Fecundities were determined from pooled egg lots and were not identified for individual females.

Return year	Mean fecundity
1989	2,344
1990	2,225
1991	2,598
1992	2,341
1993	2,340
1994	2,798
1995	2,295
1996	2,664
1997	2,447
1998	2,813
1999	2,319
2000	2,673
2001	2,960
2002	2,856
2003	3,511
2004	2,505
2005	2,718
2006	2,656
2007	3,115
2008	2,555
2009	2,459
2010	2,782

Return year	Mean fecundity
2011	2,960
Average	***2,649***

4.2 Hatchery Rearing

Rearing History

Number of eggs taken

Numbers of eggs taken from sockeye broodstock during the life of the program are shown in Table 4.6.

Table 4.6. Numbers of eggs taken from sockeye broodstock, 1989-2011.

Return year	Number of eggs taken
1989	133,600
1990	326,267
1991	231,254
1992	381,561
1993	231,700
1994	338,562
1995	247,900
1996	314,390
1997	254,459
1998	163,278
1999	190,732
2000	227,234
2001	301,925
2002	356,982
2003	319,470
2004	225,499
2005	211,985
2006	292,136
2007	302,363
2008	316,476
2009	304,963
2010	278,171
2011	290,046
Average	***271,389***

Number of acclimation days

During the life of the program, Wenatchee sockeye were only acclimated on Lake Wenatchee water. Acclimation days are presented in Table 4.7.

Table 4.7. Water source and mean acclimation period for Wenatchee sockeye, brood years 1989-2011.

Brood year	Release year	Transfer date	Release date	Number of Days	Water source
1989	1990	5-Apr	24-Oct	202	Lake Wenatchee
1990	1991	10-Apr	19-Oct	192	Lake Wenatchee
1991	1992	1-Apr	20-Oct	202	Lake Wenatchee
1992	1993	5-Apr	7-Sep	155	Lake Wenatchee
		5-Apr	26-Oct	204	Lake Wenatchee
1993	1994	5-Apr	1-Sep	149	Lake Wenatchee
		5-Apr	17-Oct	195	Lake Wenatchee
1994	1995	4-Apr	15-Sep	164	Lake Wenatchee
		4-Apr	23-Oct	202	Lake Wenatchee
1995	1996	4-Apr	25-Oct	204	Lake Wenatchee
1996	1997	4-Apr	22-Oct	201	Lake Wenatchee
1997	1998	1-Apr	9-Nov	222	Lake Wenatchee
1998	1999	1-Apr	29-Oct	211	Lake Wenatchee
1999	2000	25-Jul	28-Aug	34	Lake Wenatchee
		26-Jul	1-Nov	98	Lake Wenatchee
2000	2001	2-Jul	27-Aug	56	Lake Wenatchee
		3-Jul	27-Sep	86	Lake Wenatchee
2001	2002	15-Jul	28-Aug	44	Lake Wenatchee
		16-Jul	22-Sep	68	Lake Wenatchee
2002	2003	30-Jun	25-Aug	56	Lake Wenatchee
		1-Jul	22-Oct	113	Lake Wenatchee
2003	2004	6-Jul	25-Aug	50	Lake Wenatchee
		7-Jul	3-Nov	119	Lake Wenatchee
2004	2005	5-Jul	29-Aug	55	Lake Wenatchee
		6-Jul	2-Nov	120	Lake Wenatchee
2005	2006	11-Jul	30-Oct	111	Lake Wenatchee
2006	2007	9-10 Jul	31-Oct	113-114	Lake Wenatchee
2007	2008	7-8 Jul	29-Oct	113-114	Lake Wenatchee
2008	2009	21-Jul	28-Oct	100	Lake Wenatchee
2009	2010	19-20, 23-Jul	27-Oct	97-101	Lake Wenatchee

Brood year	Release year	Transfer date	Release date	Number of Days	Water source
2010	2011	6, 11-12-Jul	26-Oct	107-113	Lake Wenatchee
2011	2012	9-10-Jul	29-Oct	112-113	Lake Wenatchee

Release Information

Numbers released

Numbers of juvenile sockeye released into Lake Wenatchee during the life of the program are shown in Table 4.8.

Table 4.8. Total number of sockeye parr released and numbers of released fish with CWTs and PIT tags for brood years 1989-2011. The release target for sockeye was 200,000 fish.

Brood year	Release year	CWT mark rate	Number of released fish with PIT tags	Number released
1989	1990	Not marked	0	108,400
1990	1991	0.9308	0	270,802
1991	1992	0.8940	0	167,523
1992	1993	0.9240	0	340,597
1993	1994	0.7278	0	190,443
1994	1995	0.8869	0	252,859
1995[a]	1996	1.0000	0	150,808
1996[a]	1997	0.9680	0	284,630
1997[a]	1998	0.9642	0	197,195
1998[a]	1999	0.8713	0	121,344
1999	2000	0.9527	0	167,955
2000	2001	0.9558	0	190,174
2001	2002	0.9911	0	200,938
2002	2003	0.9306	0	315,783
2003	2004	0.9291	0	240,459
2004	2005	0.8995	0	172,923
2005	2006	0.9811	14,791	140,542
2006	2007	0.9735	14,764	225,670
2007	2008	0.9863	14,947	252,133
2008	2009	0.9576	14,858	154,772
2009	2010	0.9847	14,486	227,743
2010	2011	0.9564	5,039	243,260
2011	2012	0.9690	5,074	241,918
Average		***0.9379***	***11,994***[b]	***211,255***

[a] These groups were only adipose fin clipped.
[b] Average is based on brood years 2005 to present.

Fish size and condition at release

The size and condition of the juvenile sockeye released into Lake Wenatchee during the life of the program are presented in Table 4.9.

Table 4.9. Mean lengths (FL, mm), weight (g and fish/pound), and coefficient of variation (CV) of sockeye released, brood years 1989-2011. Size targets are provided in the last row of the table.

Brood year	Release year	Fork length (mm)		Mean weight	
		Mean	CV	Grams (g)	Fish/pound
1989	1990	128	-	18.2	25
1990	1991	131	-	18.9	24
1991	1992	117	3.0	20.6	22
1992	1993	73	6.8	4.2	44
1993	1994	103	-	13.6	40
1994	1995	75	6.1	4.5	38
1995	1996	137	8.2	14.7	30
1996	1997	107	5.6	15.1	30
1997	1998	122	6.1	21.3	21
1998	1999	112	5.4	17.0	27
1999	2000	94	9.5	9.5	48
		134	11.5	31.3	15
2000	2001	123	6.5	22.3	20
		146	8.4	26.0	12
2001	2002	118	7.4	20.7	22
		135	7.3	30.5	15
2002	2003	73	5.6	4.4	104
		118	7.7	13.7	23
		145	9.4	38.6	13
2003	2004	79	4.6	4.8	96
		118	5.9	17.0	26
		158	8.1	44.3	10
2004	2005	116	4.5	17.2	18
		151	7.0	39.3	12
2005	2006	149	7.5	43.7	10
2006	2007	138	10.6	32.4	14
2007	2008	137	9.3	33.0	14
2008	2009	138	9.6	34.6	13

Brood year	Release year	Fork length (mm)		Mean weight	
		Mean	CV	Grams (g)	Fish/pound
2009	2010	143	8.9	35.5	13
2010	2011	132	14.3	30.7	15
2011	2012	142	9.6	35.3	13
Targets		***133***	***9.0***	***22.7***	***20***

Survival Estimates

Life-stage survival estimates for juvenile sockeye during the life of the program are shown in Table 4.10.

Table 4.10. Hatchery life-stage survival rates (%) for sockeye salmon, brood years 1989-2011. Survival standards or targets are provided in the last row of the table.

Brood year	Collection to spawning		Unfertilized egg-eyed	Eyed egg-ponding	30 d after ponding	100 d after ponding	Ponding to release	Transport to release	Unfertilized egg-release
	Female	Male							
1989	41.6	100.0	88.1	63.9	99.2	98.9	98.1	65.2	83.0
1990	96.2	99.4	90.8	96.3	99.9	99.2	98.4	98.4	81.1
1991	91.8	94.1	79.2	94.8	99.8	99.3	96.4	96.4	72.4
1992	91.1	98.8	92.3	98.0	99.9	99.8	98.6	98.8	89.2
1993	57.1	99.2	89.2	98.3	99.6	99.1	93.7	93.8	82.2
1994	89.8	99.2	79.2	96.0	99.5	98.6	98.3	98.2	74.7
1995	97.5	99.1	87.5	95.0	99.0	93.3	73.2	73.2	60.8
1996	99.2	100.0	95.1	98.7	99.7	99.3	96.4	96.5	90.5
1997	92.8	99.3	84.8	97.9	97.9	97.6	95.5	94.9	77.5
1998	75.4	95.5	77.7	98.4	98.6	98.2	97.1	97.2	74.3
1999	92.3	100.0	92.2	97.3	99.6	99.3	98.2	99.7	88.1
2000	84.5	98.1	93.8	97.7	96.7	96.1	91.4	96.8	83.7
2001	75.4	99.2	78.5	97.6	98.0	97.6	86.9	95.1	66.6
2002	100.0	100.0	95.7	97.8	99.6	99.2	94.6	99.8	88.5
2003	91.0	98.1	87.2	96.9	99.0	98.2	94.8	95.5	74.6
2004	88.7	92.6	88.0	93.1	97.9	97.4	93.7	96.1	76.7
2005	98.5	98.5	85.3	94.9	97.8	96.6	95.5	99.2	66.3
2006	95.3	99.1	73.2	85.4	95.4	94.6	87.8	98.5	54.9
2007	88.4	99.2	89.1	98.6	97.0	95.9	94.9	99.0	83.4
2008	97.0	100.0	59.0	88.3	99.1	97.2	93.8	97.4	48.9
2009	95.8	98.3	89.1	94.8	96.9	96.2	88.4	92.3	74.7
2010	99.0	98.0	92.6	98.2	97.5	96.5	95.6	99.6	87.0
2011	100.0	100.0	92.6	100.0	96.8	96.0	95.4	99.7	88.3
Average	***88.6***	***98.5***	***86.1***	***94.7***	***98.5***	***97.6***	***93.8***	***94.8***	***76.8***

Brood year	Collection to spawning		Unfertilized egg-eyed	Eyed egg-ponding	30 d after ponding	100 d after ponding	Ponding to release	Transport to release	Unfertilized egg-release
	Female	Male							
Standard	*90.0*	*85.0*	*92.0*	*98.0*	*97.0*	*93.0*	*90.0*	*95.0*	*81.0*

4.3 Disease Monitoring

Because the sockeye hatchery program was terminated in 2012, there are not disease monitoring results.

4.4 Natural Juvenile Productivity

During 2013, juvenile sockeye salmon were sampled at the Upper and Lower Wenatchee traps.

Emigrant and Smolt Estimates

Upper Wenatchee Trap

In 2013, the Upper Wenatchee Trap was relocated to RM 50.7, about two miles upstream from the confluence of the Chiwawa River. The trap operated between 3 March and 30 June 2013. During the four-month sampling period the trap was inoperable for 18 days because of high discharge and debris. The trap captured a total of 877 wild sockeye and 15 hatchery sockeye smolts. Because of low capture numbers and no successful mark-recapture trials, a total emigrant estimate could not be calculated for the 2013 trapping season (Table 4.11). This was the six brood year since 1999 that all hatchery sockeye parr were released at a similar size and time. Monthly captures of all fish at the Upper Wenatchee Trap are reported in Appendix B.

Table 4.11. Estimated numbers of wild and hatchery sockeye smolts that emigrated from Lake Wenatchee during run years 1997-2013.

Run year	Numbers of sockeye smolts	
	Wild smolts	Hatchery smolts
1997	55,359	28,828
1998	1,447,259	55,985
1999	1,944,966	112,524
2000	985,490	24,684
2001	39,353	94,046
2002	729,716	121,511
2003	5,439,032	140,322
2004	5,771,187	216,023
2005	723,413	122,399
2006	1,266,971	159,500
2007	2,797,313	140,542
2008[a]	549,682	121,843
2009[a]	355,549	119,908
2010[a]	3,958,888	126,326

Run year	Numbers of sockeye smolts	
	Wild smolts	Hatchery smolts
2011	1,500,730	159,089
2012[b]	NA	NA
2013[b]	NA	NA
Average	***1,837,661***	***116,235***

[a] Estimates refined based on PIT tag survival to McNary Dam.
[b] Because of low numbers of sockeye captured and unsuccessful mark-recapture trials, no estimates are available for 2012 or 2013.

Age classes of wild sockeye smolts were determined from a length frequency analysis based on scales collected randomly each year since 1997 (Table 4.12). For the available run years, most wild sockeye smolts migrated as age 1+ fish. Only in two years (1997 and 2005) did more smolts migrate as age 2+ fish. Relatively few smolts migrated at age 3+.

Table 4.12. Age structure and estimated number of wild sockeye smolts that emigrated from Lake Wenatchee, 1997-2013.

Run year	Proportion of wild smolts			Total wild emigrants
	Age 1+	Age 2+	Age 3+	
1997	0.075	0.906	0.019	55,359
1998	0.955	0.037	0.008	1,447,259
1999	0.619	0.381	0.000	1,944,966
2000	0.599	0.400	0.001	985,490
2001	0.943	0.051	0.006	39,353
2002	0.961	0.039	0.000	729,716
2003	0.740	0.026	0.000	5,439,032
2004	0.929	0.071	0.000	5,771,187
2005	0.230	0.748	0.022	723,413
2006	0.994	0.006	0.000	1,266,971
2007	0.996	0.004	0.000	2,797,313
2008	0.804	0.195	0.001	549,682
2009	0.927	0.073	0.000	355,549
2010	0.963	0.036	0.001	3,958,888
2011	0.786	0.214	0.000	1,500,730
2012*	0.700	0.300	0.000	NA
2013	0.909	0.091	0.000	NA
Average	***0.772***	***0.210***	***0.003***	***1,837,661***

* Ages have not been confirmed with scale analysis and no total emigrant estimate is available.

Lower Wenatchee Trap

The Lower Wenatchee Trap operated between 13 February and 31 October 2013. During that time period the trap was inoperable for 22 days because of high river flows, debris, snow/ice, or major hatchery releases. During the nine-month sampling period, a total of 4,520 wild juvenile sockeye and 72 hatchery juvenile sockeye were captured at the Lower Wenatchee Trap. No emigrant estimate was calculated for juvenile sockeye salmon. Monthly captures of all fish collected at the Lower Wenatchee Trap are reported in Appendix B.

Freshwater Productivity

Egg-smolt survival estimates for wild sockeye salmon are provided in Table 4.13. Estimates of egg deposition were calculated based on the spawner escapement at Tumwater Dam and the sex ratio and fecundity of the broodstock. Egg-smolt survival rates for brood years 1995-2009 have ranged from 0.012 to 0.212 (mean = 0.091).

Table 4.13. Estimated egg deposition (estimated as mean fecundity times estimated number of females), numbers of smolts, and survival rates for wild Wenatchee sockeye salmon, 1995-2012; NA = not available.

Brood year	Number of females	Mean fecundity	Total eggs	Numbers of wild smolts				Egg-smolt survival
				Age 1+	Age 2+	Age 3+	Total	
1995	2,136	2,295	4,902,120	4,174	53,549	0	57,723	0.012
1996	3,767	2,664	10,035,288	1,382,133	741,032	985	2,124,150	0.212
1997	5,404	2,447	13,223,588	1,203,934	394,196	236	1,598,366	0.121
1998	2,024	2,813	5,693,512	590,309	2,007	0	592,316	0.104
1999	513	2,319	1,189,647	37,110	28,459	0	65,569	0.055
2000	11,413	2,673	30,506,949	701,257	1,414,148	0	2,115,405	0.069
2001	21,685	2,960	64,187,600	4,024,884	409,754	15,915	4,450,553	0.069
2002	17,226	2,856	49,197,456	5,361,433	541,113	0	5,902,546	0.120
2003	2,158	3,511	7,576,738	166,385	7,602	0	173,987	0.023
2004	15,469	2,505	38,749,845	1,259,369	11,189	275	1,270,833	0.033
2005	5,867	2,718	15,946,506	2,786,123	107,243	0	2,893,366	0.181
2006	2,747	2,656	7,296,032	442,164	25,919	1,507	469,590	0.064
2007	2,001	3,115	6,232,804	329,629	142,916	594	473,139	0.076
2008	11,775	2,555	30,084,691	3,814,226	320,567	0	4,134,794	0.137
2009	3,939	2,459	9,684,965	1,179,569	NA	NA	NA	NA
2010[a]	11,918	2,785	33,190,467	NA	NA	NA	NA	NA
2011[a]	9,722	2,970	28,873,491	NA	NA	NA	NA	NA
Average	***7,633***	***2,724***	***20,974,806***	***1,552,180***	***299,978***	***1,394***	***1,880,167***	***0.091***

[a] There is no emigrant estimate for trapping during 2012 or 2013.

Juvenile survival rates for hatchery sockeye salmon are provided in Table 4.14. Release-smolt survival rates for brood years 1995-2011 have ranged from 0.000 to 1.000 (mean = 0.570). Egg-smolt survival rates for the same brood years ranged from 0.000 to 0.710 (mean = 0.294). On average, egg-smolt survival of hatchery sockeye is about three times greater than egg-smolt survival of wild sockeye.

Table 4.14. Juvenile survival rates for hatchery Wenatchee sockeye, brood years 1995-2011.

Brood year	Number of eggs	Number of parr released	Date of release	Estimated number of smolts	Egg-smolt survival	Release-smolt survival
1995	247,900	150,808	10/25/96	28,828	0.116	0.191
1996	314,390	284,630	10/22/97	55,985	0.178	0.197
1997	254,459	197,195	11/9/98	112,524	0.442	0.571
1998	163,278	121,344	10/27/99	24,684	0.151	0.203
1999	190,732	84,466	8/28/00	30,326	0.159	0.359
		83,489	11/1/00	63,720	0.334	0.763
2000	227,234	92,055	8/27/01	30,918	0.136	0.336
		98,119	9/27/01	90,593	0.399	0.923
2001	301,925	96,486	8/28/02	36,484	0.121	0.378
		104,452	9/23/02	103,838	0.344	0.994
2002	356,982	98,509	6/16/03	5,192	0.015	0.053
		104,855	8/25/03	98,412	0.276	0.939
		112,419	10/22/03	112,419	0.315	1.000
2003	319,470	32,755	6/15/04	0	0.000	0.000
		104,879	8/25/04	19,574	0.061	0.187
		102,825	11/3/04	102,825	0.322	1.000
2004	225,499	81,428	8/29/05	159,500	0.707	0.922
		91,495	11/2/05			
2005	211,985	70,386	10/30/06	140,542	0.663	1.000
		70,156	10/30/06			
2006	292,136	225,670	10/31/07	121,843	0.412	0.540
2007	302,363	252,133	10/29/08	119,908	0.397	0.476
2008	316,476	154,772	10/28/09	126,326	0.399	0.813
2009	304,963	227,743	10/27/10	159,089	0.522	0.699
2010[a]	278,171	243,260	10/26/11	NA	NA	NA
2011[a]	290,046	256,120	10/29/12	NA	NA	NA

[a] There is no emigrant estimate for the 2010 or 2011 brood years.

PIT Tagging Activities

No wild juvenile sockeye salmon were PIT tagged and released in 2013 at the Upper Wenatchee Trap. Numbers of wild sockeye salmon PIT-tagged and released as part of the Comparative Survival Study during the period 2006-2013 are shown in Table 4.15. See Appendix C for a complete list of all fish captured, tagged, lost, and released.

Table 4.15. Summary of the numbers of wild sockeye salmon that were tagged and released at the Upper Wenatchee Trap within the Wenatchee River basin, 2006-2013.

Sampling Location		Numbers of PIT-tagged sockeye salmon released					
	2006	2007	2008	2009	2010	2011	2012	2013
Upper Wenatchee Trap	0	0	3,165	3,683	10,006	0	0	0

4.5 Spawning Surveys

Spawning surveys were conducted in the Little Wenatchee River from 20 August to 7 October 2013. Spawning surveys in 2013 only included counting numbers of live sockeye spawners. The last redd counts were conducted in 2007 (see Appendix H for more details).

Spawn Timing

Sockeye began spawning in the Little Wenatchee River during the first week of September and peaked around the third week of September (Figure 4.1). In the Napeequa River, spawning began the second week of September and peaked around the fourth week of September. Peak spawning was determined using the total number of spawners observed on the spawning grounds in the Little Wenatchee and Napeequa rivers.

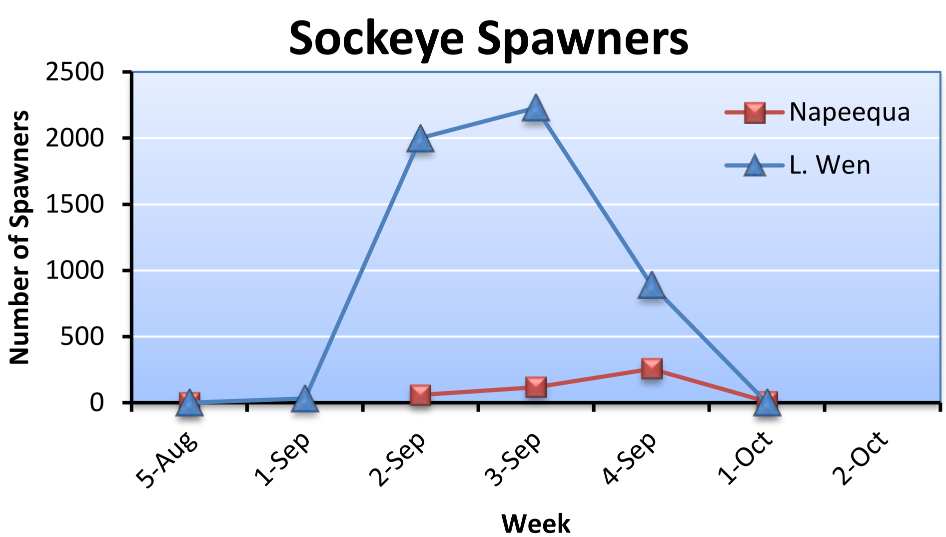


Figure 4.1. Numbers of sockeye spawners counted during different weeks in the Little Wenatchee and Napeequa rivers, August through October 2013.

Spawning Escapement

Spawning escapement of sockeye salmon in 2013 was estimated using the area-under-the-curve (AUC) method (i.e., escapement = (AUC/redd residence time) x observer efficiency) and mark-recapture methods. AUC relied on weekly counts of live sockeye in the Little Wenatchee River and Napeequa River, and assumed a redd residence time of 11 days and an observer efficiency of

100%. The mark-recapture method used PIT tags to estimate sockeye spawning escapement (see Appendix H for more details).

Area-under-the-curve

Based on the AUC approach, the estimated total spawning escapement of sockeye in the Little Wenatchee River basin in 2013 was 1,890 (Table 4.16). This approach estimated a spawning escapement of 264 sockeye in the Napeequa River. No AUC counts were conducted in the White River basin in 2013.

Table 4.16. Peak numbers of live spawners and total spawning escapement estimates for sockeye salmon in the Upper Wenatchee River basin, August through October 2013; N/A = not available.

Sampling basin	Peak number of live fish	Spawning escapement
Little Wenatchee	1,226	1,890
White River[a]	N/A	NA
Napeequa River	130	264
Total	***1,356***	***2,154***

[a] No AUC counts were conducted in the White River basin in 2013 (see Appendix H).

Mark-recapture method

Using mark-recapture methods, the estimated total escapement of sockeye in the Upper Wenatchee River basin in 2013 was 16,720 (Table 4.17). About 85% of the escapement entered the White River Basin (including the Napeequa River).

Table 4.17. Estimated escapement of adult sockeye into the Little Wenatchee and White River basins for return years 2009-2013. Escapement was based on recapture of PIT tagged fish.

Return year	Tumwater Dam count	Recreational harvest	Little Wenatchee escapement	White River escapement	Total spawning escapement
2009	16,034	2,285	576	13,876	14,452
2010	35,821	4,129	2,062	19,542	21,604
2011[a]	18,634	0	2,431	14,582	17,013
2012	66,520	12,107	4,607	23,866	28,473
2013[a]	29,015	6,262	2,426	14,294	16,720
Average	***33,205***	***4,961***	***2,420***	***17,232***	***19,652***

[a] Spawning escapement in 2011 was calculated using AUC counts and a regression model (Keller and Murauskas 2012).

The spawning escapement of 16,720 Wenatchee sockeye was greater than the overall average of 15,836 (Table 4.18).

Table 4.18. Spawning escapements for sockeye salmon in the Wenatchee River basin for return years 1989-2013; NA = not available. Total escapements before 2003 were based on counts at Tumwater Dam.

Return year	Spawning escapement		
	Little Wenatchee	White	Total
1989	NA	NA	**21,802**
1990	NA	NA	**27,325**
1991	NA	NA	**26,689**

Return year	Spawning escapement		
	Little Wenatchee	White	Total
1992	NA	NA	**16,461**
1993	NA	NA	**27,726**
1994	NA	NA	**7,330**
1995	NA	NA	**3,448**
1996	NA	NA	**6,573**
1997	NA	NA	**9,693**
1998	NA	NA	**4,014**
1999	NA	NA	**1,025**
2000	NA	NA	**20,735**
2001	NA	NA	**29,103**
2002	NA	NA	**27,565**
2003	NA	NA	**4,855**
2004	NA	NA	**27,556**
2005	NA	NA	**14,011**
2006	574	5,634	**6,208**
2007	150	1,720	**1,870**
2008	3,491	16,757	**20,248**
2009	763	7,004	**7,767**
2010	2,543	19,157	**21,700**
2011	2,431	14,582	**17,013**
2012	4,607	23,866	**28,473**
2013	2,426	14,294	**16,720**
Average	***2,123***	***12,877***	***15,836***

4.6 Carcass Surveys

Carcass surveys were conducted in the Little Wenatchee and White (including the Napeequa River) rivers from 11 September to 9 October 2013.

Number sampled

A total of 3,202 sockeye carcasses were sampled during September through October, 2013, in the Wenatchee River basin (Table 4.19). This is higher than the 1993-2013 average of 3,178 carcasses. Most of the carcasses sampled in 2013 were collected in the White River basin (93.6% or 2,996 carcasses) (Figure 4.2). The remaining 6.4% were sampled in the Little Wenatchee River (179 carcasses) and Napeequa River (27 carcasses). CWTs were collected from both male and female carcasses.

Table 4.19. Numbers of sockeye carcasses sampled within different streams/watersheds within the Wenatchee River basin, 1989-2013.

Survey year	Numbers of sockeye carcasses			
	Little Wenatchee	**White**	**Napeequa**	**Total**
1993	90	195	0	**285**
1994	121	165	0	**286**
1995	0	56	0	**56**
1996	43	1,387	3	**1,433**
1997	69	1,425	41	**1,535**
1998	61	524	4	**589**
1999	40	186	0	**226**
2000	821	5,494	0	**6,315**
2001	650	3,127	0	**3,777**
2002	506	7,258	55	**7,819**
2003	86	1,002	14	**1,102**
2004	625	6,960	138	**7,723**
2005	1	7	0	**8**
2006	101	2,158	38	**2,297**
2007	17	363	3	**383**
2008	476	5,132	125	**5,733**
2009	84	3,103	103	**3,290**
2010	217	7,832	70	**8,119**
2011	372	3,322	48	**3,742**
2012	1,309	7,479	31	**8,819**
2013	179	2,996	27	**3,202**
Average	***279***	***2,865***	***33***	***3,178***

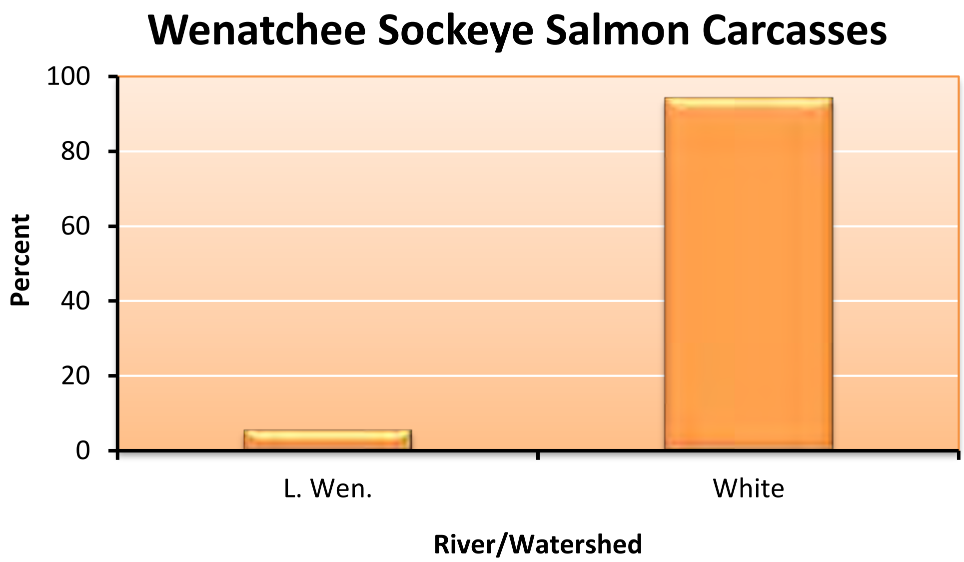


Figure 4.2. Percent of the total number of sockeye carcasses sampled in different streams/watersheds within the Wenatchee River basin during September through October, 2013.

Carcass Distribution and Origin

Sockeye carcasses were not evenly distributed among reaches within survey streams in 2013 (Table 4.20). Carcasses were only found in Reach 2 (Lost Creek to Rainy Creek) on the Little Wenatchee. Most (93.5%) of the carcasses sampled in the White River basin were in Reach 2 (Sears Creek Bridge to Napeequa River). About 0.8% of the carcasses sampled in the White River basin were in the Napeequa River.

Table 4.20. Numbers of carcasses sampled within different streams/watersheds within the Wenatchee River basin during September through October, 2013.

Stream/watershed	Reach	Total carcasses
Little Wenatchee	Little Wen 1 (L1)	0
	Little Wen 2 (L2)	179
	Little Wen 3 (L3)	0
	Total	**179**
White	White 1 (H1)	1
	White 2 (H2)	2,995
	White 3 (H3)	0
	Napeequa 1 (Q1)	27
	Total	**3,023**
Grand Total		***3,202***

Based on the available data (1993-2013), the largest percentage of both wild and hatchery sockeye spawned in Reach 2 on the White River (Table 4.21 and Figure 4.3). However, a greater percentage of wild fish was found in Reach 2 than hatchery fish.

Table 4.21. Numbers of wild and hatchery sockeye carcasses sampled within different reaches in the Wenatchee River basin, 1993-2013. Reach codes are described in Table 2.9.

Survey year	Origin	Numbers of sockeye carcasses					
		Little Wenatchee		White River			Total
		L2	L3	H1	H2	Q1	
1993	Wild	86	0	0	183	0	**269**
	Hatchery	4	0	0	12	0	**16**
1994	Wild	112	0	0	155	0	**267**
	Hatchery	9	0	0	9	0	**18**
1995	Wild	0	0	0	55	0	**55**
	Hatchery	0	0	0	1	0	**1**
1996	Wild	41	0	0	1,299	3	**1,343**
	Hatchery	2	0	0	88	0	**90**
1997	Wild	65	0	0	1,411	40	**1,516**
	Hatchery	4	0	0	11	1	**16**
1998	Wild	61	0	0	515	4	**580**
	Hatchery	0	0	0	9	0	**9**
1999	Wild	30	0	0	164	0	**194**
	Hatchery	10	0	0	22	0	**32**
2000	Wild	694	0	3	5,239	0	**5,936**
	Hatchery	127	0	0	252	0	**379**
2001	Wild	625	0	0	3,063	0	**3,688**
	Hatchery	25	0	0	64	0	**89**
2002	Wild	504	0	0	7,207	55	**7,766**
	Hatchery	2	0	0	51	0	**53**
2003	Wild	81	0	0	993	14	**1,088**
	Hatchery	5	0	0	9	0	**14**
2004	Wild	606	0	0	6,755	166	**7,527**
	Hatchery	19	0	0	205	22	**246**
2005	Wild	201	0	5	2,966	21	**3,193**
	Hatchery	1	0	0	8	0	**9**
2006	Wild	80	0	0	2,112	36	**2,228**
	Hatchery	21	0	0	46	2	**69**
2007	Wild	17	0	0	346	3	**366**
	Hatchery	0	0	0	17	0	**17**
2008	Wild	472	0	0	5,118	124	**5,714**
	Hatchery	4	0	0	14	1	**19**
2009	Wild	80	0	0	3,084	103	**3,267**
	Hatchery	4	0	0	19	0	**23**
2010	Wild	210	0	0	7,711	69	**7,990**
	Hatchery	7	0	0	121	1	**129**
2011	Wild	266	0	0	3,079	43	**3,388**
	Hatchery	106	0	0	243	5	**354**

Survey year	Origin	Numbers of sockeye carcasses					
		Little Wenatchee		White River			Total
		L2	L3	H1	H2	Q1	
2012	Wild	1,270	0	21	7,368	30	**8,689**
	Hatchery	39	0	3	87	1	**130**
2013	Wild	174	0	1	2,936	26	**3,137**
	Hatchery	3	0	0	56	1	**60**
Average	***Wild***	***270***	***0***	***1***	***2,941***	***35***	***3,248***
	Hatchery	***18***	***0***	***0***	***61***	***2***	***81***

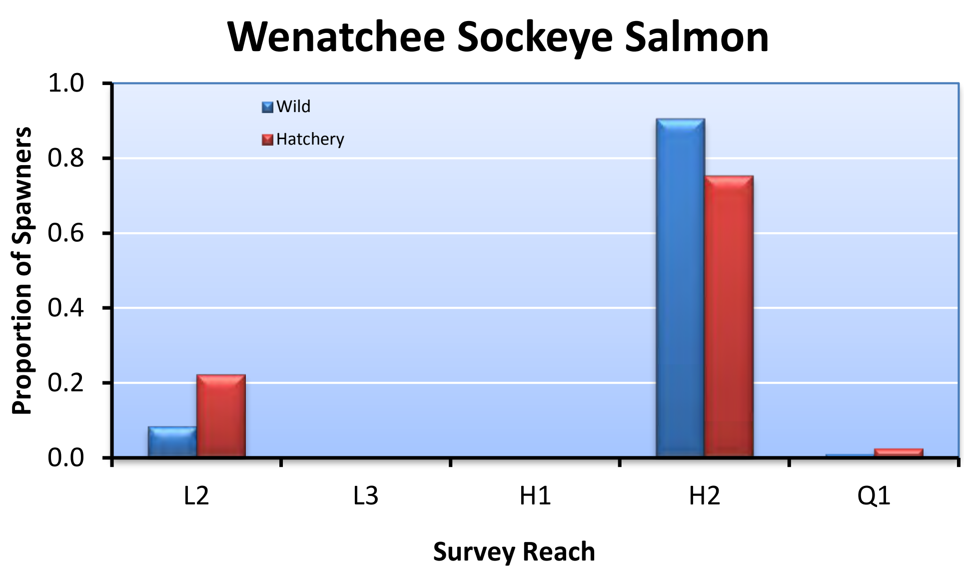


Figure 4.3. Distribution of wild and hatchery produced carcasses in different reaches in the Wenatchee River basin, pooled data from 1993-2013. Reach codes are described in Table 2.9; L = Little Wenatchee, H = White River, and Q = Napeequa River.

Sampling Rate

The sampling rate of sockeye carcasses differed among basins, with a higher sampling rate in the White than in the Little Wenatchee (Table 4.22). The overall sampling rate for both basins combined was 19%.

Table 4.22. Numbers of carcasses, estimated spawning escapements (based on mark-recapture), and sampling rates for sockeye salmon in the Wenatchee River basin, 2013.

Sampling basin	Total number of carcasses	Total spawning escapement	Sampling rate
Little Wenatchee	179	2,426	0.07
White	3,023	14,294	0.21
Total	***3,202***	***16,720***	***0.19***

Length Data

Mean lengths (POH, cm) of male and female hatchery sockeye carcasses sampled during surveys in the Wenatchee River basin in 2013 are provided in Table 4.23. Wild sockeye are sampled at Tumwater Dam, not on the spawning grounds.

Table 4.23. Mean lengths (postorbital-to-hypural length; cm) and standard deviations (in parentheses) of female hatchery sockeye carcasses sampled in different streams/watersheds in the Wenatchee River basin, 2013; N = number of fish sampled, NA = not available. Wild sockeye were sampled at Tumwater Dam.

Stream/watershed	Male		Female	
	N	Length (cm)	N	Length (cm)
Little Wenatchee River	1	41	4	41 (4)
White River	21	39	37	38 (2)
Napeequa River	0	NA	1	38
Wenatchee River	0	NA	0	NA
Total	***22***	***40***	***42***	***38 (2)***

4.7 Life History Monitoring

Life history characteristics of Wenatchee sockeye were assessed by examining carcasses on spawning grounds and fish sampled at broodstock collection sites, and by reviewing tagging data and fisheries statistics.

Migration Timing

There was little difference in migration timing of hatchery and wild sockeye past Tumwater Dam (Table 4.24a and b; Figure 4.4). On average, early in the run, hatchery and wild sockeye arrived at the dam at about the same time. Toward the end of the migration period, hatchery sockeye tended to arrive at the dam slightly later than did wild sockeye. Most hatchery and wild sockeye migrated upstream past Tumwater Dam during July through early August. The peak migration time for both hatchery and wild sockeye was the last week of July (Figure 4.4).

Table 4.24a. The Julian day and date that 10%, 50% (median), and 90% of the wild and hatchery sockeye salmon passed Tumwater Dam, 1998-2013. The average Julian day and date are also provided. Migration timing is based on video sampling at Tumwater. Data for 1998 through 2003 were based on videotapes and broodstock trapping and may not reflect the actual number of hatchery sockeye salmon. All sockeye were visually examined during trapping from 2004 to present.

Survey year	Origin	Sockeye Migration Time (days)								Sample size
		10 Percentile		50 Percentile		90 Percentile		Mean		
		Julian	Date	Julian	Date	Julian	Date	Julian	Date	
1998	Wild	195	14-Jul	201	20-Jul	208	27-Jul	202	21-Jul	4,173
	Hatchery	196	15-Jul	204	23-Jul	220	8-Aug	206	25-Jul	31
1999	Wild	226	14-Aug	233	21-Aug	241	29-Aug	234	22-Aug	908
	Hatchery	228	16-Aug	234	22-Aug	242	30-Aug	235	23-Aug	264
2000	Wild	200	18-Jul	206	24-Jul	213	31-Jul	207	25-Jul	18,390
	Hatchery	199	17-Jul	206	24-Jul	213	31-Jul	206	24-Jul	2,589

Survey year	Origin	Sockeye Migration Time (days)								Sample size
		10 Percentile		50 Percentile		90 Percentile		Mean		
		Julian	Date	Julian	Date	Julian	Date	Julian	Date	
2001	Wild	189	8-Jul	194	13-Jul	214	2-Aug	198	17-Jul	32,554
	Hatchery	199	18-Jul	212	31-Jul	240	28-Aug	214	2-Aug	79
2002	Wild	204	23-Jul	208	27-Jul	219	7-Aug	210	29-Jul	27,241
	Hatchery	204	23-Jul	209	28-Jul	222	10-Aug	211	30-Jul	580
2003	Wild	194	13-Jul	200	19-Jul	208	27-Jul	201	20-Jul	4,699
	Hatchery	194	13-Jul	201	20-Jul	211	30-Jul	203	22-Jul	375
2004	Wild	191	9-Jul	196	14-Jul	207	25-Jul	198	16-Jul	31,408
	Hatchery	189	7-Jul	194	12-Jul	203	21-Jul	196	14-Jul	1,758
2005	Wild	192	11-Jul	199	18-Jul	227	15-Aug	204	23-Jul	14,176
	Hatchery	187	6-Jul	200	19-Jul	251	8-Sep	212	31-Jul	42
2006	Wild	201	20-Jul	204	23-Jul	214	2-Aug	206	25-Jul	9,151
	Hatchery	202	21-Jul	219	7-Aug	228	16-Aug	215	3-Aug	507
2007	Wild	201	20-Jul	210	29-Jul	227	15-Aug	213	1-Aug	2,542
	Hatchery	205	24-Jul	213	1-Aug	231	19-Aug	216	4-Aug	65
2008	Wild	200	18-Jul	207	25-Jul	219	6-Aug	208	26-Jul	29,229
	Hatchery	201	19-Jul	206	24-Jul	215	2-Aug	208	26-Jul	103
2009	Wild	198	17-Jul	204	23-Jul	213	1-Aug	206	25-Jul	15,552
	Hatchery	199	18-Jul	205	24-Jul	215	3-Aug	207	26-Jul	534
2010	Wild	199	18-Jul	205	24-Jul	220	8-Aug	208	27-Jul	34,519
	Hatchery	200	19-Jul	215	3-Aug	244	1-Sep	218	6-Aug	1,302
2011	Wild	213	1-Aug	216	4-Aug	224	12-Aug	217	5-Aug	17,680
	Hatchery	213	1-Aug	213	1-Aug	231	19-Aug	216	4-Aug	954
2012[a]	Wild	207	25-Jul	212	30-Jul	216	3-Aug	212	30-Jul	21,246
	Hatchery	207	25-Jul	207	25-Jul	228	15-Aug	213	31-Jul	348
2013	Wild	196	15-Jul	200	19-Jul	207	26-Jul	201	20-Jul	28,245
	Hatchery	197	16-Jul	201	20-Jul	211	30-Jul	203	22-Jul	770
Average	Wild	***200***	-	***206***	-	***217***	-	***208***	-	***18,232***
	Hatchery	***201***	-	***209***	-	***225***	-	***211***	-	***644***

[a] The origin of sockeye passing Tumwater Dam during 8 through 11 August 2012 was not assessed. The total number of sockeye passing Tumwater Dam in 2012 was 30,617 adults. Thus, about 9,023 adults of unknown origin passed Tumwater Dam in 2012.

Table 4.24b. The week that 10%, 50% (median), and 90% of the wild and hatchery sockeye salmon passed Tumwater Dam, 1998-2013. The average week is also provided. Migration timing is based on video sampling at Tumwater. Data for 1998 through 2003 were based on videotapes and broodstock trapping and may not reflect the actual number of hatchery sockeye salmon. All sockeye were visually examined during trapping from 2004 to present.

Survey year	Origin	Sockeye Migration Time (week)				Sample size
		10 Percentile	50 Percentile	90 Percentile	Mean	
1998	Wild	28	29	30	29	4,173
	Hatchery	28	30	32	30	31
1999	Wild	33	34	35	34	908
	Hatchery	33	34	35	34	264
2000	Wild	29	30	31	30	18,390
	Hatchery	29	30	31	30	2,589
2001	Wild	27	28	31	29	32,554
	Hatchery	29	31	35	31	79
2002	Wild	30	30	32	30	27,241
	Hatchery	30	30	32	31	580
2003	Wild	28	29	30	29	4,699
	Hatchery	28	29	31	29	375
2004	Wild	28	28	28	29	31,408
	Hatchery	27	28	29	28	1,758
2005	Wild	28	29	33	30	14,176
	Hatchery	27	29	36	31	42
2006	Wild	29	29	31	30	9,151
	Hatchery	29	32	33	31	507
2007	Wild	29	30	33	31	2,542
	Hatchery	30	31	33	31	65
2008	Wild	29	30	32	30	29,229
	Hatchery	29	30	31	30	103
2009	Wild	29	30	31	30	15,552
	Hatchery	29	29	31	30	534
2010	Wild	29	30	32	30	34,519
	Hatchery	29	31	35	32	1,302
2011	Wild	31	31	32	31	17,680
	Hatchery	31	31	33	31	954
2012[a]	Wild	30	31	31	31	21,246
	Hatchery	30	30	33	31	348
2013	Wild	28	29	30	29	28,245
	Hatchery	29	29	31	29	770
Average	Wild	***29***	***30***	***31***	***30***	***18,232***
	Hatchery	***29***	***30***	***33***	***31***	***644***

[a] The origin of sockeye passing Tumwater Dam during 8 through 11 August 2012 was not assessed. The total number of sockeye passing Tumwater Dam in 2012 was 30,617 adults. Thus, about 9,023 adults of unknown origin passed Tumwater Dam in 2012.

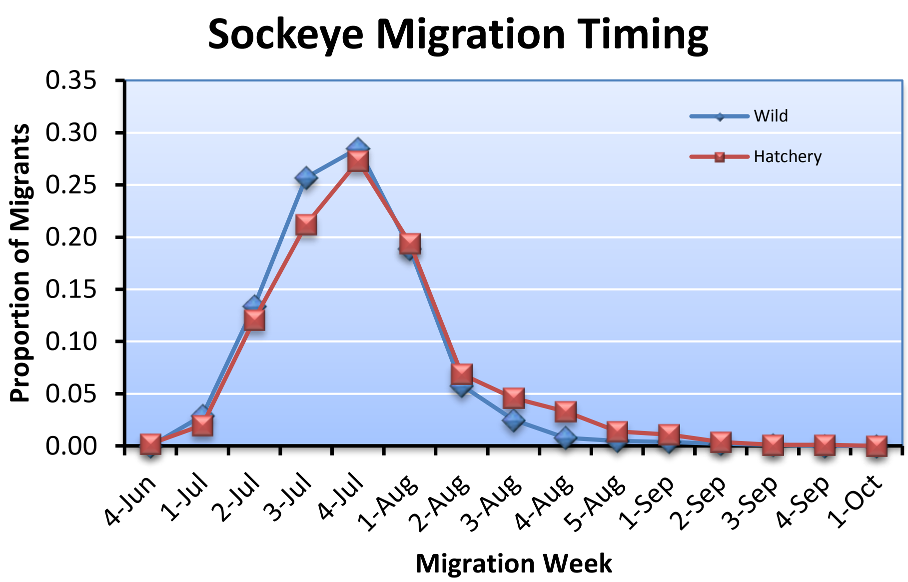


Figure 4.4. Proportion of wild and hatchery sockeye observed (using video) passing Tumwater Dam each week during their migration period late-June through early-October; data were pooled over survey years 1998-2013.

Age at Maturity

Although sample sizes are small, it appears that most hatchery sockeye returned as age-4 fish, while most wild sockeye returned as age-4 and 5 fish (Table 4.25; Figure 4.5). Only wild fish have returned at age-6.

Table 4.25. Proportions of wild and hatchery sockeye of different ages (total age) sampled in broodstock and on spawning grounds, 1994-2012. Since 2012, only wild and hatchery sockeye sampled on spawning grounds were used to establish proportions.

Survey year	Origin	Total age						Sample size
		2	3	4	5	6	7	
1994	Wild	-	-	-	-	-	-	0
	Hatchery	0.00	0.00	0.88	0.13	0.00	0.00	16
1995	Wild	-	-	-	-	-	-	0
	Hatchery	0.00	0.00	0.00	1.00	0.00	0.00	1
1996	Wild	-	-	-	-	-	-	0
	Hatchery	0.00	0.00	1.00	0.00	0.00	0.00	82
1997	Wild	-	-	-	-	-	-	0
	Hatchery	0.00	0.00	0.77	0.23	0.00	0.00	13
1998	Wild	0.00	0.08	0.85	0.08	0.00	0.00	26
	Hatchery	0.00	0.00	0.64	0.36	0.00	0.00	11
1999	Wild	0.00	0.00	0.18	0.73	0.10	0.00	113

Survey year	Origin	Total age						Sample size
		2	3	4	5	6	7	
	Hatchery	0.00	0.00	0.65	0.35	0.00	0.00	31
2000	Wild	0.00	0.00	0.00	1.00	0.00	0.00	1
	Hatchery	0.00	0.00	0.98	0.02	0.00	0.00	359
2001	Wild	0.00	0.00	0.76	0.24	0.00	0.00	29
	Hatchery	0.00	0.00	0.75	0.25	0.00	0.00	171
2002	Wild	0.00	0.00	0.20	0.80	0.00	0.00	5
	Hatchery	0.00	0.00	0.29	0.71	0.00	0.00	63
2003	Wild	0.00	0.00	0.00	1.00	0.00	0.00	5
	Hatchery	0.00	0.33	0.67	0.00	0.00	0.00	6
2004	Wild	-	-	-	-	-	-	0
	Hatchery	0.00	0.02	0.93	0.05	0.00	0.00	244
2005	Wild	-	-	-	-	-	-	0
	Hatchery	0.00	0.13	0.75	0.13	0.00	0.00	8
2006	Wild	0.00	0.00	0.34	0.65	0.01	0.00	207
	Hatchery	0.00	0.00	1.00	0.00	0.00	0.00	65
2007	Wild	0.00	0.00	0.02	0.88	0.10	0.00	206
	Hatchery	0.00	0.00	0.35	0.65	0.00	0.00	17
2008	Wild	0.00	0.00	0.95	0.04	0.01	0.00	258
	Hatchery	0.00	0.08	0.92	0.00	0.00	0.00	12
2009	Wild	0.00	0.00	0.79	0.21	0.00	0.00	251
	Hatchery	0.00	0.00	1.00	0.00	0.00	0.00	2
2010	Wild	0.00	0.00	0.67	0.33	0.00	0.00	193
	Hatchery	0.00	0.00	0.98	0.02	0.00	0.00	130
2011	Wild	0.00	0.00	0.63	0.36	0.01	0.00	270
	Hatchery	0.00	0.02	0.96	0.02	0.00	0.00	274
2012	Wild	0.00	0.00	0.92	0.08	0.00	0.00	13
	Hatchery	0.00	0.00	0.96	0.03	0.01	0.00	128
Average	***Wild***	***0.00***	***0.01***	***0.49***	***0.49***	***0.02***	***0.00***	***83***
	Hatchery	***0.00***	***0.03***	***0.76***	***0.21***	***0.00***	***0.00***	***86***

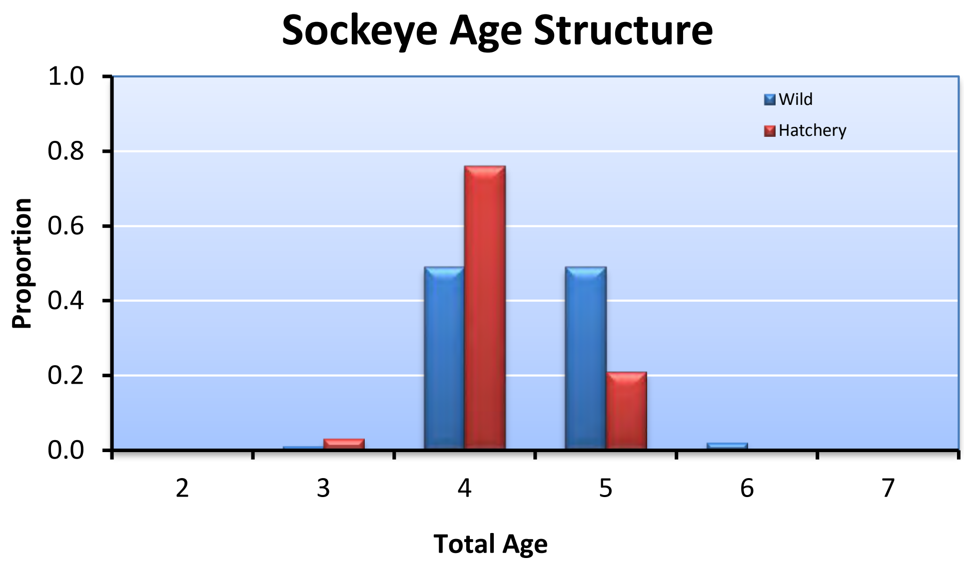


Figure 4.5. Proportions of wild and hatchery sockeye salmon of different total ages sampled at Tumwater Dam and on spawning grounds in the Wenatchee River basin for the combined years 1994-2013.

Size at Maturity

Although sample sizes are small, wild and hatchery sockeye were equivalent in size in 2012 (Table 4.26). In addition, the pooled data indicate that there is little difference in mean sizes of hatchery and wild sockeye salmon sampled in the Wenatchee River basin (Table 4.26). Analyses for the five-year reports will compare sizes of hatchery and wild fish of the same age groups and sex.

Table 4.26. Mean lengths (POH; cm) and variability statistics for wild and hatchery sockeye salmon sampled at Dryden Dam (broodstock) and on spawning grounds in the Wenatchee River basin, 1994-2012; SD = 1 standard deviation.

Survey year	Origin	Sample size	Sockeye length (POH; cm)			
			Mean	SD	Minimum	Maximum
1994	Wild	0	-	-	-	-
	Hatchery	14	42	3	37	47
1995	Wild	0	-	-	-	-
	Hatchery	1	53	-	53	53
1996	Wild	0	-	-	-	-
	Hatchery	5	51	3	49	55
1997	Wild	6	40	3	38	45
	Hatchery	17	41	3	37	50
1998	Wild	585	43	3	34	50
	Hatchery	20	43	3	40	51
1999	Wild	99	42	3	36	50
	Hatchery	31	41	3	36	47
2000	Wild	1	48	-	48	48

Survey year	Origin	Sample size	Sockeye length (POH; cm)			
			Mean	SD	Minimum	Maximum
	Hatchery	377	40	2	30	49
2001	Wild	29	42	2	38	47
	Hatchery	184	43	3	35	51
2002	Wild	5	42	1	40	43
	Hatchery	52	44	3	37	49
2003	Wild	5	44	4	38	47
	Hatchery	13	42	5	30	48
2004	Wild	0	-	-	-	-
	Hatchery	230	40	3	33	49
2005	Wild	0	-	-	-	-
	Hatchery	8	43	9	35	64
2006	Wild	248	45	4	34	52
	Hatchery	17	41	5	31	48
2007	Wild	248	45	3	32	52
	Hatchery	16	41	5	31	48
2008	Wild	261	52	3	44	66
	Hatchery	20	39	3	30	41
2009	Wild	260	43	3	33	53
	Hatchery	22	41	2	36	46
2010	Wild	200	56	3	48	66
	Hatchery	131	41	2	35	45
2011	Wild	277	43	3	35	51
	Hatchery	282	40	3	32	49
2012	Wild	15	40	4	34	48
	Hatchery	130	40	3	31	48
Pooled	***Wild***	***2,239***	***45***	***3***	***32***	***66***
	Hatchery	***1,570***	***42***	***4***	***30***	***64***

Contribution to Fisheries

The total number of hatchery and wild sockeye captured in different fisheries is provided in Tables 4.27 and 4.28. Harvest on hatchery-origin sockeye has been less than the harvest on wild sockeye.

Table 4.27. Estimated number and percent (in parentheses) of hatchery-origin Wenatchee sockeye captured in different fisheries, 1989-2007.

Brood year	Ocean fisheries	Columbia River Fisheries			Total
		Tribal	Commercial (Zones 1-5)	Recreational[a] (sport)	
1989	0 (0)	279 (30)	4 (0)	639 (69)	922
1990	0 (0)	23 (100)	0 (0)	0 (0)	23
1991	0 (0)	6 (100)	0 (0)	0 (0)	6
1992	0 (0)	38 (97)	1 (3)	0 (0)	39
1993	0 (0)	4 (100)	0 (0)	0 (0)	4
1994	0 (0)	3 (100)	0 (0)	0 (0)	3
1995	0 (0)	10 (100)	0 (0)	0 (0)	10
1996	0 (0)	63 (82)	9 (12)	5 (6)	77
1997	0 (0)	73 (73)	12 (12)	15 (15)	100
1998	0 (0)	7 (100)	0 (0)	0 (0)	7
1999	0 (0)	3 (20)	0 (0)	12 (80)	15
2000	0 (0)	67 (14)	11 (2)	414 (84)	492
2001	0 (0)	0 (0)	0 (0)	3 (100)	3
2002	0 (0)	16 (100)	0 (0)	0 (0)	16
2003	0 (0)	3 (100)	0 (0)	0 (0)	3
2004	0 (0)	6 (3)	1 (1)	192 (96)	199
2005	0 (0)	63 (42)	8 (5)	79 (53)	150
2006	0 (0)	123 (23)	2 (0)	409 (77)	534
2007	0 (0)	89 (81)	12 (11)	9 (8)	110
Average	***0 (0)***	***46 (67)***	***3 (2)***	***94 (31)***	***143***

[a] Includes the Lake Wenatchee fishery.

Table 4.28. Estimated number and percent (in parentheses) of wild Wenatchee sockeye captured in different fisheries, 1989-2007.

Brood year	Ocean fisheries	Columbia River Fisheries			Total
		Tribal	Commercial (Zones 1-5)	Recreational[a] (sport)	
1989	0 (0)	2,192 (31)	26 (0)	4,838 (69)	7,056
1990	0 (0)	191 (100)	0 (0)	0 (0)	191
1991	0 (0)	293 (99)	2 (1)	0 (0)	295
1992	0 (0)	345 (99)	5 (1)	0 (0)	350
1993	0 (0)	661 (99)	4 (1)	0 (0)	665
1994	0 (0)	146 (100)	0 (0)	0 (0)	146
1995	0 (0)	63 (85)	4 (5)	7 (9)	74
1996	0 (0)	1,606 (56)	257 (9)	993 (35)	2,856
1997	0 (0)	3,182 (54)	395 (7)	2,266 (39)	5,843

Brood year	Ocean fisheries	Columbia River Fisheries			Total
		Tribal	Commercial (Zones 1-5)	Recreational[a] (sport)	
1998	0 (0)	937 (98)	6 (1)	10 (1)	953
1999	0 (0)	25 (21)	3 (3)	90 (76)	118
2000	0 (0)	1,349 (21)	187 (3)	4,881 (76)	6,417
2001	0 (0)	827 (100)	1 (0)	0 (0)	828
2002	0 (0)	379 (83)	2 (0)	73 (16)	454
2003	0 (0)	129 (25)	12 (2)	383 (73)	524
2004	0 (0)	1,577 (24)	162 (2)	4,825 (74)	6,564
2005	0 (0)	2,571 (45)	195 (3)	2,996 (52)	5,762
2006	0 (0)	2,800 (52)	113 (2)	2,505 (46)	5,418
2007	0 (0)	1,457 (56)	189 (7)	944 (36)	2,590
Average	***0 (0)***	***1,091 (66)***	***82 (2)***	***1,306 (32)***	***2,497***

[a] Includes the Lake Wenatchee fishery.

Straying

Stray rates were determined by examining CWTs recovered on spawning grounds within and outside the Wenatchee River basin. In addition, PIT tagging of hatchery sockeye, which began with brood year 2005, allows estimation of stray rates by brood return. Targets for strays based on return year (recovery year) outside the Wenatchee River basin should be less than 5%. The target for brood year strays should also be less than 5%.

Based on CWTs and brood year analysis, no hatchery-origin Wenatchee sockeye strayed into non-target spawning areas or hatchery programs before brood year 2006 (Table 4.29). However, sockeye from brood years 2006 and 2007 strayed into the Entiat River and a few into the Methow River (non-target streams) and a non-target hatchery (Umpqua Trap) (Table 4.29). Stray rates of Wenatchee sockeye from brood year 2006 exceeded the target of 5%.

Table 4.29. Number and percent of hatchery-origin Wenatchee sockeye that homed to target spawning areas and the target hatchery program, and number and percent that strayed to non-target spawning areas and hatchery programs, by brood years 1990-2007. Hatchery-origin sockeye from brood years 1995-1998 were not tagged because of columnaris disease. Percent stays should be less than 5%.

Brood year	Homing				Straying			
	Target streams		Target hatchery		Non-target streams		Non-target hatcheries	
	Number	%	Number	%	Number	%	Number	%
1990	402	99.5	2	0.5	0	0.0	0	0.0
1991	1	100.0	0	0.0	0	0.0	0	0.0
1992	92	98.9	0	0.0	0	0.0	1	1.1
1993	29	96.7	1	3.3	0	0.0	0	0.0
1994	66	94.3	4	5.7	0	0.0	0	0.0
1995	-	-	-	-	-	-	-	-
1996	-	-	-	-	-	-	-	-

Brood year	Homing				Straying			
	Target streams		Target hatchery		Non-target streams		Non-target hatcheries	
	Number	%	Number	%	Number	%	Number	%
1997	-	-	-	-	-	-	-	-
1998	-	-	-	-	-	-	-	-
1999	65	100.0	0	0.0	0	0.0	0	0.0
2000	571	100.0	0	0.0	0	0.0	0	0.0
2001	17	100.0	0	0.0	0	0.0	0	0.0
2002	251	100.0	0	0.0	0	0.0	0	0.0
2003	11	100.0	0	0.0	0	0.0	0	0.0
2004	56	100.0	0	0.0	0	0.0	0	0.0
2005	67	97.1	2	2.9	0	0.0	0	0.0
2006	117	41.9	0	0.0	160	57.3	2	0.7
2007	240	97.2	1	0.4	6	2.4	0	0.0
Total	**1,985**	**91.7**	**10**	**0.5**	**166**	**7.7**	**3**	**0.1**

Based on PIT-tag analyses, on average, about 7% of the hatchery sockeye returns were last detected in streams outside the Wenatchee River basin (Table 4.30). The numbers in Table 4.30 should be considered rough estimates because they are not based on confirmed spawning (only last detections) and the numbers have not been adjusted for detection efficiencies, which currently do not exist for PIT-tag detection arrays in tributaries. What these data do indicate is that some hatchery sockeye from the Wenatchee program have wandered or strayed into the Entiat and Methow rivers and possibly into the Okanogan system (based on sockeye detected at Wells Dam but not in the Methow River).

Table 4.30. Number and percent of hatchery-origin Wenatchee sockeye that homed to target spawning areas and the target hatchery program, and number and percent that strayed to non-target spawning areas and hatchery programs for brood years 2005-2008. Estimates were based on last detections of PIT-tagged hatchery sockeye. Percent strays should be less than 5%.

Brood Year	Homing				Straying			
	Target streams		Target hatchery		Non-target stream		Non-target hatchery	
	Number	%	Number	%	Number	%	Number	%
2005	166	92.2	0	0.0	14	7.8	0	0.0
2006	440	94.6	0	0.0	25	5.4	0	0.0
2007	192	95.0	0	0.0	10	5.0	0	0.0
2008	127	89.4	0	0.0	15	10.6	0	0.0
Average	***231***	***92.8***	***0***	***0.0***	***16***	***7.2***	***0***	***0.0***

Genetics

Genetic studies were conducted to determine the potential impacts of the Wenatchee sockeye supplementation program on natural-origin sockeye in the upper Wenatchee River basin (Blankenship et al. 2008; the entire report is appended as Appendix I). Specifically, the objective of the study was to determine if the genetic composition of the Lake Wenatchee sockeye population had been altered by the supplementation program, which was based on the artificial propagation of a small subset of the Wenatchee population. Microsatellite DNA allele frequencies were used to differentiate between temporally replicated collections of natural and hatchery-origin sockeye in the Wenatchee River basin. A total of 13 collections of Wenatchee sockeye were analyzed; eight temporally replicated collections of natural-origin sockeye and five temporally replicated collections of hatchery-origin sockeye. Paired natural-hatchery collections were available from return years 2000, 2001, 2004, 2006, and 2007.

Overall, the study showed that allele frequency distributions were consistent over time, regardless of origin, resulting in small, insignificant measures of genetic differentiation among collections. This indicates that there was no year-to-year differences in allele frequencies between natural and hatchery-origin sockeye. In addition, the analyses found no differences between pre- and post-supplementation collections. Thus, it was concluded that the allele frequencies of the broodstock collections equaled the allele frequency of the natural collections.

Proportion of Natural Influence

Another method for assessing the genetic risk of a supplementation program is to determine the influence of the hatchery and natural environments on the adaptation of the composite population. This is estimated by the proportion of natural-origin fish in the hatchery broodstock (pNOB) and the proportion of hatchery-origin fish in the natural spawning escapement (pHOS). The ratio pNOB/(pHOS+pNOB) is the Proportion of Natural Influence (PNI). The larger the ratio (PNI), the greater the strength of selection in the natural environment relative to that of the hatchery environment. In order for the natural environment to dominate selection, PNI should be greater than 0.50, and important integrated populations should have a PNI of at least 0.67 (HSRG/WDFW/NWIFC 2004).

PNI values for the life of the program (brood years 1989-2011) are shown in Table 4.31. Throughout the program, PNI was consistently greater than 0.67. The hatchery program was terminated in 2012.

Table 4.31. Proportionate natural influence (PNI) of the Wenatchee sockeye supplementation program for brood years 1989-2011. PNI was calculated as the proportion of naturally produced sockeye in the hatchery broodstock (pNOB) divided by the proportion of hatchery sockeye counted at Tumwater Dam (pHOS) plus pNOB. NOS = number of natural-origin sockeye counted at Tumwater Dam; HOS = number of hatchery-origin sockeye counted at Tumwater Dam; NOB = number of natural-origin sockeye collected for broodstock; and HOB = number of hatchery-origin sockeye included in hatchery broodstock.

Brood year	Spawners[a]			Broodstock			PNI
	NOS	HOS	pHOS	NOB	HOB	pNOB	
1989	21,802	0	0.00	115	0	1.00	1.00
1990	27,325	0	0.00	302	0	1.00	1.00
1991	26,689	0	0.00	199	0	1.00	1.00
1992	16,461	0	0.00	320	0	1.00	1.00

Brood year	Spawners[a]			Broodstock			PNI
	NOS	HOS	pHOS	NOB	HOB	pNOB	
1993	25,064	2,662	0.10	207	0	1.00	0.91
1994	6,929	396	0.05	236	5	0.98	0.95
1995	3,259	186	0.05	194	3	0.98	0.95
1996	6,009	544	0.08	225	0	1.00	0.93
1997	9,597	77	0.01	192	19	0.91	0.99
1998	3,976	32	0.01	122	6	0.95	0.99
1999	905	60	0.06	79	60	0.57	0.90
2000	19,569	1,161	0.06	170	5	0.97	0.94
2001	28,280	815	0.03	200	7	0.97	0.97
2002	27,372	193	0.01	256	0	1.00	0.99
2003	4,797	58	0.01	198	0	1.00	0.99
2004	26,095	1,460	0.05	177	0	1.00	0.95
2005	13,983	28	0.00	166	0	1.00	1.00
2006	9,183	255	0.03	214	0	1.00	0.97
2007	2,320	59	0.02	210	0	1.00	0.98
2008	22,929	92	0.00	243	2	0.99	1.00
2009	13,090	447	0.03	239	0	1.00	0.97
2010	30,357	1,134	0.04	198	0	1.00	0.96
2011	17,490	940	0.05	196	0	1.00	0.95
Average	***15,804***	***461***	***0.03***	***203***	***5***	***0.97***	***0.97***

[a] Proportions of natural-origin and hatchery-origin spawners were determined from video tape at Tumwater Dam.

Natural and Hatchery Replacement Rates

Natural replacement rates (NRR) were calculated as the ratio of natural-origin recruits (NOR) to the parent spawning population. Natural-origin recruits are naturally produced (wild) fish that survive to contribute to harvest (directly or indirectly), to broodstock, and to spawning grounds. We do not account for fish that died in route to the spawning grounds (migration mortality) or died just before spawning (pre-spawn mortality) (see Appendix B in Hillman et al. 2012). We calculated NORs with and without harvest. NORs without harvest include all returning fish that either returned to the basin or were collected as wild broodstock. NORs with harvest include all fish harvested and are based on a brood year harvest rates from the hatchery program. For brood years 1989-2007, NRR in the Wenatchee averaged 1.47 (range, 0.13-5.00) if harvested fish were not included in the estimate and 1.72 (range, 0.14-6.09) if harvested fish were included in the estimate (Table 4.32).

Hatchery replacement rates (HRR) were estimated as hatchery adult-to-adult returns. These rates should be greater than the NRRs and greater than or equal to 5.40 (the calculated target value in Murdoch and Peven 2005). HRRs exceeded NRRs in 11 of the 19 years of data, regardless if harvest was or was not included in the estimates (Table 4.32). Hatchery replacement rates for Wenatchee sockeye have equaled or exceeded the estimated target value of 5.40 in four of the 19 years regardless if harvest was or was not included in the estimate (Table 4.32).

Table 4.32. Broodstock collected, spawning escapements, natural and hatchery-origin recruits (NOR and HOR), and natural and hatchery replacement rates (NRR and HRR; with and without harvest) for sockeye salmon in the Wenatchee River basin, 1989-2007.

Brood year	Broodstock Collected	Spawning Escapement	Harvest not included				Harvest included			
			HOR	NOR	HRR	NRR	HOR	NOR	HRR	NRR
1989	255	21,802	2,757	23,616	10.81	1.08	3,680	30,672	14.43	1.41
1990	316	27,325	401	3,509	1.27	0.13	423	3,701	1.34	0.14
1991	233	26,689	95	4,814	0.41	0.18	101	5,110	0.43	0.19
1992	343	16,461	597	5,491	1.74	0.33	636	5,840	1.85	0.35
1993	307	27,726	77	12,224	0.25	0.44	81	12,889	0.26	0.46
1994	265	7,325	46	1,194	0.17	0.16	49	1,340	0.18	0.18
1995	209	3,445	118	839	0.56	0.24	128	914	0.61	0.27
1996	227	6,553	1,348	28,049	5.94	4.28	1,424	30,904	6.27	4.72
1997	226	9,674	739	36,097	3.27	3.73	839	41,939	3.71	4.34
1998	190	4,008	104	16,166	0.55	4.03	111	17,118	0.58	4.27
1999	247	965	68	566	0.46	0.59	83	685	0.56	0.71
2000	195	20,730	1,425	29,082	7.31	1.40	1,917	35,499	9.83	1.71
2001	245	29,095	24	17,242	0.10	0.59	28	18,069	0.11	0.62
2002	257	27,565	281	5,752	1.09	0.21	297	6,207	1.16	0.23
2003	219	4,855	32	2,054	0.15	0.42	35	2,589	0.16	0.53
2004	202	27,555	94	23,599	0.47	0.86	293	30,155	1.45	1.09
2005	207	14,011	162	20,833	2.23	1.49	611	26,590	2.95	1.90
2006	220	9,438	1,142	26,966	5.20	2.86	1,678	32,375	7.63	3.43
2007	228	2,379	907	11,894	3.98	5.00	1,018	14,484	4.46	6.09
Average	***236***	***15,137***	***564***	***14,210***	***2.42***	***1.47***	***707***	***16,688***	***3.05***	***1.72***

Juvenile-to-Adult Survivals

When possible, both parr-to-adult ratios (PAR) and smolt-to-adult ratios (SAR) were calculated for hatchery sockeye salmon. Ratios were calculated as the number of hatchery adult recaptures divided by the number of tagged hatchery parr released or the estimated number of smolts emigrating from Lake Wenatchee. Survival ratios were based on CWT returns, when available, or on the estimated number of hatchery adults recovered on the spawning grounds, in broodstock, and harvested. For the available brood years, PARs have ranged from 0.0001 to 0.0339 for hatchery sockeye salmon and SARs have ranged from 0.0002 to 0.0255 (Table 4.33).

Table 4.33. Parr-to-adult ratios (PAR) and smolt-to-adult ratios (SAR) for Wenatchee hatchery sockeye salmon, brood years 1990-2006; NA = not available.

Brood year	Number of parr released	Number of smolts	Estimated adult recaptures	PAR	SAR
1989	108,400	NA	3,680	0.0339	NA
1990	270,802	NA	423	0.0016	NA
1991	167,523	NA	101	0.0006	NA

Brood year	Number of parr released	Number of smolts	Estimated adult recaptures	PAR	SAR
1992	340,597	NA	618	0.0018	NA
1993	190,443	NA	82	0.0004	NA
1994	252,859	NA	50	0.0002	NA
1995	150,808	28,828	131	0.0009	0.0045
1996	284,630	55,985	1,425	0.0050	0.0255
1997	197,195	112,524	839	0.0043	0.0075
1998	121,344	24,684	111	0.0009	0.0045
1999	167,955	94,046	83	0.0005	0.0009
2000	190,174	121,511	1,917	0.0101	0.0158
2001	200,938	140,322	28	0.0001	0.0002
2002	315,783	216,023	297	0.0009	0.0014
2003	240,459	122,399	35	0.0001	0.0003
2004	172,923	159,500	293	0.0017	0.0018
2005	140,542	140,542	611	0.0043	0.0043
2006	225,670	121,843	1,679	0.0074	0.0138
Average	**207,725**	**111,517**	**689**	**0.0042**	**0.0067**

4.8 ESA/HCP Compliance

Broodstock Collection

The 2011 sockeye broodstock collections at Tumwater Dam occurred concurrently with the spring Chinook reproductive success monitoring and evaluation activities (BPA Project No. 2003-039-00) and Wenatchee steelhead broodstock collection activities authorized under ESA permits 1196 and 1395, respectively. No ESA-listed spring Chinook or steelhead take occurred during sockeye broodstock collections at Tumwater Dam that were outside those authorized through ESA Section 10 permits 1196 and 1395.

Hatchery Rearing and Release

The 2011 brood Wenatchee sockeye program released 241,918 juveniles, representing 121% of the production overage allowance in ESA Section 10 Permit 1347.

Hatchery Effluent Monitoring

Per ESA Permits 1196, 1347, and 1395, permit holders shall monitor and report hatchery effluents in compliance with applicable National Pollution Discharge Elimination Systems (NPDES) (EPA 1999) permit limitations. There was one violation reported for the period of January 1 through December 31 2013 for PUD hatchery programs. NPDES monitoring and reporting for Chelan PUD Hatchery Programs during 2013 are provided in Appendix F.

Smolt and Emigrant Trapping

ESA-listed spring Chinook and steelhead were encountered during operation of the upper Wenatchee trap. ESA takes are reported in the steelhead (Section 3.8) and spring Chinook (Section 5.8) sections and will not be repeated here.

Spawning Surveys

Sockeye spawning ground surveys conducted in the Wenatchee River basin during 2013 were consistent with ESA Section 10 Permit No. 1347. Because of the difficulty of quantifying the level of take associated with spawning ground surveys, the Permit does not specify a take level associated with these activities, even though it does authorize implementation of spawning ground surveys. Therefore, no take levels are reported. However, to minimize potential effects to established redds, wading was restricted to the extent practical and extreme caution was used to avoid established redds when wading was required.

SECTION 5: WENATCHEE (CHIWAWA) SPRING CHINOOK

Although this section of the report focuses on results from monitoring the Chiwawa spring Chinook program, information on spring Chinook collected throughout the Wenatchee River basin is also provided. Information specific to Nason Creek spring Chinook is presented in Section 6.

5.1 Broodstock Sampling

This section focuses on results from sampling 2011-2013 Chiwawa spring Chinook broodstock, which were collected at the Chiwawa weir and at Tumwater Dam. Some information for the 2013 return is not available at this time (e.g., age structure and final origin determination). This information will be provided in the 2014 annual report.

Origin of Broodstock

Hatchery-origin adults made up between 35-56% of the Chiwawa spring Chinook broodstock for return years 2011-2013 (Table 5.1). Natural and hatchery-origin adults were collected only at Tumwater Dam for return year 2013. Broodstock were trapped at Tumwater Dam from mid-June through early July of 2013. Hatchery-origin broodstock were collected in 2013 because of a delay in ESA permitting leading to a contracted collection schedule. All hatchery fish collected in 2013 were ultimately used for a pond abrasion study at Eastbank Fish Hatchery and were not spawned because the natural-origin broodstock collection goal was met.

Table 5.1. Numbers of wild and hatchery Chiwawa spring Chinook collected for broodstock, numbers that died before spawning, and numbers of Chinook spawned, 1989-2013. Unknown origin fish (i.e., undetermined by scale analysis, no CWT or fin clips, and no additional hatchery marks) were considered naturally produced. Mortality includes fish that died of natural causes typically near the end of spawning and were not needed for the program or were surplus fish killed at spawning.

Brood year	Wild spring Chinook					Hatchery spring Chinook					Total number spawned
	Number collected	Prespawn loss	Mortality	Number spawned	Number released	Number collected	Prespawn loss	Mortality	Number spawned	Number released	
1989	28	0	0	28	0	0	0	0	0	0	28
1990	19	1	0	18	0	0	0	0	0	0	18
1991	32	0	5	27	0	0	0	0	0	0	27
1992	113	0	0	78	35	0	0	0	0	0	78
1993	100	3	3	94	0	0	0	0	0	0	94
1994	9	0	1	8	0	4	0	0	4	0	12
1995	No Program										
1996	8	0	0	8	0	10	0	0	10	0	18
1997	37	0	5	32	0	83	1	3	79	0	111
1998	13	0	0	13	0	35	1	0	34	0	47
1999	No Program										
2000	10	0	1	9	0	38	1	16	21	0	30
2001	115	2	0	113	0	267	8	0	259	0	372
2002	21	0	1	20	0	63	1	11	51	0	71
2003	44	1	2	41	0	75	2	20	53	0	94
2004	100	1	16	83	0	196	30	34	132	0	215

Brood year	Wild spring Chinook					Hatchery spring Chinook					Total number spawned
	Number collected	Prespawn loss	Mortality	Number spawned	Number released	Number collected	Prespawn loss	Mortality	Number spawned	Number released	
2005	98	1	6	91	0	185	3	1	181	0	279
2006	95	0	4	91	0	303	0	29	224	50	315
2007	45	1	1	43	0	124	2	18	104	0	147
2008	88	2	3	83	0	241	5	16	220	0	303
2009	113	6	11	96	0	151	3	37	111	0	207
2010	83	0	6	77	0	103	0	5	98	0	175
2011	80	0	0	80	0	101	2	6	93	0	173
2012	75	1	1	73	0	41	3	38	0	0	111
2013	75	5	0	70	0	52	1	50	0	1	70
Average[a]	***61***	***1***	***3***	***55***	***2***	***90***	***3***	***12***	***73***	***2***	***130***

[a] Origin determinations should be considered preliminary pending scale analyses.

Age/Length Data

Ages were determined from scales and/or coded wire tags (CWT) collected from broodstock. For both the 2011 and 2012 returns, most adults, regardless of origin, were age-4 Chinook (Table 5.2). A larger percentage of the age-5 Chinook were natural-origin fish, whereas a larger percentage of the age-3 fish were hatchery-origin fish.

Table 5.2. Percent of hatchery and wild spring Chinook of different ages (total age) collected from broodstock, 1991-2012.

Return year	Origin	Total age			
		2	3	4	5
1991	Wild	0.0	0.0	22.0	78.0
	Hatchery	0.0	0.0	0.0	0.0
1992	Wild	0.0	0.0	28.6	71.4
	Hatchery	0.0	0.0	50.0	50.0
1993	Wild	0.0	0.0	22.0	78.0
	Hatchery	0.0	0.0	0.0	0.0
1994	Wild	0.0	0.0	28.6	71.4
	Hatchery	0.0	0.0	50.0	50.0
1995	Wild	No program			
	Hatchery				
1996	Wild	0.0	28.6	71.4	0.0
	Hatchery	0.0	50.0	50.0	0.0
1997	Wild	0.0	0.0	87.5	12.5
	Hatchery	0.0	1.2	98.8	0.0
1998	Wild	0.0	0.0	63.6	36.4
	Hatchery	0.0	0.0	62.9	37.1
1999	Wild	No program			
	Hatchery				
2000	Wild	0.0	20.0	70.0	10.0

Return year	Origin	Total age			
		2	3	4	5
	Hatchery	0.0	59.1	40.9	0.0
2001	Wild	0.0	2.8	94.4	2.8
	Hatchery	0.0	1.5	98.5	0.0
2002	Wild	0.0	0.0	66.7	33.3
	Hatchery	0.0	0.0	93.4	6.6
2003	Wild	0.0	27.0	2.7	70.3
	Hatchery	0.0	21.3	5.3	73.3
2004	Wild	1.0	6.1	88.8	4.1
	Hatchery	0.0	40.4	59.6	0.0
2005	Wild	0.0	1.0	85.0	14.0
	Hatchery	0.0	4.4	95.6	0.0
2006	Wild	0.0	2.0	70.4	27.6
	Hatchery	0.0	1.3	81.2	17.4
2007	Wild	0.0	15.6	53.3	31.1
	Hatchery	0.0	27.4	60.5	12.1
2008	Wild	0.0	6.3	78.8	15.0
	Hatchery	0.0	8.2	86.8	4.9
2009	Wild	0.0	8.6	79.0	12.4
	Hatchery	0.0	18.5	79.5	2.0
2010	Wild	0.0	5.3	94.7	0.0
	Hatchery	0.0	0.0	99.0	1.0
2011	Wild	0.0	2.7	52.7	44.6
	Hatchery	0.0	20.4	60.2	19.4
2012	Wild	0.0	0.0	79.0	21.0
	Hatchery	0.0	4.3	95.7	0.0
Average	***Wild***	***0.1***	***6.3***	***62.0***	***31.7***
	Hatchery	***0.0***	***12.9***	***63.4***	***13.7***

There was little difference in mean lengths between hatchery and natural-origin broodstock of age-4 and 5 Chinook in 2011 and 2012 (Table 5.3).

Table 5.3. Mean fork length (cm) at age (total age) of hatchery and wild spring Chinook collected from broodstock, 1991-2012; N = sample size and SD = 1 standard deviation.

Return year	Origin	Spring Chinook fork length (cm)											
		Age-2			Age-3			Age-4			Age-5		
		Mean	N	SD	Mean	N	SD	Mean	N	SD	Mean	N	SD
1991	Wild	-	0	-	-	5	-	-	19	-	-	8	-
	Hatchery	-	0	-	-	0	-	-	0	-	-	0	-
1992	Wild	-	0	-	-	0	-	-	0	-	-	0	-

Return year	Origin	Spring Chinook fork length (cm)											
		Age-2			Age-3			Age-4			Age-5		
		Mean	N	SD	Mean	N	SD	Mean	N	SD	Mean	N	SD
	Hatchery	-	0	-	-	0	-	-	0	-	-	0	-
1993	Wild	-	0	-	-	0	-	79	4	3	92	8	4
	Hatchery	-	0	-	-	0	-	-	0	-	-	0	-
1994	Wild	-	0	-	-	0	-	79	2	3	96	5	6
	Hatchery	-	0	-	-	0	-	82	2	11	92	2	2
1995	Wild	No program											
	Hatchery												
1996	Wild	-	0	-	51	2	1	79	5	7	-	0	-
	Hatchery	-	0	-	56	5	4	74	5	6	-	0	-
1997	Wild	-	0	-	-	0	-	80	28	5	99	4	8
	Hatchery	-	0	-	56	1	-	82	82	4	-	0	-
1998	Wild	-	0	-	-	0	-	78	7	13	83	4	18
	Hatchery	-	0	-	-	0	-	77	22	8	93	13	7
1999	Wild	No program											
	Hatchery												
2000	Wild	-	0	-	51	2	3	82	7	4	98	1	-
	Hatchery	-	0	-	59	13	4	79	9	8	-	0	-
2001	Wild	-	0	-	49	3	6	82	101	6	95	3	3
	Hatchery	-	0	-	56	4	7	83	261	5	-	0	-
2002	Wild	-	0	-	-	0	-	79	12	4	96	6	10
	Hatchery	-	0	-	-	0	-	81	57	6	94	4	9
2003	Wild	-	0	-	55	10	5	83	1	-	99	26	6
	Hatchery	-	0	-	59	16	5	86	4	18	96	55	6
2004	Wild	47	1	-	60	6	6	80	87	5	99	4	3
	Hatchery	-	0	-	51	80	7	80	118	5	-	0	-
2005	Wild	-	0	-	49	1	-	80	85	6	96	14	8
	Hatchery	-	0	-	56	8	5	82	175	6	-	0	-
2006	Wild	-	0	-	50	2	2	79	69	7	97	27	5
	Hatchery	-	0	-	46	1	-	80	205	6	95	43	7
2007	Wild	-	0	-	54	7	3	79	24	6	93	14	7
	Hatchery	-	0	-	59	34	8	81	75	5	93	15	7
2008	Wild	-	0	-	54	5	9	83	63	5	93	12	6
	Hatchery	-	0	-	56	20	10	82	211	6	96	12	7
2009	Wild	-	0	-	52	9	6	81	83	5	94	13	6
	Hatchery	-	0	-	56	28	6	82	120	5	87	3	11
2010	Wild	-	0	-	58	4	9	80	72	6	-	0	-
	Hatchery	-	0	-	-	0	-	82	102	6	101	1	-

Return year	Origin	Spring Chinook fork length (cm)											
		Age-2			Age-3			Age-4			Age-5		
		Mean	N	SD	Mean	N	SD	Mean	N	SD	Mean	N	SD
2011	Wild	-	0	-	56	2	3	79	39	5	95	33	7
	Hatchery	-	0	-	63	21	7	80	62	6	95	20	6
2012	Wild	-	0	-	-	0	-	81	49	6	97	13	8
	Hatchery	-	0	-	51	2	0	80	41	5	-	0	-
Average	***Wild***	***47***	***1***	***-***	***53***	***3***	***5***	***80***	***38***	***6***	***95***	***10***	***7***
	Hatchery	***-***	***0***	***-***	***56***	***12***	***6***	***81***	***78***	***7***	***94***	***8***	***7***

Sex Ratios

Male spring Chinook in the 2011-2013 return years made up 50%, 49.5%, and 49.1%, respectively, of the adults collected. This resulted in overall male to female ratios of 1.01:1.00, 0.90:1.00, and 0.96:1.00, respectively (Table 5.4). For the 2013 return year, natural-origin and hatchery-origin fish both consisted of a slightly higher proportion of females than males (Table 5.4).

Table 5.4. Numbers of male and female wild and hatchery spring Chinook collected for broodstock, 1989-2013. Ratios of males to females are also provided.

Return year	Number of wild spring Chinook			Number of hatchery spring Chinook			Total M/F ratio
	Males (M)	Females (F)	M/F	Males (M)	Females (F)	M/F	
1989	11	17	0.65:1.00	-	-	-	0.65:1.00
1990	7	12	0.58:1.00	-	-	-	0.58:1.00
1991	13	19	0.68:1.00	-	-	-	0.68:1.00
1992	39	39	1.00:1.00	-	-	-	1.00:1.00
1993	50	50	1.00:1.00	-	-	-	1.00:1.00
1994	5	4	1.25:1.00	2	2	1.00:1.00	1.17:1.00
1995	No program						
1996	6	2	3.00:1.00	8	2	4.00:1.00	3.50:1.00
1997	14	23	0.61:1.00	34	49	0.69:1.00	0.67:1.00
1998	9	4	2.25:1.00	18	17	1.06:1.00	1.29:1.00
1999	No program						
2000	5	5	1.00:1.00	32	6	5.33:1.00	3.36:1.00
2001	45	70	0.64:1.00	90	177	0.51:1.00	0.55:1.00
2002	9	12	0.75:1.00	30	33	0.91:1.00	0.87:1.00
2003	28	16	1.75:1.00	42	33	1.27:1.00	1.43:1.00
2004	58	42	1.38:1.00	102	94	1.09:1.00	1.18:1.00
2005	58	40	1.45:1.00	89	96	0.93:1.00	1.08:1.00
2006	49	46	1.07:1.00	123	179	0.69:1.00	0.77:1.00
2007	20	25	0.80:1.00	66	58	1.14:1.00	1.04:1.00
2008	41	47	0.87:1.00	109	132	0.83:1.00	0.84:1.00

Return year	Number of wild spring Chinook			Number of hatchery spring Chinook			Total M/F ratio
	Males (M)	Females (F)	M/F	Males (M)	Females (F)	M/F	
2009	53	60	0.88:1.00	79	72	1.10:1.00	1.00:1.00
2010	41	42	0.98:1.00	53	50	1.06:1.00	1.02:1.00
2011	38	42	0.90:1.00	53	48	1.10:1.00	1.01:1.00
2012	35	40	0.87:1.00	20	21	0.95:1.00	0.90:1.00
2013	83	87	0.95:1.00	26	26	1.00:1.00	0.96:1.00
Total	***717***	***744***	***0.96:1.00***	***976***	***1095***	***0.89:1.00***	***0.92:1.00***

Fecundity

Mean fecundities for the 2011-2013 returns of spring Chinook ranged from 4,223-4,716 eggs per female (Table 5.5). These fecundities were generally less than the overall average of 4,682 eggs per female, but were close to the expected fecundity of 4,400 eggs per female assumed in the broodstock protocol. For 2011 and 2012 return years, natural-origin Chinook produced more eggs per female than did hatchery-origin fish. This could be attributed to differences in size and age of hatchery and natural-origin fish described above. For 2013, only natural-origin fish were used for the Chiwawa spring Chinook program (Table 5.5).

Table 5.5. Mean fecundity of wild, hatchery, and all female spring Chinook collected for broodstock, 1989-2013; NA = not available.

Return year	Mean fecundity		
	Wild	Hatchery	Total
1989*	NA	NA	2,832
1990*	NA	NA	5,024
1991*	NA	NA	4,600
1992*	NA	NA	5,199[a]
1993*	NA	NA	5,249
1994*	NA	NA	5,923
1995	No program		
1996*	NA	NA	4,645
1997	4,752	4,479	4,570
1998	5,157	5,376	5,325
1999	No program		
2000	5,028	5,019	5,023
2001	4,530	4,663	4,624
2002	5,024	4,506	4,654
2003	6,191	5,651	5,844
2004	4,846	4,775	4,799
2005	4,365	4,312	4,327
2006	4,773	4,151	4,324
2007	4,656	4,351	4,441

Return year	Mean fecundity		
	Wild	Hatchery	Total
2008	4,691	4,560	4,592
2009	4,691	4,487	4,573
2010	4,548	4,114	4,314
2011	4,969	3,884	4,385
2012	4,522	3,682	4,223
2013	4,716	0	4,716
Average	***4,841***	***4,251***	***4,682***

* Individual fecundities were not tracked with females until 1997.
[a] Estimated as the mean of fecundities two years before and two years after 1992.

5.2 Hatchery Rearing

Rearing History

Number of eggs taken

Based on the unfertilized egg-to-release survival standard of 81%, a total of 829,630 eggs were required to meet the program release goal of 672,000 smolts for brood years 1989-2010. For the 2011-2013 brood years, a total of 367,901, 252,410, and 169,442 eggs were required to meet the release goals of 298,000, 204,452, and 144,026 smolts, respectively. Between 1989 and 2013, the egg take goal was reached only in 2001 (Table 5.6). The green egg takes for 2011-2013 brood years were 99.5%, 99.3%, and 97.4% of program goals, respectively.

ESA Permit 18121 sets limits on the percentage of the total run and natural-origin fish in the broodstock to meet the conservation program. Applying these criteria to the low total abundance of spring Chinook salmon to the Chiwawa River basin and the low abundance of natural-origin fish returning to the basin has resulted in the program not meeting production goals.

Table 5.6. Numbers of eggs taken from spring Chinook broodstock, 1989-2013.

Return year	Number of eggs taken
1989	45,311
1990	60,287
1991	73,601
1992	111,624
1993	257,208
1994	35,539
1995	No program
1996	18,579
1997	312,182
1998	90,521
1999	No program
2000	55,256

Return year	Number of eggs taken
2001	1,099,630
2002	196,186
2003	247,501
2004	538,176
2005	536,490
2006	744,344
2007	359,739
2008	761,821
2009	564,912
2010	383,944
2011	366,244
2012	250,695
2013	165,047
Average	***316,297***

Number of acclimation days

Early rearing of the 2011 brood Chiwawa spring Chinook was similar to previous years with fish being held on well water before being transferred to Chiwawa Ponds for final acclimation. Beginning in 2006 (2005 brood acclimation), modifications were made to the Chiwawa Fish Hatchery intakes so that Wenatchee River water could be applied to the Chiwawa River intakes during severe cold periods to prevent the formation of frazzle ice. During acclimation of the 2011 brood, fish were acclimated for 202 to 210 days on Chiwawa River water, with 40 of those days containing a small percentage of Wenatchee River water to prevent freezing of hatchery intakes (Table 5.7).

Table 5.7. Number of days spring Chinook broods were acclimated and water source, brood years 1989-2011; NA = not available.

Brood year	Release year	Transfer date	Release date	Number of days and water source		
				Total	Chiwawa	Wenatchee
1989	1991	19-Oct	11-May	204	NA	NA
1990	1992	13-Sep	27-Apr	227	NA	NA
1991	1993	24-Sep	24-Apr	212	NA	NA
1992	1994	30-Sep	20-Apr	202	NA	NA
1993	1995	28-Sep	20-Apr	204	NA	NA
1994	1996	1-Oct	25-Apr	207	NA	NA
1995	1997	No Program				
1996	1998	25-Sep	29-Apr	216	NA	NA

Brood year	Release year	Transfer date	Release date	Number of days and water source		
				Total	Chiwawa	Wenatchee
1997	1999	28-Sep	22-Apr	206	NA	NA
1998	2000	27-Sep	24-Apr	210	NA	NA
1999	2001	No Program				
2000	2002	26-Sep	25-Apr	211	NA	NA
2001	2003	22-Oct	1-May	191	NA	NA
2002	2004	25-Sep	2-May	220	NA	NA
2003	2005	30-Sep	3-May	215	NA	NA
		30-Sep	18-Apr-18-May	200	NA	NA
2004	2006	3-Sep	1-May	240	88-104	124
		3-Sep	17-Apr-17-May	226	NA	NA
2005	2007	25-Sep	1-May	217	217	98[a]
		26-Sep	16-Apr-15-May	202-232	202-232	98[a]
2006	2008	24-27-Sep	14-Apr-13-May	231	231	95[a]
2007	2009	1-Oct	15-Apr-13-May	223	223	103[a]
2008	2010	14-15-Sep	14-Apr-12-May	212-241	212-241	129
2009	2011	14-15-Sep	26-Apr-19-May	225-249	225-249	88
2010	2012	3, 5-6-Oct	17-Apr-1-May	195-212	195-212	132
2011	2013	24-26-Sep	16-22-Apr	202-210	202-210	40

[a] Represents the number of days Wenatchee River water was applied to the Chiwawa River intake screen to prevent the formation of frazzle ice.

Release Information

Numbers released

The 2011 brood Chiwawa spring Chinook program achieved 94.6% of the 298,000 target goal with about 281,821 smolts being released volitionally into the Chiwawa River (Table 5.8).

Table 5.8. Numbers of spring Chinook smolts tagged and released from the hatchery, brood years 1989-2011. The release target for Chiwawa spring Chinook is 298,000 smolts.

Brood year	Release year	Type of release	CWT mark rate	Number released that were PIT tagged	Number of smolts released	Total number of smolts released
1989	1991	Volitional	0.9932	0	43,000	43,000
1990	1992	Volitional	0.9931	0	53,170	53,170
1991	1993	Volitional	0.9831	0	62,138	62,138
1992	1994	Volitional	0.9747	0	85,113	85,113
1993	1995	Volitional	0.9892	0	223,610	223,610

Brood year	Release year	Type of release	CWT mark rate	Number released that were PIT tagged	Number of smolts released	Total number of smolts released
1994	1996	Volitional	0.9967	0	27,226	27,226
1995	1997	No program				
1996	1998	Forced	0.8413	0	15,176	15,176
1997	1999	Volitional	0.9753	0	266,148	266,148
1998	2000	Volitional	0.9429	0	75,906	75,906
1999	2001	No program				
2000	2002	Volitional	0.9920	0	47,104	47,104
2001	2003	Forced	0.9961	0	192,490[a]	377,544
		Volitional	0.9856	0	185,054[a]	
2002	2004	Volitional	0.9693	0	149,668	149,668
2003	2005	Forced	0.9783	0	69,907	222,131
		Volitional	0.9743	0	152,224	
2004	2006	Forced	0.9533	0	243,505	494,517
		Volitional	0.9493	0	251,012	
2005	2007	Forced	0.9882	4,993	245,406	494,012
		Volitional	0.9864	4,988	248,606	
2006	2007	Direct	0.0000	0	12,977[b]	612,482
	2008	Volitional	0.9795	9,894	612,482	
2007	2008	Direct	0.0000	0	9,494	305,542
	2009	Volitional	0.9948	10,035	296,048	
2008	2010	Volitional	0.9835	10,006	609,789	609,789
2009	2011	Forced	0.9874	0	241,181	438,561
		Volitional	0.9874	9,412	197,380	
2010[c]	2012	Volitional	0.9904	5,020	346,248	346,248
2011	2013	Volitional	0.9902	9,945	281,821	281,821

[a] This does not include the 226,456 eyed eggs that were planted in the Chiwawa River.
[b] This high ELISA group was only adipose fin clipped and directly planted into Big Meadow Creek in May.
[c] This does not include 18,480 eyed eggs that were culled because of high ELISA.

Numbers tagged

The 2011 brood Chiwawa spring Chinook were 99% CWT and adipose fin clipped (Table 5.8).

In 2013, a total of 5,100 spring Chinook from the 2012 brood were PIT tagged at Eastbank Hatchery on 17 to 20 June. These fish were tagged in raceway #1. Fish were not fed the day before tagging, during tagging, or for two days after tagging. Fish averaged 76.5 mm in length and 6.5 g at time of tagging. These fish were transferred to the Chiwawa Raceway in October 2013. A total of 5,061 PIT-tagged spring Chinook were released from the Chiwawa facility in April. A total of 37 fish died and two others shed their tags during the period between tagging and release. Table 5.9 summarizes the number of hatchery spring Chinook that have been PIT-tagged and released into the Chiwawa River.

Table 5.9. Summary of PIT-tagging activities for Chiwawa hatchery spring Chinook, brood years 2005-2012.

Brood year	Release year	Number of fish tagged	Number of tagged fish that died	Number of tags shed	Number of tagged fish released
2005	2007	10,063	74	8	9,981[a]
2006	2008	10,055	134	27	9,894
2007	2009	10,112	61	16	10,035
2008	2010	10,101	81	14	10,006
2009	2011	10,101	655	34	9,412
2010	2012	5,102	82	0	5,020
2011	2013	10,200	254	1	9,945
2012	2014	5,100	37	2	5,061

[a] This release consisted of 4,988 tagged Chinook that were released volitionally and 4,993 that were forced released.

Fish size and condition at release

Spring Chinook from the 2011 brood were released as yearling smolts between 16 and 22 April 2013. Size at release was below the target established for the program. The CV for fork length was 29% short of the target (Table 5.10).

Table 5.10. Mean lengths (FL, mm), weight (g and fish/pound), and coefficient of variation (CV) of spring Chinook smolts released from the hatchery, brood years 1989-2011. Size targets are provided in the last row of the table.

Brood year	Release year	Fork length (mm)		Mean weight	
		Mean	CV	Grams (g)	Fish/pound
1989	1991	147	4.4	37.8	12
1990	1992	137	5.0	32.4	14
1991	1993	135	4.2	30.3	15
1992	1994	133	5.0	28.4	16
1993	1995	136	4.5	30.2	15
1994	1996	139	7.1	34.4	13
1995	1997	No Program			
1996	1998	157	5.3	52.1	9
1997	1999	146	7.2	38.7	12
1998	2000	143	9.1	39.5	12
1999	2001	No Program			
2000	2002	150	6.8	46.7	10
2001	2003	142	7.1	37.6	12
2002	2004	146	8.5	40.3	11

Brood year	Release year	Fork length (mm)		Mean weight	
		Mean	CV	Grams (g)	Fish/pound
2003	2005	167[a]	5.9	59.4	8
		151[b]	7.4	44.2	10
2004	2006	146[a]	6.4	39.1	12
		139[b]	5.7	34.3	13
2005	2007	136[a]	4.6	30.8	15
		129[b]	5.8	26.6	17
2006	2008	124	8.8	23.5	19
2007	2008	70[a]	4.0	3.7	122
	2009	140[b]	11.0	33.6	14
2008	2010	141	10.7	36.0	13
2009	2011	167	12.9	56.8	8
2010	2012	129	8.1	25.8	18
2011	2013	134	6.4	29.5	15
Average		***139***	***6.9***	***35.7***	***17***
Targets		***176***	***9.0***	***37.8***	***12***

[a] Forced release group.
[b] Volitional release group.

Survival Estimates

Overall survival of Chiwawa spring Chinook from green (unfertilized) egg to release was below the standard set for the program (Table 5.11). There was lower than expected survivals in the eyed egg to ponding stage contributing to decreased program performance. Pre-spawn survival of adults was above the standard set for the program.

Table 5.11. Hatchery life-stage survival rates (%) for spring Chinook, brood years 1989-2011. Survival standards or targets are provided in the last row of the table.

Brood year	Collection to spawning		Unfertilized egg-eyed	Eyed egg-ponding	30 d after ponding	100 d after ponding	Ponding to release	Transport to release	Unfertilized egg-release
	Female	Male							
1989	100.0	100.0	98.0	99.1	99.1	99.0	96.4	99.3	94.8
1990	100.0	85.7	91.8	98.1	99.5	98.9	97.9	99.2	88.2
1991	100.0	100.0	94.4	96.1	99.6	97.9	93.2	95.0	84.4
1992	100.0	100.0	98.4	96.7	99.9	99.9	80.0	80.6	76.2
1993	96.0	98.0	89.7	98.0	99.7	99.3	98.9	99.7	86.9
1994	100.0	100.0	98.6	100.0	99.8	99.4	77.0	78.9	76.6
1995	No program								
1996	100.0	100.0	88.3	100.0	93.8	93.0	89.9	97.7	81.7
1997	98.6	100.0	93.2	95.7	98.3	99.6	95.6	99.3	85.3
1998	95.2	100.0	94.5	99.0	98.5	98.3	89.6	99.1	83.9
1999	No program								
2000	100.0	100.0	91.0	98.1	97.2	96.6	95.4	99.3	85.2

Brood year	Collection to spawning		Unfertilized egg-eyed	Eyed egg-ponding	30 d after ponding	100 d after ponding	Ponding to release	Transport to release	Unfertilized egg-release
	Female	Male							
2001	97.6	97.0	88.9	98.1	99.7	99.6	51.3	51.8	34.3
2002	97.8	100.0	82.1	98.0	97.4	96.7	94.8	99.1	76.3
2003	93.9	100.0	93.2	97.7	99.5	99.3	98.5	98.1	89.7
2004	97.8	82.5	93.3	98.4	98.8	94.3	93.9	97.2	91.9
2005	97.1	100.0	95.9	98.0	99.2	99.0	97.9	99.1	92.1
2006	100.0	100.0	90.1	98.1	99.2	99.0	95.3	97.7	84.2
2007	98.8	97.7	92.9	97.2	99.4	99.0	98.0	99.4	88.5
2008	96.6	99.3	90.8	93.2	97.4	97.1	95.6	97.6	80.0
2009	94.4	97.6	92.5	88.3	97.6	97.4	89.2	92.8	77.6
2010[a]	98.9	100.0	99.2	100.0	97.9	97.5	95.6	98.2	94.8
2011	98.9	98.9	93.2	88.4	96.8	96.4	93.4	97.1	76.9
Average	***98.2***	***97.9***	***92.9***	***97.0***	***98.5***	***98.0***	***91.3***	***94.1***	***82.4***
Standard	***90.0***	***85.0***	***92.0***	***98.0***	***97.0***	***93.0***	***90.0***	***95.0***	***81.0***

[a] Survival estimates do not include the 18,840 eyed eggs that were culled because of high ELISA levels.

5.3 Disease Monitoring

Results of 2013 adult broodstock bacterial kidney disease (BKD) monitoring indicated that most females (97.1%) had ELISA values less than 0.199. About 88.6% of females had ELISA values less than 0.120, which would have required about 11.4% of the progeny to be reared at densities not to exceed 0.06 fish per pound (Table 5.12). As per the HCP Hatchery Committee Agreement, progeny from the four high ELISA females were culled to minimize possible negative effects to the remainder of the program. These progeny represented about 9.2% of the estimated production for the 2013 brood.

For the 2011 brood, mortalities resulting from external fungal infections began increasing shortly after transfer to the Chiwawa Ponds. A formalin drip treatments was used to control the infection. No significant health issues were encountered for the remainder of juvenile rearing.

Table 5.12. Proportion of bacterial kidney disease (BKD) titer groups for the Chiwawa spring Chinook broodstock, brood years 1996-2013. Also included are the proportions to be reared at either 0.125 fish per pound or 0.060 fish per pound.

Brood year[a]	Optical density values by titer group				Proportion at rearing densities (fish per pound, fpp)	
	Very Low (≤ 0.099)	Low (0.1-0.199)	Moderate (0.2-0.449)	High (≥ 0.450)	≤ 0.125 fpp (<0.119)	≤ 0.060 fpp (>0.120)
1996	0.0000	0.2500	0.2500	0.5000	0.0000	1.0000
1997	0.1176	0.7353	0.0588	0.0882	0.3529	0.6471
1998	0.1176	0.8235	0.0588	0.0000	0.4706	0.5294
1999	No Program					
2000	0.0000	0.9091	0.0909	0.0000	0.1818	0.8182
2001	0.4066	0.5436	0.0373	0.0124	0.6515	0.3485

Brood year[a]	Optical density values by titer group				Proportion at rearing densities (fish per pound, fpp)	
	Very Low (≤ 0.099)	Low (0.1-0.199)	Moderate (0.2-0.449)	High (≥ 0.450)	≤ 0.125 fpp (<0.119)	≤ 0.060 fpp (>0.120)
2002	0.2195	0.6585	0.0732	0.0488	0.5610	0.4390
2003	0.6957	0.1087	0.0652	0.1304	0.7174	0.2826
2004	0.8182	0.1515	0.0227	0.0076	0.8939	0.1061
2005	0.9084	0.0916	0.0000	0.0000	0.9695	0.0305
2006	0.7222	0.2556	0.0000	0.0222	0.8444	0.1556
2007	0.5854	0.3415	0.0244	0.0488	0.7073	0.2927
2008	0.8304	0.1520	0.0058	0.0117	0.9357	0.0643
2009	0.7600	0.1840	0.0080	0.0480	0.8480	0.1520
2010	0.8791	0.0769	0.0000	0.0439	0.9451	0.0549
2011	0.7640	0.2022	0.0000	0.0337	0.8764	0.1236
2012	0.8333	0.1333	0.0167	0.0167	0.9170	0.0830
2013	0.08286	0.1429	0.0286	0.0000	0.8857	0.1143
Average	***0.5142***	***0.3388***	***0.0436***	***0.0596***	***0.6917***	***0.3083***

[a] Individual ELISA samples were not collected before the 1996 brood.

5.4 Natural Juvenile Productivity

During 2013, juvenile spring Chinook were sampled at the Upper Wenatchee, Lower Wenatchee, and Chiwawa traps and counted during snorkel surveys within the Chiwawa River basin.

Parr Estimates

A total of 149,563 (±10%) subyearling and 852 (±21%) yearling spring Chinook were estimated in the Chiwawa River basin in August 2013 (Table 5.13 and 5.14). During the survey period 1992-2013, numbers of subyearling and yearling Chinook have ranged from 5,815 to 149,563 and 5 to 967, respectively, in the Chiwawa River basin (Table 5.13 and 5.14; Figure 5.1). Numbers of all fish counted in the Chiwawa River basin are reported in Appendix A.

Table 5.13. Total numbers of subyearling spring Chinook estimated in different steams in the Chiwawa River basin during snorkel surveys in August 1992-2013; NS = not sampled.

Sample Year	Number of subyearling spring Chinook								
	Chiwawa River	Phelps Creek	Chikamin Creek	Rock Creek	Unnamed Creek	Big Meadow Creek	Alder Creek	Brush Creek	Clear Creek	Total
1992	45,483	NS	NS	NS	NS	NS	NS	NS	NS	**45,483**
1993	77,269	0	1,258	586	NS	NS	NS	NS	NS	**79,113**
1994	53,492	0	398	474	68	624	0	0	0	**55,056**
1995	52,775	0	1,346	210	0	683	67	160	0	**55,241**
1996	5,500	0	29	10	0	248	28	0	0	**5,815**
1997	15,438	0	56	92	0	480	0	0	0	**16,066**
1998	65,875	0	1,468	496	57	506	0	13	0	**68,415**
1999	40,051	0	366	592	0	598	22	0	0	**41,629**

Sample Year	Number of subyearling spring Chinook									
	Chiwawa River	Phelps Creek	Chikamin Creek	Rock Creek	Unnamed Creek	Big Meadow Creek	Alder Creek	Brush Creek	Clear Creek	Total
2000	NS	NS	NS	NS	NS	NS	NS	NS	NS	**NS**
2001	106,753	168	2,077	2,855	354	2,332	78	0	0	**114,617**
2002	117,230	75	8,233	2,953	636	5,021	429	0	297	**134,874**
2003	80,250	4,508	1,570	3,255	118	1,510	22	45	0	**91,278**
2004	43,360	102	717	215	54	637	21	71	0	**45,177**
2005	45,999	71	2,092	660	17	792	0	0	0	**49,631**
2006	73,478	113	2,500	1,681	51	1,890	62	127	0	**79,902**
2007	53,863	125	5,235	870	51	538	20	28	22	**60,752**
2008	72,431	214	3,287	4,730	163	1,221	28	255	22	**82,351**
2009	101,085	125	2,486	1,849	14	1,082	29	18	17	**106,705**
2010	117,499	526	4,571	4,052	0	1,449	56	42	25	**128,220**
2011	136,424	64	2,762	1,330	53	581	42	214	40	**141,510**
2012	96,036	78	4,125	2,227	49	1,322	35	31	37	**103,940**
2013	140,485	120	3,301	3,214	0	2,345	31	21	46	**149,563**
Average	***73,370***	***314***	***2,394***	***1,618***	***89***	***1,256***	***51***	***54***	***27***	***79,172***

Table 5.14. Total numbers of yearling spring Chinook estimated in different steams in the Chiwawa River basin during snorkel surveys in August 1992-2013; NS = not sampled.

Sample Year	Number of yearling spring Chinook									
	Chiwawa River	Phelps Creek	Chikamin Creek	Rock Creek	Unnamed Creek	Big Meadow Creek	Alder Creek	Brush Creek	Y Creek	Total
1992	563	NS	NS	NS	NS	NS	NS	NS	NS	**563**
1993	174	0	0	0	NS	NS	NS	NS	NS	**174**
1994	14	0	0	4	0	0	0	0	0	**18**
1995	13	0	0	0	0	0	0	0	0	**13**
1996	22	0	0	0	0	0	0	0	0	**22**
1997	5	0	0	0	0	0	0	0	0	**5**
1998	63	0	0	0	0	0	0	0	0	**63**
1999	41	0	0	0	0	0	0	0	0	**41**
2000	NS	NS	NS	NS	NS	NS	NS	NS	NS	**NS**
2001	66	0	3	0	0	0	0	0	0	**69**
2002	32	0	0	0	0	0	0	0	0	**32**
2003	134	0	0	0	0	0	0	0	0	**134**
2004	14	0	0	0	0	7	0	0	0	**21**
2005	62	0	17	0	0	0	0	0	0	**79**
2006	345	0	0	43	0	0	0	0	0	**388**
2007	41	0	0	0	0	0	0	0	0	**41**
2008	144	0	45	0	0	0	0	0	0	**189**
2009	49	0	0	5	0	0	0	0	0	**54**
2010	207	27	19	38	0	0	0	0	0	**291**

Sample Year	**Number of yearling spring Chinook**									
	Chiwawa River	**Phelps Creek**	**Chikamin Creek**	**Rock Creek**	**Unnamed Creek**	**Big Meadow Creek**	**Alder Creek**	**Brush Creek**	**Y Creek**	**Total**
2011	645	0	71	194	0	57	0	0	0	**967**
2012	748	0	0	19	0	0	0	0	0	**767**
2013	836	0	0	8	0	8	0	0	0	**852**
Average	***201***	***1***	***8***	***16***	***0***	***4***	***0***	***0***	***0***	***229***

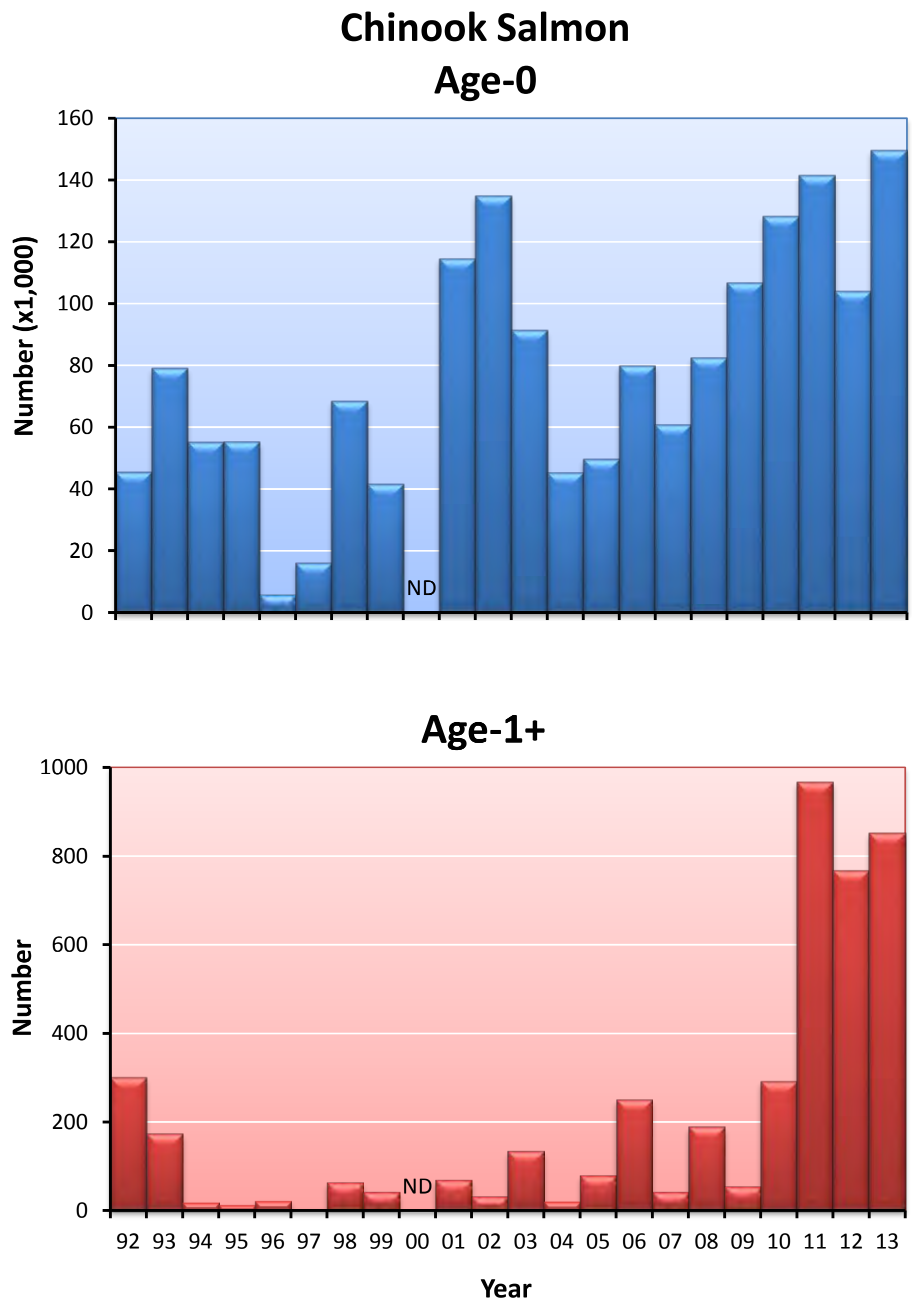


Figure 5.1. Numbers of subyearling and yearling Chinook salmon within the Chiwawa River Basin in August 1992-2013; ND = no data.

Juvenile Chinook were distributed contagiously among reaches in the Chiwawa River. Their densities were highest in the upper portions of the basin, with the highest densities within tributaries. Juvenile Chinook were most abundant in multiple channels and least abundant in glides and riffles. Most Chinook associated closely with woody debris in multiple channels. These sites (multiple channels) made up 17% of the total area of the Chiwawa River basin, but they provided habitat for 48% of all subyearling Chinook in the basin in 2013. In contrast, riffles made up 53% of the total area, but provided habitat for only 13% of all juvenile Chinook in the Chiwawa River basin. Pools made up 23% of the total area and provided habitat for 37% of all juvenile Chinook in the basin. Virtually no Chinook used glides that lacked woody debris.

Mean densities of juvenile Chinook in two reaches of the Chiwawa River were generally less than those in corresponding reference areas (Nason Creek and the Little Wenatchee River) (Figure 5.2). Within both the Chiwawa River and its reference areas, pools and multiple channels consistently had the highest densities of juvenile Chinook.

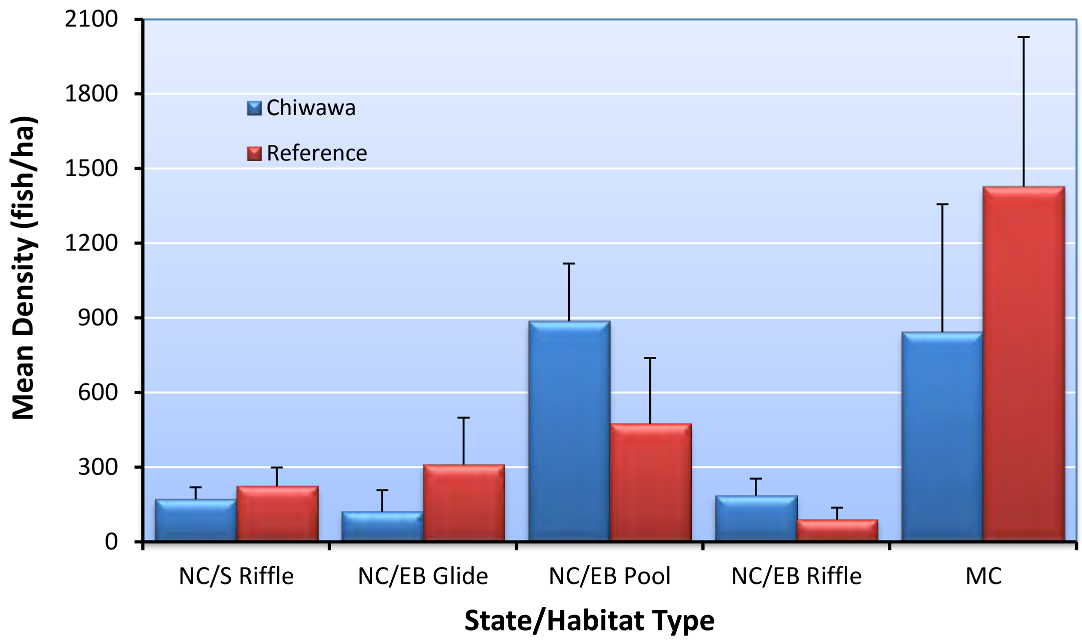


Figure 5.2. Comparison of the 20-year means of subyearling spring Chinook densities within state/habitat types in reaches 3 and 8 of the Chiwawa River and their matched reference areas on Nason Creek and the Little Wenatchee River. NC = natural channel; S = straight channel; EB = eroded banks; MC = multiple channel. There was no sampling in 2000 and no sampling within reference areas in 1992.

Smolt and Emigrant Estimates

Numbers of spring Chinook smolts and emigrants were estimated at the Upper Wenatchee, Lower Wenatchee, and Chiwawa traps in 2013.

Chiwawa Trap

The Chiwawa Trap operated between 22 February and 21 November 2013. During that time period the trap was inoperable for 16 days because of high river flows, debris, snow/ice, or mechanical failure. The trap operated in two different positions depending on stream flow; lower position at flows greater than 12 m^3/s and an upper position at flows less than 12 m^3/s. Daily trap efficiencies were estimated from two regression models depending on trap position and age class of fish (e.g., subyearling and yearling). The daily number of fish captured was expanded by the estimated trap efficiency to estimate daily total emigration. Monthly captures of all fish and results of mark-recapture efficiency tests at the Chiwawa Trap are reported in Appendix B.

Wild yearling spring Chinook (2011 brood year) were primarily captured from March through June 2013 (Figure 5.3). Based on capture efficiencies estimated from the flow model, the total number of wild yearling Chinook emigrating from the Chiwawa River was 37,185 (±4,022). Combining the total number of subyearling spring Chinook (67,982) that emigrated during the fall of 2012 with the total number of yearling Chinook (37,185) that emigrated during 2013 and the number of estimated Chinook that were not trapped (3,665) resulted in a total emigrant estimate of 108,832 (±12,926) spring Chinook for the 2011 brood year (Table 5.15). The method for estimating emigration during the non-trapping period is explained in detail in Appendix B.

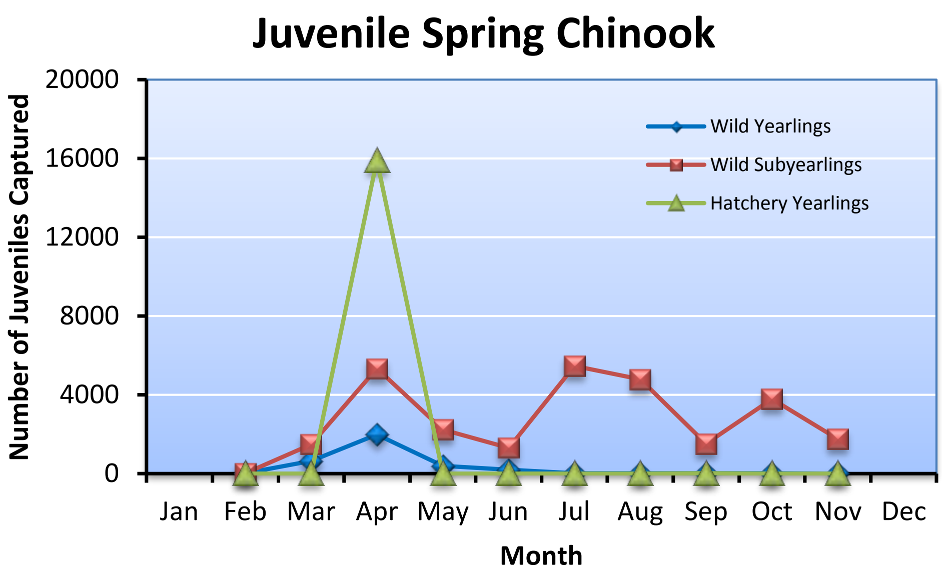


Figure 5.3. Monthly captures of wild subyearling, wild yearling, and hatchery yearling spring Chinook at the Chiwawa Trap, 2013.

Table 5.15. Numbers of redds and juvenile spring Chinook at different life stages in the Chiwawa River basin for brood years 1991-2013; NS = not sampled.

Brood year	Number of redds	Egg deposition	Number of parr	Number of smolts produced within Chiwawa River basin[a]	Total number of smolts[b]	Number of emigrants
1991	104	478,400	45,483[c]	42,525	42,525	NS
1992	302	1,570,098	79,113	39,723	56,763	65,541
1993	106	556,394	55,056	8,662	17,926	22,698
1994	82	485,686	55,240	16,472	22,145	25,067
1995	13	66,248	5,815	3,830	5,230	5,951
1996	23	106,835	16,066	15,475	17,922	19,183
1997	82	374,740	68,415	28,334	39,044	44,562
1998	41	218,325	41,629	23,068	24,953	25,923
1999	34	166,090	NS	10,661	13,953	15,649

Brood year	Number of redds	Egg deposition	Number of parr	Number of smolts produced within Chiwawa River basin[a]	Total number of smolts[b]	Number of emigrants
2000	128	642,944	114,617	40,831	50,634	55,685
2001	1,078	4,984,672	134,874	86,482	389,940	546,266
2002	345	1,605,630	91,278	90,948	152,547	184,279
2003	111	648,684	45,177	16,755	27,897	33,637
2004	241	1,156,559	49,631	72,080	101,172	116,158
2005	332	1,436,564	79,902	69,064	140,737	177,659
2006	297	1,284,228	60,752	45,050	86,579	107,972
2007	283	1,256,803	82,351	25,809	65,539	86,006
2008	689	3,163,888	106,705	35,023	91,229	120,184
2009	421	1,925,233	128,220	30,959	51,417	61,955
2010	502	2,165,628	141,510	47,511	82,911	101,130
2011	492	2,157,420	103,940	37,185	82,053	108,832
2012	808	3,412,184	149,563	-	-	-
Average	***296***	***1,357,421***	***78,826***	***37,450***	***74,440***	***96,217***

[a] The estimated number of smolts (yearlings) that are produced entirely within the Chiwawa River basin. Smolt estimates for brood years 1992-1996 were calculated with a mark-recapture model; brood years 1997-present were calculated with a flow model.
[b] These numbers represent Chiwawa smolts produced within the entire Wenatchee River basin. This assumes that 66% of the subyearling migrants from the Chiwawa River basin survive to smolt in the Wenatchee River basin, regardless of the number of subyearling migrants (i.e., no density dependence). Smolt estimates for brood years 1992-1996 were calculated with a mark-recapture model; brood years 1997-present were calculated with a flow model.
[c] Estimate only includes numbers of Chinook in the Chiwawa River. Tributaries were not sampled at that time.

Wild subyearling spring Chinook (2012 brood year) were captured between 22 February and 21 November 2013. Based on capture efficiencies estimated from the flow model for both the upper trap position and lower position, the total number of wild subyearling (fry and parr) Chinook from the Chiwawa River basin was 103,936 (±44,244). Removing fry from the estimate, a total of 49,774 (±6,026) parr emigrated from the Chiwawa River basin in 2013. Although subyearling parr migrated during most months of sampling, the majority (97%) migrated during July through November (Figure 5.3).

Yearling spring Chinook sampled in 2013 averaged 88 mm in length, 7.7 g in weight, and had a mean condition of 1.09 (Table 5.16). These size estimates were less than the overall mean of yearling spring Chinook sampled in previous years (overall means: 93 mm, 9.1 g, and condition of 1.08). Subyearling spring Chinook sampled in 2013 at the Chiwawa Trap averaged 71 mm in length, averaged 4.1 g, and had a mean condition of 1.09 (Table 5.16). These sizes were less than the overall mean of subyearling spring Chinook sampled in previous years (overall means, 76 mm, 5.4 g, and condition of 1.10).

Table 5.16. Mean fork length (mm), weight (g), and condition factor of subyearling and yearling spring Chinook collected in the Chiwawa Trap, 1996-2013. Numbers in parentheses indicate 1 standard deviation.

Sample year	Life stage	Sample size[a]	Mean size		
			Length (mm)	Weight (g)	Condition (K)
1996	Subyearling	514	78 (25)	6.9 (4.2)	1.11 (0.11)
	Yearling	1,589	94 (9)	9.5 (3.0)	1.11 (0.08)
1997	Subyearling	840	86 (8)	7.5 (2.1)	1.16 (0.08)
	Yearling	1,114	100 (7)	10.2 (2.6)	1.02 (0.10)
1998	Subyearling	3,743	82 (11)	6.2 (2.2)	1.08 (0.09)
	Yearling	2,663	97 (7)	10.3 (2.8)	1.12 (0.23)
1999	Subyearling	569	89 (9)	8.5 (2.4)	1.15 (0.07)
	Yearling	3,664	95 (8)	9.6 (3.4)	1.09 (0.19)
2000	Subyearling	1,810	85 (10)	7.4 (2.4)	1.15 (0.10)
	Yearling	1,891	97 (8)	10.5 (5.2)	1.13 (0.07)
2001	Subyearling	4,657	82 (11)	6.6 (3.4)	1.14 (0.09)
	Yearling	2,935	97 (7)	10.5 (2.4)	1.15 (0.08)
2002	Subyearling	6,130	64 (12)	3.0 (1.6)	1.06 (0.10)
	Yearling	1,735	94 (8)	9.0 (2.3)	1.09 (0.08)
2003	Subyearling	3,679	64 (12)	3.2 (1.7)	1.08 (0.10)
	Yearling	2,657	87 (9)	7.2 (3.5)	1.07 (0.10)
2004	Subyearling	2,278	75 (16)	4.3 (2.1)	0.92 (0.16)
	Yearling	1,032	91 (9)	8.5 (2.7)	1.09 (0.10)
2005	Subyearling	2,702	73 (12)	4.6 (2.2)	1.08 (0.09)
	Yearling	803	96 (9)	9.9 (2.8)	1.08 (0.08)
2006	Subyearling	3,462	76 (11)	5.1 (2.0)	1.12 (0.21)
	Yearling	4,645	95 (7)	9.4 (2.3)	1.10 (0.13)
2007	Subyearling	1,718	72 (12)	4.5 (2.1)	1.13 (0.16)
	Yearling	2,245	91 (8)	8.6 (2.5)	1.10 (0.09)
2008	Subyearling	10,443	79 (12)	5.9 (2.3)	1.15 (0.15)
	Yearling	8,792	93 (7)	8.8 (2.1)	1.08 (0.10)
2009	Subyearling	10,536	75 (10)	5.0 (2.2)	0.91 (0.11)
	Yearling	3,630	92 (7)	8.8 (2.1)	0.89 (0.07)
2010	Subyearling	3,888	77 (12)	5.4 (2.3)	1.11 (0.16)
	Yearling	5,799	91 (8)	8.9 (2.2)	1.15 (0.14)
2011	Subyearling	6,870	73 (11)	4.8 (2.2)	1.15 (0.16)
	Yearling	4,734	94 (8)	8.7 (2.2)	1.04 (0.10)
2012	Subyearling	8,756	75 (10)	4.8 (2.2)	1.13 (0.28)
	Yearling	7,290	90 (7)	8.0 (2.6)	1.06 (0.24)
2013	Subyearling	10,181	71 (10)	4.1 (1.7)	1.09 (0.39)

Sample year	Life stage	Sample size[a]	Mean size		
			Length (mm)	Weight (g)	Condition (K)
	Yearling	3,135	88 (9)	7.7 (2.8)	1.09 (0.20)
Average	***Subyearling***	***4,599***	***76 (7)***	***5.4 (1.5)***	***1.10 (0.07)***
	Yearling	***3,353***	***93 (3)***	***9.1 (1.0)***	***1.08 (0.06)***

[a] Sample size represents the number of fish that were measured for both length and weight.

Upper Wenatchee Trap

The Upper Wenatchee Trap operated between 3 March and 30 June 2013. During the four-month sampling period, a total of 98 wild yearling Chinook, 7,321 wild subyearling Chinook, and six hatchery yearling Chinook were captured at the Upper Wenatchee Trap. Monthly captures of all fish collected at the Upper Wenatchee Trap are reported in Appendix B.

Lower Wenatchee Trap

The lower Wenatchee Trap operated in a new location in 2013. Hence, historic flow-discharge relationships are invalid and new models to estimate trap efficiency must be developed for all species. Until new models are developed (2-3 years) all estimates of juvenile abundance should be considered preliminary.

The Lower Wenatchee Trap operated between 13 February and 31 October 2013. During that time period the trap was inoperable for 22 days because of high river flows, debris, snow/ice, or major hatchery releases. During the nine-month sampling period, a total of 1,854 wild yearling Chinook, 52,652 wild subyearling Chinook (mostly summer Chinook), and 13,979 hatchery yearling Chinook were captured at the Lower Wenatchee Trap. Based on capture efficiencies estimated from the flow model, the total number of wild yearling Chinook that emigrated past the Lower Wenatchee Trap was 89,917 (±579,521). Monthly captures of all fish collected at the Lower Wenatchee Trap are reported in Appendix B.

PIT Tagging Activities

As part of the Comparative Survival Study (CSS), a total of 17,002 wild juvenile Chinook (12,103 subyearling and 4,899 yearlings) were PIT tagged and released in 2013 in the Wenatchee River basin (Table 5.17a). Most of these (71.6%) were tagged at the Chiwawa trap. See Appendix C for a complete list of all fish captured, tagged, lost, and released.

Table 5.17a. Numbers of wild Chinook that were captured, tagged, and released at different locations within the Wenatchee River basin, 2013. Numbers of fish that died or shed tags are also given.

Sampling Location	Species and Life Stage	Number held	Number of recaptures	Number tagged	Number died	Shed Tags	Total released	Percent mortality
Chiwawa Trap	Wild Subyearling Chinook	9,827	544	9,098	8	4	9,086	0.08
	Wild Yearling Chinook	3,179	6	3,105	12	0	3,093	0.38
	Total	**13,006**	**550**	**12,203**	**20**	**4**	**12,179**	**0.15**
Chiwawa Remote	Wild Subyearling Chinook	3,114	75	3,039	22	0	3,017	0.71
	Wild Yearling Chinook	**0**	**0**	**0**	**0**	**0**	**0**	**--**
	Total	**3,114**	**75**	**3,039**	**22**	**0**	**3,017**	**0.71**
Upper Wenatchee Trap	Wild Subyearling Chinook	0	0	0	0	0	0	--

Sampling Location	Species and Life Stage	Number held	Number of recaptures	Number tagged	Number died	Shed Tags	Total released	Percent mortality
	Wild Yearling Chinook	96	1	94	0	0	94	0.00
	Total	**96**	**1**	**94**	**0**	**0**	**94**	**0.00**
Lower Wenatchee Trap	Wild Subyearling Chinook	0	0	0	0	0	0	0.00
	Wild Yearling Chinook	1,841	114	1,713	1	0	1,712	0.05
	Total	**1,841**	**114**	**1,713**	**1**	**0**	**1,712**	**0.05**
Total:	**Wild Subyearling Chinook**	**12,941**	**619**	**12,137**	**30**	**4**	**12,103**	**0.23**
	Wild Yearling Chinook	**5,116**	**121**	**4,912**	**13**	**0**	**4,899**	**0.25**
Grand Total:		***18,057***	***740***	***17,049***	***43***	***4***	***17,002***	***0.24***

Numbers of wild Chinook salmon PIT-tagged and released as part of CSS during the period 2006-2013 are shown in Table 5.17b.

Table 5.17b. Summary of the numbers of wild Chinook that were tagged and released at different locations within the Wenatchee River basin, 2006-2013.

Sampling Location	Species and Life Stage	Numbers of PIT-tagged Chinook salmon released							
		2006	2007	2008	2009	2010	2011	2012	2013
Chiwawa Trap	Wild Subyearling Chinook	5,130	6,137	8,755	8,765	3,324	6,030	7,644	9,086
	Wild Yearling Chinook	2,793	4,659	8,397	3,694	6,281	4,318	7,980	3,093
	Total	**7,923**	**10,796**	**17,152**	**12,459**	**9,605**	**10,348**	**15,624**	**12,179**
Chiwawa Remote	Wild Subyearling Chinook	111	20	43	128	531	0	3,181	3,017
	Wild Yearling Chinook	0	0	0	3	4	0	0	0
	Total	**111**	**20**	**43**	**131**	**535**	**0**	**3,181**	**3,017**
Upper Wenatchee Trap	Wild Subyearling Chinook	0	15	0	37	3	1	1	0
	Wild Yearling Chinook	81	1,434	159	296	486	714	75	94
	Total	**81**	**1,449**	**159**	**333**	**489**	**715**	**76**	**94**
Nason Creek Remote[a]	Wild Subyearling Chinook	68	6	4	701	595	0	0	0
	Wild Yearling Chinook	1	7	0	13	3	0	0	0
	Total	**69**	**13**	**4**	**714**	**598**	**0**	**0**	**0**
Upper Wenatchee Remote	Wild Subyearling Chinook	0	61	1	0	2	0	0	0
	Wild Yearling Chinook	27	0	0	0	0	0	0	0
	Total	**27**	**61**	**1**	**0**	**2**	**0**	**0**	**0**
Middle Wenatchee Remote	Wild Subyearling Chinook	0	0	65	284	233	0	0	0
	Wild Yearling Chinook	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**65**	**284**	**233**	**0**	**0**	**0**
Lower Wenatchee Remote	Wild Subyearling Chinook	0	0	0	0	0	0	0	0
	Wild Yearling Chinook	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Peshastin Creek	Wild Subyearling Chinook	0	0	0	0	1	0	0	0

Sampling Location	Species and Life Stage	Numbers of PIT-tagged Chinook salmon released							
		2006	2007	2008	2009	2010	2011	2012	2013
Remote	Wild Yearling Chinook	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**
Lower Wenatchee Trap	Wild Subyearling Chinook	0	0	2	0	0	0	0	0
	Wild Yearling Chinook	522	1,641	506	468	917	0	0	1,712
	Total	**522**	**1,641**	**508**	**468**	**917**	**0**	**0**	**1,712**
Total:	**Wild Subyearling Chinook**	**5,309**	**6,239**	**8,870**	**9,915**	**4,689**	**6,031**	**10,826**	**12,103**
	Wild Yearling Chinook	**3,424**	**7,741**	**9,062**	**4,474**	**7,691**	**5,032**	**8,055**	**4,899**
Grand Total:		***8,733***	***13,980***	***17,932***	***14,389***	***12,380***	***11,063***	***18,881***	***17,002***

Freshwater Productivity

Both productivity and survival estimates for different life stages of spring Chinook in the Chiwawa River basin are provided in Table 5.18. Estimates for brood year 2011 fall within the ranges estimated over the period of brood years 1991-2010. During that period, freshwater productivities ranged from 125-1,015 parr/redd, 122-779 smolts/redd, and 147-834 emigrants/redd. Survivals during the same period ranged from 2.7-19.1% for egg-parr, 2.9-16.8% for egg-smolt, and 3.2-18.0% for egg-emigrants. Overwinter survival rates for juvenile spring Chinook within the Chiwawa River basin have ranged from 15.7-100.0%.

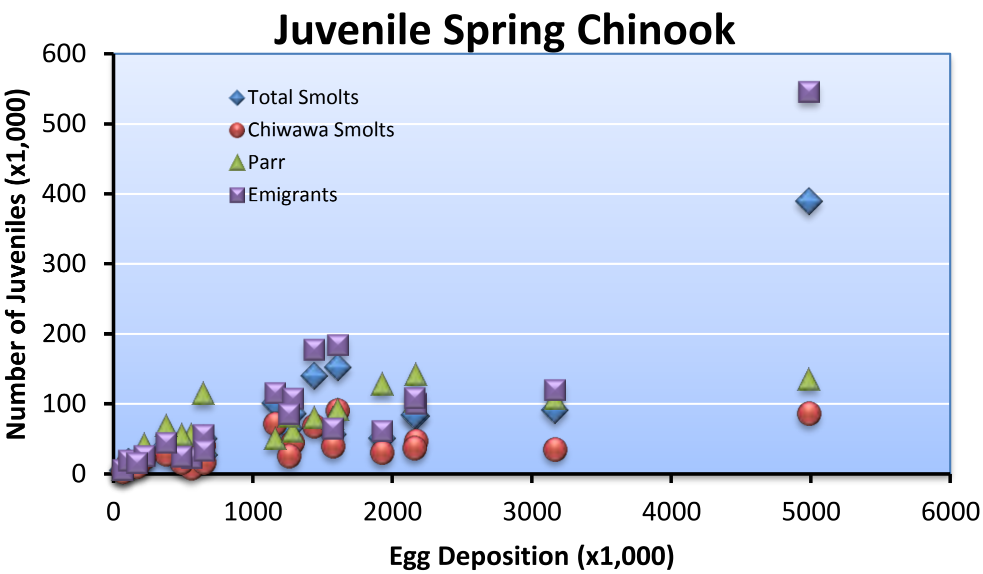
Table 5.18. Productivity (fish/redd) and survival (%) estimates for different juvenile life stages of spring Chinook in the Chiwawa River basin for brood years 1991-2012; ND = no data. These estimates were derived from data in Table 5.15.

Brood year	Parr/Redd	Smolts/Redd[a]	Emigrants/ Redd	Egg-Parr (%)	Parr-Smolt[b] (%)	Egg-Smolt[a] (%)	Egg-Emigrant (%)
1991	437	409	ND	9.5	93.5	8.9	ND
1992	262	188	217	5.0	50.2	3.6	4.2
1993	519	169	214	9.9	15.7	3.2	4.1
1994	674	270	306	11.4	29.8	4.6	5.2
1995	447	402	458	8.8	65.9	7.9	9.0
1996	699	779	834	15.0	96.3	16.8	18.0
1997	834	476	543	18.3	41.4	10.4	11.9
1998	1,015	609	632	19.1	55.4	11.4	11.9
1999	ND	410	460	ND	ND	8.4	9.4
2000	895	396	435	17.8	35.6	7.9	8.7
2001	125	362	507	2.7	64.1	7.8	11.0
2002	265	442	534	5.7	99.6	9.5	11.5
2003	407	251	303	7.0	37.1	4.3	5.2
2004	206	420	482	4.3	100.0	8.7	10.0
2005	241	424	535	5.6	86.4	9.8	12.4

Brood year	Parr/Redd	Smolts/Redd[a]	Emigrants/ Redd	Egg-Parr (%)	Parr-Smolt[b] (%)	Egg-Smolt[a] (%)	Egg-Emigrant (%)
2006	205	292	364	4.7	74.2	6.7	8.4
2007	291	232	304	6.6	31.3	5.2	6.8
2008	155	132	174	3.4	32.8	2.9	3.8
2009	305	122	147	6.7	24.1	2.7	3.2
2010	282	165	201	6.5	33.6	3.8	4.7
2011	211	172	221	4.8	35.8	3.9	5.0
2012	185	-	-	4.4	-	-	-
Average	***412***	***399***	***394***	***8.4***	***55.1***	***7.1***	***8.2***

[a] These estimates include Chiwawa smolts produced within the Wenatchee River basin. This assumes that 66% of the subyearling migrants survive to smolt, regardless of the number of subyearling migrants (i.e., no density dependence). Smolt estimates for brood years 1992-1996 were calculated with a mark-recapture model; brood years 1997-present were calculated with a flow model.
[b] These estimates represent overwinter survival within the Chiwawa River basin. It does not include Chiwawa smolts produced outside the Chiwawa River basin. As noted in footnote *a*, smolts/redd and egg-smolt survival include Chiwawa smolts produced in the Wenatchee River basin.

Seeding level (egg deposition) explained most of the variability in productivity and survival of juvenile spring Chinook in the Chiwawa River basin. That is, for estimates based on "within-Chiwawa-Basin" life stages (e.g., parr and within-Chiwawa-Basin smolts), survival and productivity decreased as seeding levels increased (Figure 5.4). This suggests that density dependence regulates juvenile productivity and survival within the Chiwawa River basin. This form of population regulation is less apparent with total smolts (i.e., Chiwawa smolts produced within the Wenatchee River basin) and total emigrants. However, one would expect the number of emigrants to increases as seeding levels exceed the capacity of the Chiwawa River basin.



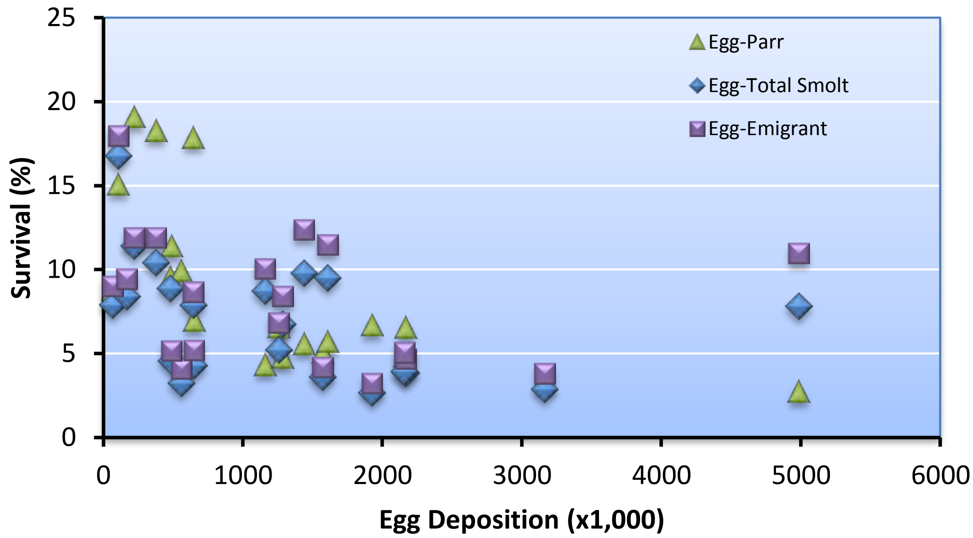


Figure 5.4. Relationships between seeding levels (egg deposition) and juvenile life-stage survivals and productivities for Chiwawa spring Chinook, brood years 1991-2011. Total smolts are Chiwawa smolts produced within and outside the Chiwawa River basin (assumes a 66% survival on subyearling emigrants). Chiwawa smolts are smolts produced only in the Chiwawa River basin.

5.5 Spawning Surveys

Surveys for spring Chinook redds were conducted during August through September, 2013, in the Chiwawa River (including Rock, Phelps, Big Meadow, and Chikamin creeks), Nason Creek, Icicle Creek, Peshastin Creek (including Ingalls Creek), Upper Wenatchee River (including Chiwaukum Creek), Little Wenatchee River, and White River (including the Napeequa River and Panther Creek).

Redd Counts

A total of 1,159 spring Chinook redds were counted in the Wenatchee River basin in 2013 (Table 5.19). This is higher than the average of 656 redds counted during the period 1989-2013 in the Wenatchee River basin. Most spawning occurred in the Chiwawa River (61.6% or 714 redds) (Table 5.19; Figure 5.5). Nason Creek contained 18.3% (212 redds), Icicle contained 9.2% (107 redds), White River contained 4.7% (54 redds), the Upper Wenatchee River 1.5% (17 redds), Little Wenatchee contained 4.4% (51 redds), and Peshastin Creek contained 0.3% (4 redds).

Table 5.19. Numbers of spring Chinook redds counted within different streams/watersheds within the Wenatchee River basin, 1989-2013. Redd counts in Peshastin Creek in 2001 and 2002 (*) were elevated because the U.S. Fish and Wildlife Service planted 487 and 350 spring Chinook adults, respectively, into the stream. These counts were not included in the total or average calculations.

Sample year	Number of spring Chinook redds							
	Chiwawa	Nason	Little Wenatchee	White	Wenatchee River	Icicle	Peshastin	Total
1989	314	98	45	64	94	24	NS	**639**
1990	255	103	30	22	36	50	4	**500**
1991	104	67	18	21	41	40	1	**292**
1992	302	81	35	35	38	37	0	**528**
1993	106	223	61	66	86	53	5	**600**
1994	82	27	7	3	6	15	0	**140**
1995	13	7	0	2	1	9	0	**32**
1996	23	33	3	12	1	12	1	**85**
1997	82	55	8	15	15	33	1	**209**
1998	41	29	8	5	0	11	0	**94**
1999	34	8	3	1	2	6	0	**54**
2000	128	100	9	8	37	68	0	**350**
2001	1,078	374	74	104	218	88	173*	**2,109**
2002	345	294	42	42	64	245	107*	**1,139**
2003	111	83	12	15	24	18	60	**323**
2004	241	169	13	22	46	30	55	**576**
2005	332	193	64	86	143	8	3	**829**
2006	297	152	21	31	27	50	10	**588**
2007	283	101	22	20	12	17	11	**466**
2008	689	336	38	31	180	116	21	**1,411**
2009	421	167	39	54	5	32	15	**733**
2010	502	188	38	33	47	155	5	**968**
2011	492	170	30	20	12	122	26	**872**
2012	880	413	43	86	73	199	10	**1,704**
2013	714	212	51	54	17	107	4	**1,159**
Average	***315***	***147***	***29***	***34***	***49***	***62***	***11***	***656***

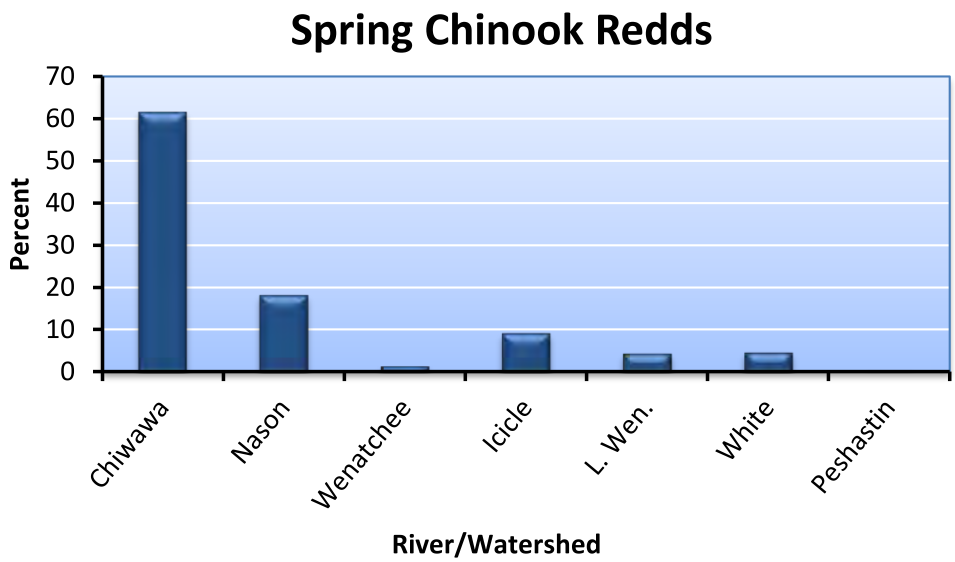


Figure 5.5. Percent of the total number of spring Chinook redds counted in different streams/watersheds within the Wenatchee River basin during August through September, 2013.

Redd Distribution

Spring Chinook redds were not evenly distributed among reaches within survey streams in 2013 (Table 5.20). Most of the spawning in the Chiwawa River basin occurred in Reaches 1 through 6. About 36% of the spawning in the Chiwawa River basin occurred in the lower two reaches (RM 0.0-19.3; from the mouth to Rock Creek). Relatively few fish spawned in Rock and Chikamin creeks. The spatial distribution of redds in Nason Creek was weighted towards Reach 3, having 32% of the Nason Creek redds. In the Little Wenatchee River, 90% of all spawning occurred in Reach 3 (RM 5.2-9.2; Lost Creek to Rainy Creek). On the White River, 88% of the spawning occurred in Reach 3 (RM 11.0-12.9; Napeequa River to Grasshopper Meadows). About 53% of all the spawning in the Wenatchee River occurred upstream from the mouth of the Chiwawa River.

Table 5.20. Numbers and proportions of spring Chinook redds counted within different streams/watersheds within the Wenatchee River basin during August through September, 2013.

Stream/watershed	Reach	Number of redds	Proportion of redds within stream/watershed
Chiwawa	Chiwawa 1 (C1)	126	0.18
	Chiwawa 2 (C2)	296	0.41
	Chiwawa 3 (C3)	25	0.04
	Chiwawa 4 (C4)	81	0.11
	Chiwawa 5 (C5)	67	0.09
	Chiwawa 6 (C6)	92	0.13
	Phelps 1	0	0.0
	Rock 1 (R1)	14	0.02
	Chikamin 1 (K1)	13	0.02

Stream/watershed	Reach	Number of redds	Proportion of redds within stream/watershed
	Big Meadow 1	0	0.0
	Total	**714**	**1.00**
Nason	Nason 1 (N1)	64	0.30
	Nason 2 (N2)	27	0.13
	Nason 3 (N3)	68	0.32
	Nason 4 (N4)	53	0.25
	Total	**212**	**1.00**
Little Wenatchee	Little Wen 2 (L2)	5	0.10
	Little Wen 3 (L3)	46	0.90
	Total	**51**	**1.00**
White	White 2 (H2)	0	0.0
	White 3 (H3)	48	0.88
	White 4 (H4)	2	0.04
	Napeequa 1 (Q1)	2	0.04
	Panther 1 (T1)	2	0.04
	Total	**54**	**1.00**
Wenatchee River	Wen 8 (W8)	0	0.0
	Wen 9 (W9)	1	0.06
	Wen 10 (W10)	9	0.53
	Chiwaukum (U1)	7	0.41
	Total	**17**	**1.00**
Icicle	Icicle 1 (I1)	107	1.00
	Total	**107**	**1.00**
Peshastin	Peshastin 1 (P1)	3	0.75
	Peshastin 2 (P2)	0	0.0
	Ingalls (D1)	1	0.25
	Total	**4**	**1.00**
Grand Total		***1,159***	***1.00***

Spawn Timing

Spring Chinook began spawning during the first week of August in Nason Creek, Chiwawa River, and the White River, and the second week in the Little Wenatchee River and the Wenatchee River (Figure 5.6). Spawning peaked the fourth week of August in the White River and the Little Wenatchee, and the fifth week of August in Nason Creek and the Chiwawa River. The Wenatchee River peaked the first week of September. All spawning was completed by the end of September.

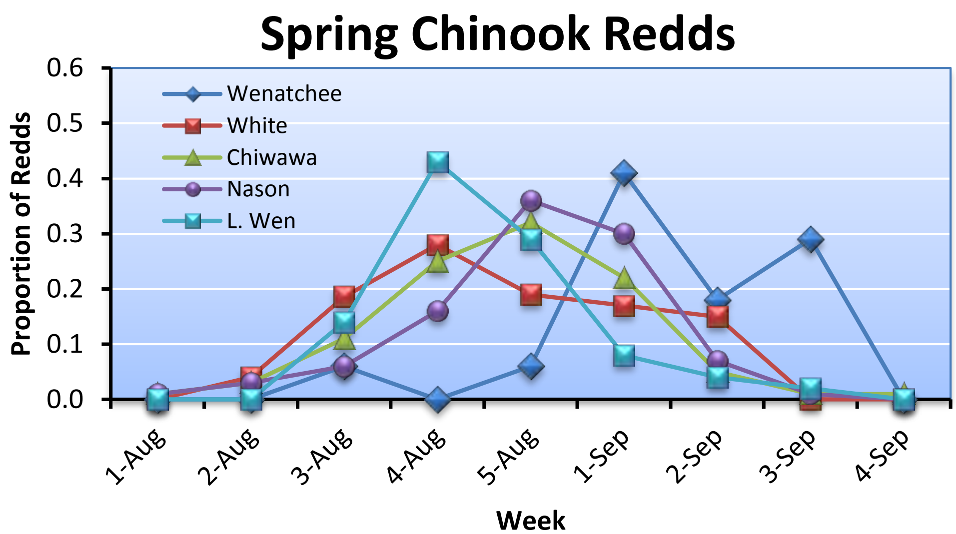


Figure 5.6. Proportion of spring Chinook redds counted during different weeks in different sampling streams within the Wenatchee River basin, August through September 2013.

Spawning Escapement

Spawning escapement for spring Chinook was calculated as the number of redds times the male-to-female ratio (i.e., fish per redd expansion factor) estimated from broodstock and fish sampled at adult trapping sites. The estimated fish per redd ratio for spring Chinook upstream from Tumwater in 2013 was 1.94 (based on sex ratios estimated at Tumwater Dam). The estimated fish per redd ratio for spring Chinook downstream from Tumwater (Icicle and Peshastin creeks) was 1.75 (derived from broodstock collected at the Leavenworth National Fish Hatchery). Multiplying these ratios by the number of redds counted in the Wenatchee River basin resulted in a total spawning escapement of 2,227 spring Chinook (Table 5.21). The Chiwawa River basin had the highest spawning escapement (1,385 Chinook), while Peshastin Creek had the lowest.

Table 5.21. Number of redds, fish per redd ratios, and total spawning escapement for spring Chinook in the Wenatchee River basin, 2013. Spawning escapement was estimated as the product of redds times fish per redd.

Sampling area	Total number of redds	Fish/redd	Total spawning escapement*
Chiwawa	714	1.94	1,385
Nason	212	1.94	411
Upper Wenatchee River	17	1.94	33
Icicle	107	1.75	187
Little Wenatchee	51	1.94	99
White	54	1.94	105
Peshastin	4	1.75	7
Total	***1,159***		***2,227***

* Spawning escapement estimate is based on total number of redds by stream. If escapement is calculated at the reach scale, then the total escapement may vary from what is shown here because of rounding errors.

The estimated total spawning escapement of 2,227 spring Chinook in 2013 was greater than the overall average of 1,473 spring Chinook (Table 5.22). The escapement in the Chiwawa River basin in 2013 was over three times the escapement in Nason Creek, the second most abundant stream in the Wenatchee River basin (Table 5.22).

Table 5.22. Spawning escapements for spring Chinook in the Wenatchee River basin for return years 1989-2013; NA = not available.

Return year	Upper basin spawning escapement						Lower basin spawning escapement			Total
	Fish/redd	Chiwawa	Nason	Little Wenatchee	White	Wenatchee River	Fish/redd	Icicle	Peshastin	
1989	2.27	713	222	102	145	213	2.27	54	NA	**1,449**
1990	2.24	571	231	67	49	81	2.24	112	9	**1,120**
1991	2.33	242	156	42	49	96	2.33	93	2	**680**
1992	2.24	676	181	78	78	85	2.24	83	0	**1,181**
1993	2.20	233	491	134	145	189	2.20	117	11	**1,320**
1994	2.24	184	60	16	7	13	2.24	34	0	**314**
1995	2.51	33	18	0	5	3	2.51	23	0	**82**
1996	2.53	58	83	8	30	3	2.53	30	3	**215**
1997	2.22	182	122	18	33	33	2.22	73	2	**463**
1998	2.21	91	64	18	11	0	2.21	24	0	**208**
1999	2.77	94	22	8	3	6	2.77	17	0	**150**
2000	2.70	346	270	24	22	100	2.70	184	0	**946**
2001	1.60	1,725	598	118	166	349	1.60	141	277	**3,374**
2002	2.05	707	603	86	86	131	2.05	502	219	**2,334**
2003	2.43	270	202	29	36	58	2.43	44	146	**785**
2004[a]	3.56/3.00	858	507	39	66	138	1.79	54	98	**1,760**
2005	1.80	598	347	115	155	257	1.75	14	5	**1,491**
2006	1.78	529	271	37	55	48	1.80	90	18	**1,048**
2007	4.58	1,296	463	101	92	55	1.86	32	20	**2,059**
2008	1.68	1,158	565	64	52	302	1.77	205	37	**2,383**
2009	3.20	1,347	534	125	173	16	2.72	87	41	**2,323**
2010	2.18	1,094	410	83	72	102	2.72	422	14	**2,197**
2011	4.13	2,032	702	124	83	50	2.66	325	69	**3,385**
2012	1.63	1,434	673	70	140	119	1.90	378	19	**2,833**
2013	1.94	1,385	411	99	105	33	1.75	187	7	**2,227**
Average	***2.42***	***714***	***328***	***64***	***74***	***99***	***2.21***	***133***	***42***	***1,473***

[a] In 2004 the fish/redd expansion estimate of 3.56 was applied to the Chiwawa River only and 3.00 fish/redd for the rest of the upper basin.

5.6 Carcass Surveys

Surveys for spring Chinook carcasses were conducted during August through September, 2013, in the Chiwawa River (including Rock, Phelps, Big Meadow, and Chikamin creeks), Nason Creek, Icicle Creek, Peshastin Creek (including Ingalls Creek), Upper Wenatchee River (including Chiwaukum Creek), Little Wenatchee River, and White River (including the Napeequa River and Panther Creek).

Number sampled

A total of 617 spring Chinook carcasses were sampled during August through September in the Wenatchee River basin (Table 5.23). Most were sampled in the Chiwawa River basin (64.2% or 396 carcasses) and Nason Creek (23% or 142 carcasses) (Figure 5.7). A total of 28 carcasses were sampled in Icicle Creek, eight in the upper Wenatchee River, 20 in the Little Wenatchee, 22 in the White River, and one in Peshastin Creek.

Table 5.23. Numbers of spring Chinook carcasses sampled within different streams/watersheds within the Wenatchee River basin, 1996-2013.

Survey year	Number of spring Chinook carcasses							
	Chiwawa	Nason	Little Wenatchee	White	Wenatchee River	Icicle	Peshastin	Total
1996	22	3	0	2	0	1	0	**28**
1997	17	42	3	8	1	28	1	**100**
1998	24	25	3	2	1	6	0	**61**
1999	15	5	0	0	2	1	0	**23**
2000	122	110	8	1	37	52	0	**330**
2001	763	388	68	81	213	163	63	**1,739**
2002	210	292	30	25	34	91	65	**747**
2003	70	100	8	8	11	37	64	**298**
2004	178	186	1	13	29	16	40	**463**
2005	391	217	48	52	120	2	0	**830**
2006	241	190	13	25	15	7	0	**491**
2007	250	201	16	13	24	15	6	**525**
2008	386	243	15	13	94	67	5	**823**
2009	240	128	20	20	1	67	2	**478**
2010	192	141	7	11	29	39	2	**421**
2011	177	98	7	4	3	40	3	**332**
2012	390	332	24	21	23	61	3	**854**
2013	396	142	20	22	8	28	1	**671**
Average	***227***	***158***	***16***	***18***	***36***	***40***	***14***	***509***

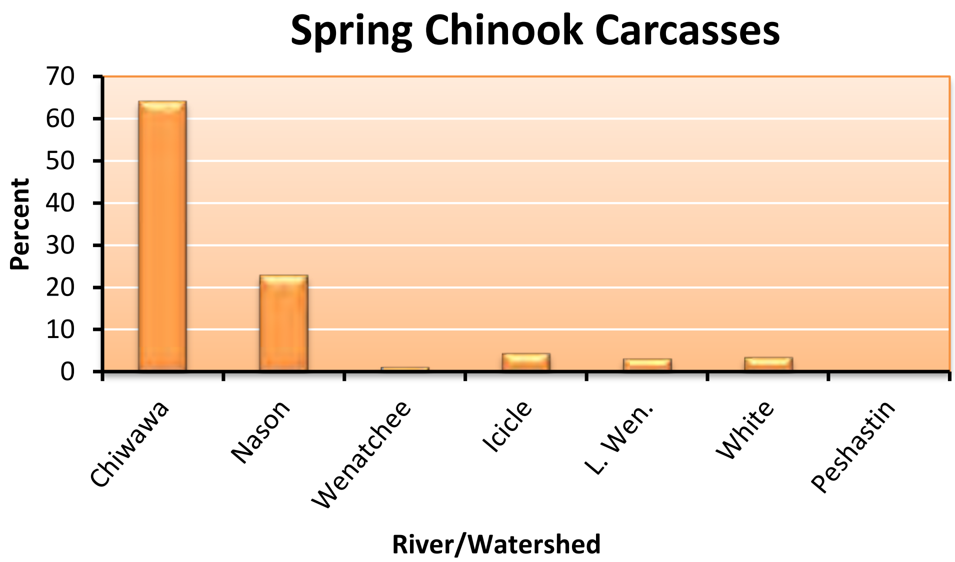


Figure 5.7. Percent of the total number of spring Chinook carcasses sampled in different streams/watersheds within the Wenatchee River basin during August through September, 2013.

Carcass Distribution and Origin

Spring Chinook carcasses were not evenly distributed among reaches within survey streams in 2013 (Table 5.24). Most of the carcasses in the Chiwawa River basin occurred in Reaches 1 and 2 (downstream from Rock Creek). In Nason Creek, most carcasses (36%) were collected in Reach 1 and the fewest (9%) in Reach 4. Most of the carcasses in the Little Wenatchee River were sampled in Reach 3 (Lost Creek to Rainy Creek). On the White River, all occurred in Reach 3 (Napeequa River to Grasshopper Meadows). On the Wenatchee River, 84% of the carcasses were found upstream from the confluence of the Chiwawa River and 8% were found below the confluence.

Table 5.24. Numbers and proportions of carcasses sampled within different streams/watersheds within the Wenatchee River basin during August through September, 2013.

Stream/watershed	Reach	Number of carcasses	Proportion of redds within stream/watershed
Chiwawa	Chiwawa 1 (C1)	109	0.27
	Chiwawa 2 (C2)	150	0.38
	Chiwawa 3 (C3)	26	0.07
	Chiwawa 4 (C4)	44	0.11
	Chiwawa 5 (C5)	29	0.07
	Chiwawa 6 (C6)	30	0.08
	Phelps 1	0	0.0
	Rock 1 (R1)	3	0.01
	Chikamin 1 (K1)	5	0.01
	Big Meadow 1	0	0.0
	Total	**396**	**1.00**

Stream/watershed	Reach	Number of carcasses	Proportion of redds within stream/watershed
Nason	Nason 1 (N1)	56	0.39
	Nason 2 (N2)	14	0.10
	Nason 3 (N3)	37	0.26
	Nason 4 (N4)	35	0.25
	Total	**142**	**1.00**
Little Wenatchee	Little Wen 2 (L2)	0	0.0
	Little Wen 3 (L3)	20	1.00
	Total	**20**	**1.00**
White	White 2 (H2)	0	0.0
	White 3 (H3)	19	0.86
	White 4 (H4)	0	0.0
	Napeequa 1 (Q1)	0	0.0
	Panther 1 (T1)	3	0.14
	Total	**22**	**1.00**
Wenatchee River	Wen 8 (W8)	0	0.0
	Wen 9 (W9)	0	0.0
	Wen 10 (W10)	3	0.38
	Chiwaukum 1	5	0.62
	Total	**8**	**1.00**
Icicle	Icicle 1 (I1)	28	1.00
	Total	**28**	**1.00**
Peshastin	Peshastin 1 (P1)	1	1.00
	Peshastin 2 (P2)	0	0.00
	Ingalls (D1)	0	0.00
Grand Total		**617**	**1.00**

Of the 396 carcasses sampled in the Chiwawa River basin in 2013, 72% were hatchery fish (Table 5.25; these numbers may change after analysis of CWTs). In the Chiwawa River basin, the spatial distribution of hatchery and wild fish was not equal (Table 5.25). A larger percentage of hatchery fish were found in the lower reaches (C1 and C2; Mouth to Rock Creek) than were wild fish. This general trend was also apparent in the pooled data (Figure 5.8).

Table 5.25. Numbers of wild and hatchery spring Chinook carcasses sampled within different reaches in the Chiwawa River basin, 1993-2013. See Table 2.8 for description of survey reaches.

Survey year	Origin	Survey Reach								Total
		C-1	C-2	C-3	C-4	C-5	C-6	Chikamin	Rock	
1993	Wild	0	0	0	0	0	0	0	0	**0**
	Hatchery	1	0	0	0	0	0	0	0	**1**
1994	Wild	0	6	0	2	0	2	0	0	**10**
	Hatchery	1	1	0	2	0	0	0	0	**4**

Survey year	Origin	Survey Reach								Total
		C-1	C-2	C-3	C-4	C-5	C-6	Chikamin	Rock	
1995	Wild	0	0	0	0	0	0	0	0	**0**
	Hatchery	2	3	0	1	0	0	0	0	**6**
1996	Wild	13	1	1	1	0	0	0	0	**16**
	Hatchery	6	0	0	0	0	0	0	0	**6**
1997	Wild	5	2	0	1	0	0	0	0	**8**
	Hatchery	3	1	0	0	0	1	1	3	**9**
1998	Wild	0	3	6	1	2	4	0	0	**16**
	Hatchery	1	3	2	0	1	1	0	0	**8**
1999	Wild	1	8	0	5	0	0	0	0	**14**
	Hatchery	0	0	0	0	1	0	0	0	**1**
2000	Wild	29	29	1	1	1	1	0	0	**62**
	Hatchery	42	12	0	0	0	2	0	0	**56**
2001	Wild	27	60	15	43	16	21	1	3	**186**
	Hatchery	164	284	19	58	14	21	8	0	**568**
2002	Wild	22	15	10	6	9	7	1	0	**70**
	Hatchery	46	41	12	5	1	15	15	4	**139**
2003	Wild	7	13	0	12	4	2	0	0	**38**
	Hatchery	14	14	0	3	1	0	0	0	**32**
2004	Wild	25	50	2	12	7	2	0	1	**99**
	Hatchery	48	21	1	1	1	4	0	2	**78**
2005	Wild	18	36	3	5	3	2	0	0	**67**
	Hatchery	170	132	7	7	4	3	0	1	**324**
2006	Wild	10	17	2	8	4	3	1	0	**45**
	Hatchery	84	75	5	7	6	13	3	3	**196**
2007	Wild	3	15	3	4	2	2	0	0	**29**
	Hatchery	42	118	15	14	18	12	2	0	**221**
2008	Wild	4	23	0	4	4	8	0	0	**43**
	Hatchery	174	122	2	9	15	15	4	1	**342**
2009	Wild	3	21	4	8	4	1	0	3	**44**
	Hatchery	89	70	6	14	7	5	0	5	**196**
2010	Wild	4	30	7	8	10	3	0	0	**62**
	Hatchery	64	35	2	10	7	5	0	5	**128**
2011	Wild	8	26	10	6	8	6	0	1	**65**
	Hatchery	43	40	4	5	5	9	1	4	**111**
2012	Wild	11	73	6	21	13	18	0	3	**145**
	Hatchery	93	91	9	13	16	16	0	6	**244**
2013	Wild	12	39	7	21	15	15	0	0	**109**
	Hatchery	97	111	19	23	14	15	5	3	**287**
Average	***Wild***	***10***	***22***	***4***	***8***	***5***	***4***	***0***	***1***	***54***
	Hatchery	***56***	***56***	***5***	***8***	***5***	***7***	***2***	***2***	***141***

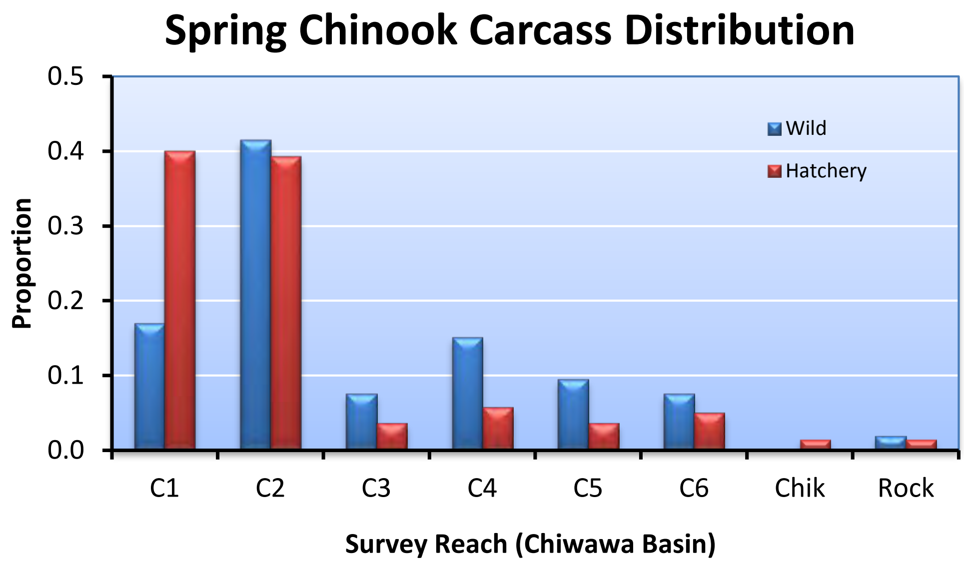


Figure 5.8. Distribution of wild and hatchery produced carcasses in different reaches in the Chiwawa River basin, 1993-2013; Chik = Chikamin Creek and Rock = Rock Creek. Reach codes are described in Table 2.8.

Sampling Rate

Overall, 30% of the estimated total spawning escapement of spring Chinook in the Wenatchee River basin was sampled in 2013 (Table 5.26). Sampling rates among streams/watershed varied from 15 to 35%.

Table 5.26. Number of redds and carcasses, total spawning escapement, and sampling rates for spring Chinook salmon in the Wenatchee River basin, 2013.

Sampling area	Total number of redds	Total number of carcasses	Total spawning escapement	Sampling rate
Chiwawa	714	396	1,385	0.29
Nason	212	142	411	0.35
Upper Wenatchee	17	8	33	0.24
Icicle	107	28	187	0.15
Little Wenatchee	51	20	99	0.20
White	54	22	105	0.21
Peshastin	4	1	7	0.14
Total	***1,159***	***671***	***2,227***	***0.30***

Length Data

Mean lengths (POH, cm) of male and female spring Chinook carcasses sampled during surveys in the Wenatchee River basin in 2013 are provided in Table 5.27. The average sizes of males and females sampled in the Wenatchee River basin were 58 and 62 cm, respectively.

Table 5.27. Mean lengths (postorbital-to-hypural length; cm) and standard deviations (in parentheses) of male and female spring Chinook carcasses sampled in different streams/watersheds in the Wenatchee River basin, 2013.

Stream/watershed	Mean lengths (cm)	
	Male	Female
Chiwawa	58 (11.5)	62 (6.0)
Nason	54 (11.2)	61 (4.4)
Upper Wenatchee	--	60 (4.6)
Icicle	61 (13.1)	60 (5.4)
Little Wenatchee	65 (9.9)	65 (7.9)
White	63 (4.3)	63 (4.3)
Peshastin	--	60 (0.0)
Total	***58 (11.6)***	***62 (5.7)***

5.7 Life History Monitoring

Life history characteristics of spring Chinook were assessed by examining carcasses on spawning grounds and fish collected at broodstock collection sites, and by reviewing tagging data and fisheries statistics.

Migration Timing

There was little difference in migration timing of hatchery and wild spring Chinook past Tumwater Dam (Table 5.28a and b; Figure 5.9). On average, early in the migration, wild Chinook arrived at Tumwater Dam slightly earlier than hatchery fish, but by the end of the migration, both were arriving at about the same time. Most hatchery and wild spring Chinook migrated upstream past Tumwater Dam during June and July (Figure 5.9).

Table 5.28a. The Julian day and date that 10%, 50% (median), and 90% of the wild and hatchery spring Chinook salmon passed Tumwater Dam, 1998-2013. The average Julian day and date are also provided. Migration timing is based on video sampling at Tumwater. Data for 1998 through 2003 were based on videotapes and broodstock trapping and may not reflect the actual number of hatchery spring Chinook. All spring Chinook were visually examined during trapping from 2004 to present.

Survey year	Origin	Spring Chinook Migration Time (days)								Sample size
		10 Percentile		50 Percentile		90 Percentile		Mean		
		Julian	Date	Julian	Date	Julian	Date	Julian	Date	
1998	Wild	156	5-Jun	156	5-Jun	156	5-Jun	156	5-Jun	49
	Hatchery	156	5-Jun	156	5-Jun	156	5-Jun	156	5-Jun	25
1999	Wild	192	11-Jul	207	26-Jul	224	12-Aug	207	26-Jul	173
	Hatchery	200	19-Jul	211	30-Jul	229	18-Aug	213	1-Aug	25
2000	Wild	171	19-Jun	186	4-Jul	194	12-Jul	184	2-Jul	651
	Hatchery	179	27-Jun	189	7-Jul	201	19-Jul	190	8-Jul	357
2001	Wild	154	3-Jun	166	15-Jun	185	4-Jul	167	16-Jun	2,073
	Hatchery	157	6-Jun	169	18-Jun	185	4-Jul	170	19-Jun	4,244

Survey year	Origin	Spring Chinook Migration Time (days)								Sample size
		10 Percentile		50 Percentile		90 Percentile		Mean		
		Julian	Date	Julian	Date	Julian	Date	Julian	Date	
2002	Wild	174	23-Jun	189	8-Jul	204	23-Jul	189	8-Jul	1,033
	Hatchery	178	27-Jun	189	8-Jul	199	18-Jul	189	8-Jul	1,363
2003	Wild	162	11-Jun	181	30-Jun	200	19-Jul	181	30-Jun	919
	Hatchery	157	6-Jun	179	28-Jun	192	11-Jul	178	27-Jun	423
2004	Wild	156	4-Jun	172	20-Jun	189	7-Jul	172	20-Jun	969
	Hatchery	161	9-Jun	177	25-Jun	189	7-Jul	177	25-Jun	1,295
2005	Wild	153	2-Jun	172	21-Jun	193	12-Jul	173	22-Jun	1,038
	Hatchery	153	2-Jun	173	22-Jun	187	6-Jul	172	21-Jun	2,808
2006	Wild	177	26-Jun	184	3-Jul	193	12-Jul	185	7-Jul	577
	Hatchery	178	27-Jun	185	4-Jul	194	13-Jul	186	5-Jul	1,601
2007	Wild	169	18-Jun	185	4-Jul	203	22-Jul	185	4-Jul	351
	Hatchery	174	23-Jun	192	11-Jul	209	28-Jul	192	11-Jul	3,232
2008	Wild	173	21-Jun	188	6-Jul	209	27-Jul	189	7-Jul	634
	Hatchery	177	25-Jun	193	11-Jul	210	28-Jul	193	11-Jul	5,368
2009	Wild	174	23-Jun	186	5-Jul	201	20-Jul	187	6-Jul	1,008
	Hatchery	175	24-Jun	187	6-Jul	202	21-Jul	188	7-Jul	4,106
2010	Wild	173	22-Jun	190	9-Jul	214	2-Aug	191	10-Jul	977
	Hatchery	180	29-Jun	194	13-Jul	213	1-Aug	195	14-Jul	4,450
2011	Wild	183	2-Jul	198	17-Jul	213	1-Aug	198	17-Jul	1,433
	Hatchery	187	6-Jul	200	19-Jul	210	29-Jul	199	18-Jul	4,707
2012	Wild	180	28-Jun	191	9-Jul	205	23-Jul	192	10-Jul	1,482
	Hatchery	182	30-Jun	194	12-Jul	206	24-Jul	194	12-Jul	4,449
2013	Wild	163	12-Jun	182	1-Jul	199	18-Jul	183	2-Jul	1,106
	Hatchery	164	13-Jun	181	30-Jun	195	14-Jul	181	30-Jun	3,681
Average	Wild	***169***	***-***	***183***	***-***	***199***	***-***	***184***	***-***	***905***
	Hatchery	***172***	***-***	***186***	***-***	***199***	***-***	***186***	***-***	***2,633***

Table 5.28b. The week that 10%, 50% (median), and 90% of the wild and hatchery spring Chinook salmon passed Tumwater Dam, 1998-2013. The average week is also provided. Migration timing is based on video sampling at Tumwater. Data for 1998 through 2003 were based on videotapes and broodstock trapping and may not reflect the actual number of hatchery spring Chinook. All spring Chinook were visually examined during trapping from 2004 to present.

Survey year	Origin	Spring Chinook Migration Time (week)				Sample size
		10 Percentile	50 Percentile	90 Percentile	Mean	
1998	Wild	23	23	23	23	49
	Hatchery	23	23	23	23	25
1999	Wild	28	30	32	30	173

Survey year	Origin	Spring Chinook Migration Time (week)				Sample size
		10 Percentile	50 Percentile	90 Percentile	Mean	
	Hatchery	29	31	34	31	25
2000	Wild	24	27	27	27	651
	Hatchery	26	27	29	28	357
2001	Wild	22	24	27	24	2,073
	Hatchery	23	25	27	25	4,244
2002	Wild	25	27	30	27	1,033
	Hatchery	26	27	29	27	1,363
2003	Wild	24	26	29	26	919
	Hatchery	23	26	28	26	423
2004	Wild	23	25	27	25	969
	Hatchery	23	26	27	26	1,295
2005	Wild	22	25	28	25	1,038
	Hatchery	22	25	27	25	2,808
2006	Wild	26	27	28	27	577
	Hatchery	26	27	28	27	1,601
2007	Wild	25	27	29	27	351
	Hatchery	25	28	30	28	3,232
2008	Wild	25	27	30	27	634
	Hatchery	26	28	30	28	5,368
2009	Wild	25	27	29	27	1,008
	Hatchery	25	27	29	27	4,106
2010	Wild	25	28	31	28	977
	Hatchery	26	28	31	28	4,450
2011	Wild	27	29	31	29	1,433
	Hatchery	27	29	30	29	4,707
2012	Wild	26	28	30	28	1,482
	Hatchery	26	28	30	28	4,449
2013	Wild	24	26	29	27	1,106
	Hatchery	24	26	29	26	3,681
Average	Wild	***25***	***27***	***29***	***27***	***905***
	Hatchery	***25***	***27***	***29***	***27***	***2,633***

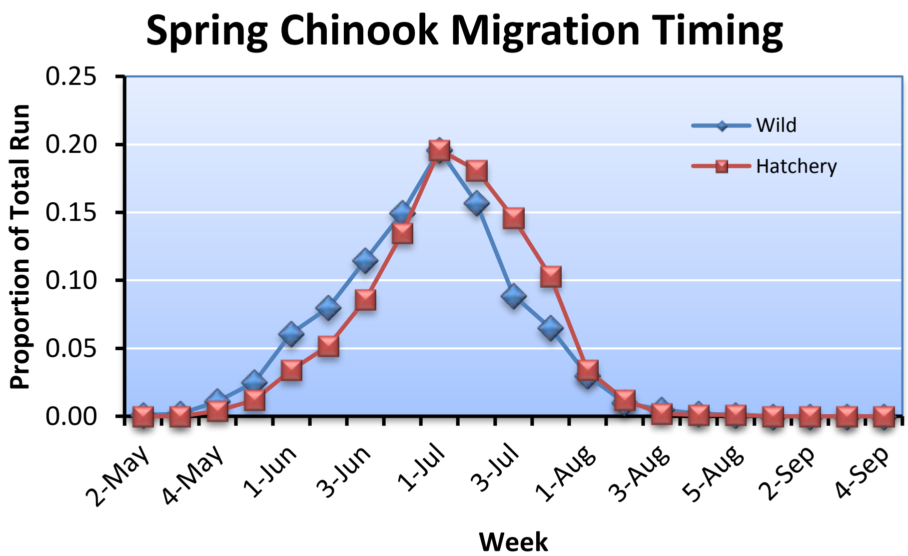


Figure 5.9. Proportion of wild and hatchery spring Chinook observed (using video) passing Tumwater Dam each week during their migration period May through September; data were pooled over survey years 1998-2013.

Age at Maturity

Most of the wild and hatchery spring Chinook sampled during the period 1994-2013 in the Chiwawa River basin were age-4 fish (total age) (Table 5.29; Figure 5.10). On average, hatchery fish made up a higher percentage of age-3 Chinook than did wild fish. In contrast, a higher proportion of age-5 wild fish returned than did age-5 hatchery fish. Thus, wild fish tended to return at an older age than hatchery fish.

Table 5.29. Proportions of wild and hatchery spring Chinook of different ages (total age) sampled on spawning grounds in the Chiwawa River basin, 1994-2013.

Sample year	Origin	Total age					Sample size
		2	3	4	5	6	
1994	Wild	0.00	0.00	0.33	0.67	0.00	9
	Hatchery	0.00	0.20	0.00	0.80	0.00	5
1995	Wild	0.00	0.00	0.00	0.00	0.00	0
	Hatchery	0.00	0.00	1.00	0.00	0.00	5
1996	Wild	0.00	0.36	0.64	0.00	0.00	14
	Hatchery	0.00	0.83	0.17	0.00	0.00	6
1997	Wild	0.00	0.00	0.75	0.25	0.00	8
	Hatchery	0.00	0.00	1.00	0.00	0.00	9
1998	Wild	0.00	0.00	0.00	1.00	0.00	15
	Hatchery	0.00	0.00	0.13	0.88	0.00	8
1999	Wild	0.00	0.07	0.50	0.43	0.00	14
	Hatchery	0.00	0.00	0.00	1.00	0.00	1
2000	Wild	0.00	0.02	0.95	0.04	0.00	56

Sample year	Origin	Total age					Sample size
		2	3	4	5	6	
	Hatchery	0.00	0.50	0.50	0.00	0.00	52
2001	Wild	0.00	0.01	0.95	0.04	0.00	176
	Hatchery	0.00	0.02	0.98	0.00	0.00	571
2002	Wild	0.00	0.00	0.56	0.44	0.00	54
	Hatchery	0.00	0.00	0.91	0.09	0.00	129
2003	Wild	0.00	0.08	0.00	0.92	0.00	36
	Hatchery	0.00	0.19	0.03	0.78	0.00	32
2004	Wild	0.00	0.05	0.94	0.01	0.00	99
	Hatchery	0.00	0.42	0.58	0.00	0.00	78
2005	Wild	0.00	0.02	0.78	0.21	0.00	67
	Hatchery	0.00	0.04	0.96	0.00	0.00	324
2006	Wild	0.02	0.02	0.51	0.44	0.00	45
	Hatchery	0.01	0.04	0.78	0.18	0.00	196
2007	Wild	0.00	0.10	0.24	0.67	0.00	29
	Hatchery	0.00	0.35	0.59	0.06	0.00	221
2008	Wild	0.02	0.02	0.81	0.14	0.00	43
	Hatchery	0.00	0.07	0.89	0.05	0.00	340
2009	Wild	0.00	0.09	0.86	0.05	0.00	44
	Hatchery	0.00	0.24	0.75	0.02	0.00	196
2010	Wild	0.00	0.00	0.90	0.10	0.00	63
	Hatchery	0.00	0.07	0.91	0.02	0.00	127
2011	Wild	0.00	0.08	0.38	0.54	0.00	65
	Hatchery	0.00	0.26	0.45	0.30	0.00	112
2012	Wild	0.00	0.01	0.80	0.19	0.00	141
	Hatchery	0.00	0.03	0.96	0.02	0.00	243
2013	Wild	0.00	0.07	0.62	0.31	0.00	97
	Hatchery	0.00	0.12	0.81	0.07	0.00	285
Average	***Wild***	***0.00***	***0.05***	***0.58***	***0.32***	***0.00***	***54***
	Hatchery	***0.00***	***0.17***	***0.62***	***0.21***	***0.00***	***147***

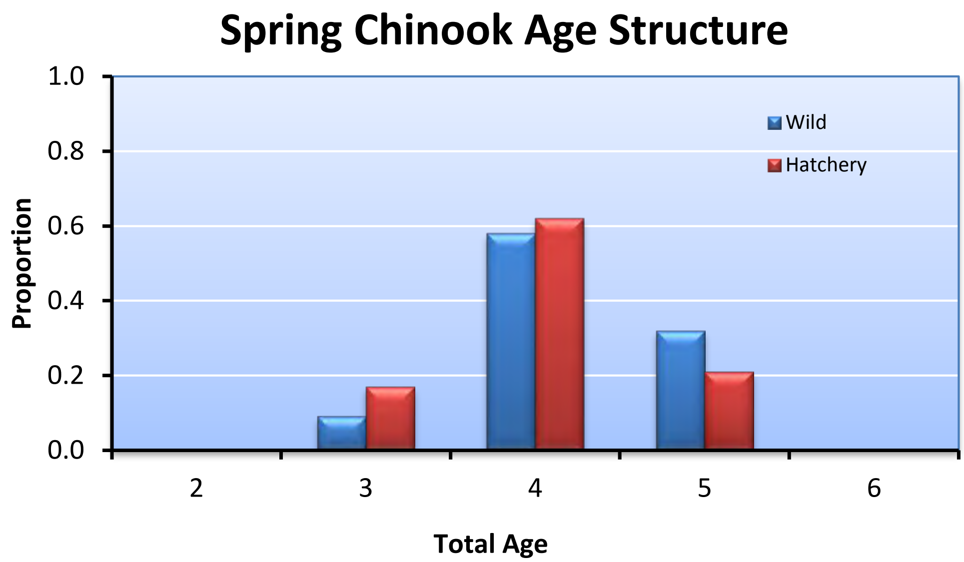


Figure 5.10. Proportions of wild and hatchery spring Chinook of different total ages sampled at the Chiwawa Weir and on spawning grounds in the Chiwawa River basin for the combined years 1994-2013.

Size at Maturity

On average, hatchery and wild spring Chinook of a given age differed slightly in length (Table 5.30). Differences were usually no more than 1-2 cm between hatchery and wild fish of the same age.

Table 5.30. Mean lengths (POH in cm; ±1SD) and sample sizes (in parentheses) of different ages (total age) of male and female spring Chinook of wild and hatchery-origin sampled in the Chiwawa River basin, 1994-2013. Return years 2004-2013 include carcasses and live fish PIT-tag detections. In addition, 2005 and 2006 include fish released at the weir.

Return year	Total age	Mean length (cm)			
		Male		Female	
		Wild	Hatchery	Wild	Hatchery
1994	3				43 ±0 (1)
	4			62 ±3 (3)	
	5	76 ±0 (1)		73 ±2 (5)	
	6				
1995	3				
	4		61 ±5 (5)		
	5				
	6				
1996	3	45 ±3 (5)	49 ±7 (10)		
	4	69 ±4 (6)	69 ±0 (1)	67 ±8 (2)	
	5				
	6				
1997	3				
	4	61 ±1 (2)	68 ±0 (1)	67 ±5 (3)	63 ±3 (8)

Return year	Total age	Mean length (cm)			
		Male		Female	
		Wild	Hatchery	Wild	Hatchery
	5	67 ±5 (2)			
	6				
1998	3				
	4				54 ±0 (1)
	5	77 ±7 (8)	75 ±4 (4)	74 ±4 (7)	76 ±4 (3)
	6				
1999	3	44 ±0 (1)			
	4	61 ±0 (1)		64 ±3 (6)	
	5	76 ±5 (3)		72 ±5 (3)	66 ±0 (1)
	6				
2000	3		46 ±3 (17)		50 ±7 (3)
	4	60 ±8 (23)	62 ±5 (5)	61 ±5 (26)	62 ±3 (20)
	5	77 ±1 (2)			
	6				
2001	3	37 ±0 (1)	42 ±4 (11)	41 ±0 (1)	60 ±0 (1)
	4	63 ±5 (57)	65 ±5 (151)	62 ±4 (110)	63 ±4 (407)
	5	75 ±5 (2)	83 ±0 (1)	76 ±1 (5)	
	6				
2002	3				
	4	64 ±4 (14)	66 ±5 (46)	60 ±4 (15)	63 ±4 (71)
	5	80 ±6 (13)	75 ±5 (4)	72 ±3 (12)	73 ±6 (6)
	6				
2003	3	45 ±2 (3)	45 ±1 (6)		
	4		63 ±0 (1)		
	5	78 ±5 (12)	74 ±8 (11)	75 ±3 (19)	72 ±5 (14)
	6				
2004	3	42 ±3 (3)	44 ±5 (33)		
	4	63 ±7 (60)	66 ±5 (9)	63 ±4 (59)	63 ±6 (36)
	5			74 ±0 (1)	
	6				
2005	3		43 ±5 (48)		
	4	61 ±5 (32)	65 ±5 (224)	62 ±4 (61)	62 ±4 (382)
	5	74 ±5 (6)	54±0 (1)	71 ±3 (11)	
	6				
2006	3	45 ±3 (3)	43 ±3 (73)		
	4	64 ±3 (7)	62 ±6 (91)	63 ±5 (41)	60 ±4 (227)
	5	74 ±6 (8)	75 ±6 (17)	71 ±4 (26)	71± 4 (37)
	6				
2007	3	39 ±3 (5)	45 ±6 (90)		50 ±3 (7)
	4	60 ±4 (4)	66 ±5 (45)	61 ±4 (10)	63 ±3 (142)
	5	78 ±6 (15)	76 ±5 (8)	74 ±3 (20)	73 ±5 (12)

Return year	Total age	Mean length (cm)			
		Male		Female	
		Wild	Hatchery	Wild	Hatchery
	6				
2008	3	43 ±0 (1)	44 ±5 (22)		
	4	65 ±4 (9)	64 ±6 (73)	62 ±4 (26)	64 ±4 (229)
	5	65 ±5 (3)	79 ±5 (10)	73 ±3 (4)	72 ±3 (5)
	6				
2009	3	45 ±3 (8)	46 ±6 (68)		65 ±0 (1)
	4	64 ±4 (38)	65 ±5 (136)	63 ±3 (67)	64 ±4 (202)
	5	79 ±0 (1)		72 ±2 (4)	71 ±4 (10)
	6				
2010	3		46 ±4 (11)		65 ±3 (3)
	4	64 ±5 (31)	66 ±5 (74)	64 ±4 (82)	65 ±3 (196)
	5	77 ±4 (6)		73 ±5 (9)	73 ±6 (4)
	6				
2011	3	43 ±4 (133)	44 ±4 (1374)		53 ±4 (17)
	4	62 ±5 (137)	64 ±5 (169)	64 ±3 (94)	64 ±3 (258)
	5	80 ±5 (78)	79 ±4 (85)	75 ±3 (116)	75 ±3 (63)
	6				
2012	3	56 ±0 (1)	52 ±7 (7)		
	4	79 ± 6(37)	80 ±6 (49)	79 ± (76)	78 ±4 (180)
	5	97 ±7 (11)	96 ±3 (4)	93 ± (16)	87 ±0 (1)
	6				
2013	3	45 ±4 (6)	44 ±4 (32)		51 ±22 (2)
	4	61 ±6 (27)	63 ±7 (44)	62 ±6 (33)	61 ±4 (183)
	5	74 ±5 (8)	75 ±5 (5)	71 ±4 (21)	70 ±4 (16)
	6				

Contribution to Fisheries

Nearly all the harvest on hatchery-origin Chiwawa spring Chinook occurs within the Columbia Basin. Ocean catch records (Pacific Fishery Management Council) indicate that virtually no Upper Columbia spring Chinook are taken in ocean fisheries. Most of the harvest on hatchery-origin Chiwawa spring Chinook occurs in the Lower Columbia River fisheries, which are managed by the states and tribes pursuant to management plans developed in *U.S. v Oregon*. The Lower Columbia River fisheries occur during what is referred to in *U.S. v Oregon* as the winter, spring, and summer seasons, which begin in February and ends July 31 of each year. The Tribal fishery occurs upstream from Bonneville Dam, but primarily in Zone 6, the area between Bonneville and McNary dams; the non-treaty commercial fisheries occur in Zones 1-5, which are downstream from Bonneville Dam. The non-treaty recreational (sport) fishery occurs in the lower mainstem.

The total number of hatchery-origin spring Chinook captured in different fisheries has been relatively low (Table 5.31). The largest harvests occurred on the 1997, 1998, and 2004-2007 brood years.

Table 5.31. Estimated number and percent (in parentheses) of hatchery-origin Chiwawa spring Chinook captured in different fisheries, brood years 1989-2007; NP = no hatchery program.

Brood year	Ocean fisheries	Columbia River Fisheries			Total
		Tribal	Commercial (Zones 1-5)	Recreational[a] (sport)	
1989	3 (13)	5 (21)	0 (0)	16 (67)	24
1990	0 (0)	0 (0)	0 (0)	18 (100)	18
1991	0 (0)	3 (100)	0 (0)	0 (0)	3
1992	0 (0)	1 (100)	0 (0)	0 (0)	1
1993	3 (75)	1 (25)	0 (0)	0 (0)	4
1994	0 (0)	0 (0)	0 (0)	0 (0)	0
1995	NP	NP	NP	NP	NP
1996	0 (0)	2 (100)	0 (0)	0 (0)	2
1997	1 (0)	193 (51)	68 (18)	115 (31)	377
1998	9 (5)	47 (24)	12 (6)	126 (65)	194
1999	NP	NP	NP	NP	NP
2000	0 (0)	17 (74)	0 (0)	6 (26)	23
2001	36 (64)	8 (14)	1 (2)	11 (20)	56
2002	12 (17)	11 (15)	22 (31)	26 (37)	71
2003	18 (21)	29 (35)	11 (13)	26 (31)	84
2004	3 (1)	188 (40)	31 (7)	253 (53)	475
2005	6 (5)	31 (24)	18 (14)	74 (57)	129
2006	25 (3)	469 (60)	84 (11)	201 (26)	779
2007	14 (3)	180 (43)	74 (18)	151 (36)	419
Average	***8 (12)***	***70 (43)***	***19 (7)***	***58 (31)***	***154***

[a] Includes the Wanapum fishery.

Straying

Stray rates were determined by examining CWTs recovered on spawning grounds within and outside the Wenatchee River basin. Targets for strays based on return year (recovery year) within the Wenatchee River basin should be less than 10% and targets for strays outside the Wenatchee River basin should be less than 5%. The target for brood year stray rates should be less than 5%.

The percentage of the spawning escapement made up of hatchery-origin Chiwawa spring Chinook in non-target spawning areas within the Wenatchee River basin has been high in some years and exceeded the target of 10% (Table 5.32). Chiwawa spring Chinook have strayed into spawning areas on Nason Creek, the White River, the Little Wenatchee River, and the Upper Wenatchee River. On average, Chiwawa spring Chinook made up the highest percentage of the spawning escapement within Nason Creek and the Upper Wenatchee River. Stray rates of hatchery-origin Chiwawa spring Chinook do not appear to have declined with the change in source water that was implemented in 2006 for the Chiwawa rearing ponds.

Table 5.32. Number (No.) and percent (%) of the spawning escapement in other non-target spawning streams within the Wenatchee River basin that consisted of hatchery-origin Chiwawa spring Chinook, return years 1992-2012. For example, for return year 2001, 35.3% of the spring Chinook spawning escapement in Nason Creek consisted of hatchery-origin Chiwawa spring Chinook. Percent strays should be less than 10%.

Return year	Nason Creek		Icicle Creek		Peshastin Creek		Upper Wenatchee		White River		Little Wenatchee	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1992	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
1993	61	12.4	0	0.0	0	0.0	34	18.0	7	4.8	0	0.0
1994	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
1995	0	0.0	0	0.0	0	0.0	2	66.7	0	0.0	0	0.0
1996	25	30.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
1997	55	45.1	8	11.0	0	0.0	0	0.0	0	0.0	0	0.0
1998	3	4.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
1999	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
2000	45	16.7	0	0.0	0	0.0	31	31.0	0	0.0	6	27.3
2001	211	35.3	0	0.0	0	0.0	271	77.7	46	39.0	52	31.3
2002	188	31.2	10	2.0	0	0.0	60	45.8	14	16.3	21	24.4
2003	14	6.9	0	0.0	0	0.0	30	51.7	0	0.0	0	0.0
2004	139	27.4	0	0.0	0	0.0	54	39.1	6	9.1	0	0.0
2005	252	72.6	7	50.0	0	0.0	256	99.6	106	68.4	65	56.5
2006	131	48.3	13	14.4	0	0.0	28	58.3	9	16.4	12	32.4
2007	303	65.4	0	0.0	0	0.0	37	67.3	7	7.6	6	5.9
2008	381	67.4	48	23.4	29	78.4	258	85.4	30	57.7	52	81.3
2009	289	54.1	8	9.2	0	0.0	16	100.0	63	36.4	56	44.8
2010	272	66.3	58	13.7	11	78.6	86	84.3	23	31.9	59	71.1
2011	397	56.6	61	18.8	0	0.0	41	82.0	0	0.0	53	42.7
2012	398	59.1	49	13.0	7	36.8	98	82.4	45	32.1	15	21.4
Total	***3,164***	***44.0***	***262***	***9.1***	***47***	***4.8***	***1,302***	***63.3***	***356***	***24.3***	***397***	***29.6***

Hatchery-origin Chiwawa spring Chinook have strayed into the Methow and Entiat basins (Table 5.33). Based on return year analyses, rates of hatchery-origin Chiwawa spring Chinook straying into these populations have been low in most years. Chiwawa spring Chinook made up more than 5% of the spawning escapement in the Entiat River basin during return years 2002, 2006, 2008, 2009, and 2011.

Table 5.33. Number and percent of spawning escapements within other non-target basins that consisted of hatchery-origin Chiwawa spring Chinook, return years 1992-2012. For example, for return year 2002, 9.2% of the spring Chinook spawning escapement in the Entiat River basin consisted of hatchery-origin Chiwawa spring Chinook. Percent strays should be less than 5%. NS = not sampled.

Return year	Methow River basin		Entiat River basin	
	Number	%	Number	%
1992	0	0.0	0	0.0
1993	0	0.0	0	0.0
1994	0	0.0	0	0.0
1995	0	0.0	0	0.0
1996	NS	NS	0	0.0
1997	0	0.0	0	0.0
1998	NS	NS	0	0.0
1999	0	0.0	0	0.0
2000	0	0.0	1	0.6
2001	0	0.0	1	0.2
2002	0	0.0	34	9.2
2003	0	0.0	6	2.3
2004	0	0.0	0	0.0
2005	10	0.7	15	4.2
2006	8	0.5	27	9.3
2007	9	0.8	4	1.6
2008	12	1.2	61	21.9
2009	9	0.3	15	5.4
2010	10	0.4	18	3.7
2011	51	1.7	49	8.2
2012	13	1.0	28	4.9
Total	***122***	***0.4***	***256***	***5.0***

Based on brood year analyses, on average, about 35% of the hatchery returns have strayed into non-target spawning areas, exceeding the target of 5% (Table 5.34). Depending on brood year, percent strays into non-target spawning areas have ranged from 0-81%. Few (<1%) have strayed into non-target hatchery programs. The change in source water that was implemented in 2006 for the Chiwawa rearing ponds does not appear to have decreased stray rates.

Table 5.34. Number and percent of hatchery-origin Chiwawa spring Chinook that homed to target spawning areas and the target hatchery program, and number and percent that strayed to non-target spawning areas and non-target hatchery programs, by brood years 1989-2007. Percent strays should be less than 5%.

Brood year	Homing				Straying			
	Target stream		Target hatchery		Non-target streams		Non-target hatcheries	
	Number	%	Number	%	Number	%	Number	%
1989	74	41.1	1	0.6	102	56.7	3	1.7
1990	0	0.0	1	100.0	0	0.0	0	0.0
1991	29	90.6	0	0.0	2	6.3	1	3.1
1992	2	6.5	4	12.9	25	80.6	0	0.0
1993	134	47.5	82	29.1	63	22.3	3	1.1
1994	4	19.0	14	66.7	3	14.3	0	0.0
1995	No program							
1996	58	75.3	7	9.1	12	15.6	0	0.0
1997	1,242	55.6	298	13.4	687	30.8	5	0.2
1998	553	55.8	109	11.0	329	33.2	0	0.0
1999	No program							
2000	149	42.1	115	32.5	90	25.4	0	0.0
2001	647	35.8	276	15.3	878	48.6	4	0.2
2002	314	44.3	238	33.6	156	22.0	1	0.1
2003	556	79.8	11	1.6	123	17.6	7	1.0
2004	1,198	47.6	203	8.1	1,091	43.4	23	0.9
2005	822	59.3	139	10.0	415	29.9	10	0.7
2006	1,007	54.8	147	8.0	669	36.4	14	0.8
2007	510	61.4	60	7.2	241	29.0	19	2.3
Total	***7,299***	***52.2***	***1,705***	***12.2***	***4,886***	***34.9***	***90***	***0.6***

Genetics

Genetic studies were conducted to determine the potential impacts of the Chiwawa Supplementation Program on natural-origin spring Chinook in the upper Wenatchee River basin (Blankenship et al. 2007; the entire report is appended as Appendix J). Microsatellite DNA allele frequencies collected from temporally replicated natural and hatchery-origin spring Chinook were used to statistically assign individual fish to specific demes (locations) within the Wenatchee population. In addition, genetic effects of the hatchery program were assessed by examining relationships between census and effective population sizes (N_e) from samples collected before and after supplementation.

Overall, this work showed that although allele frequencies within and between natural and hatchery-origin spring Chinook were significantly different, there was no evidence (i.e., robust signal) that the difference was the result of the hatchery program. Rather, the differences were more likely the result of life history characteristics. However, there was an increasing trend toward homogenization of the allele frequencies of the natural and hatchery-origin fish that comprised the broodstock, even though there was consistent year-to-year variation in allele frequencies among hatchery and natural-origin fish. In addition, there were no robust signals indicating that hatchery-origin hatchery broodstock, hatchery-origin natural spawners, natural-origin hatchery broodstock, and natural-origin natural spawners were substantially different from each other. Finally, the N_e estimate of 387 was only slightly larger than the pre-hatchery N_e (based on demographic data from 1989-1992), which means that the Chiwawa hatchery program has not reduced the N_e of the Wenatchee spring Chinook population.

Significant differences in allele frequencies were observed within and among major spawning areas in the Upper Wenatchee River basin. However, these differences made up only a very small portion of the overall variation, indicating genetic similarity among the major spawning areas. There was no evidence that the Chiwawa program has changed the genetic structure (allele frequency) of spring Chinook in Nason Creek and the White River, despite the presence of hatchery-origin spawners in both systems.

Proportion of Natural Influence

Another method for assessing the genetic risk of a supplementation program is to determine the influence of the hatchery and natural environments on the adaptation of the composite population. This is estimated by the proportion of natural-origin fish in the hatchery broodstock (pNOB) and the proportion of hatchery-origin fish in the natural spawning escapement (pHOS). The ratio pNOB/(pHOS+pNOB) is the Proportion of Natural Influence (PNI). The larger the ratio (PNI), the greater the strength of selection in the natural environment relative to that of the hatchery environment. In order for the natural environment to dominate selection, PNI should be greater than 0.50, and important integrated populations should have a PNI of at least 0.67 (HSRG/WDFW/NWIFC 2004).

For brood years 1989-1994, the PNI was greater than or equal to 0.67 (Table 5.35). Since brood year 1994, the PNI has been less than 0.67.

Table 5.35. Proportionate natural influence (PNI) of the Chiwawa spring Chinook supplementation program for brood years 1989-2012. PNI was calculated as the proportion of naturally produced Chinook in the hatchery broodstock (pNOB) divided by the proportion of hatchery Chinook on the spawning grounds (pHOS) plus pNOB. NOS = number of natural-origin Chinook on the spawning grounds; HOS = number of hatchery-origin Chinook on the spawning grounds; NOB = number of natural-origin Chinook collected for broodstock; and HOB = number of hatchery-origin Chinook included in hatchery broodstock.

Brood year	Spawners			Broodstock			PNI
	NOS	HOS	pHOS	NOB	HOB	pNOB	
1989	713	0	0.00	28	0	1.00	1.00
1990	571	0	0.00	18	0	1.00	1.00
1991	242	0	0.00	27	0	1.00	1.00
1992	676	0	0.00	78	0	1.00	1.00
1993	231	2	0.01	94	0	1.00	0.99
1994	123	61	0.33	8	4	0.67	0.67
1995	0	33	1.00	No Program			

Brood year	Spawners			Broodstock			PNI
	NOS	HOS	pHOS	NOB	HOB	pNOB	
1996	41	17	0.29	8	10	0.44	0.60
1997	60	122	0.67	32	79	0.29	0.30
1998	59	32	0.35	13	34	0.28	0.44
1999	87	7	0.07	No Program			
2000	173	173	0.50	9	21	0.30	0.38
2001	414	1,311	0.76	113	259	0.30	0.28
2002	205	502	0.71	20	51	0.28	0.28
2003	143	127	0.47	41	53	0.44	0.48
2004	582	276	0.32	83	132	0.39	0.55
2005	134	464	0.78	91	181	0.33	0.30
2006	116	413	0.78	91	224	0.29	0.27
2007	192	1,104	0.85	43	104	0.29	0.25
2008	205	953	0.82	83	220	0.27	0.25
2009	303	1,044	0.78	96	111	0.46	0.37
2010	418	676	0.62	77	98	0.44	0.42
2011	874	1,158	0.57	80	93	0.46	0.45
2012	557	877	0.61	73	0	1.00	0.62
Average	***297***	***390***	***0.47***	***50***	***70***	***0.50***	***0.50***

Natural and Hatchery Replacement Rates

Natural replacement rates (NRR) were calculated as the ratio of natural-origin recruits (NOR) to the parent spawning population (spawning escapement). Natural-origin recruits are naturally produced (wild) fish that survive to contribute to harvest (directly or indirectly), to broodstock, and to spawning grounds. We do not account for fish that died in route to the spawning grounds (migration mortality) or died just before spawning (pre-spawn mortality) (see Appendix B in Hillman et al. 2012). We calculated NORs with and without harvest. NORs without harvest include all returning fish that either returned to the basin or were collected as wild broodstock. NORs with harvest include all fish harvested and are based on a brood year harvest rates from the hatchery program. For brood years 1989-2007, NRR for spring Chinook in the Chiwawa averaged 1.14 (range, 0.01-4.40) if harvested fish were not include in the estimate and 1.25 (range, 0.01-4.81) if harvested fish were included in the estimate (Table 5.36). NRRs for more recent brood years will be calculated as soon as all tag recoveries and sampling rates have been loaded into the database.

Hatchery replacement rates (HRR) are the hatchery adult-to-adult returns and were calculated as the ratio of hatchery-origin recruits (HOR) to the parent broodstock collected. These rates should be greater than the NRRs and greater than or equal to 5.30 (the calculated target value in Murdoch and Peven 2005). In nearly all years, HRRs were greater than NRRs, regardless if harvest was or was not included (Table 5.36). HRRs exceeded the estimated target value of 5.3

in seven or nine of the 17 years, depending on if harvested fish were or were not included in the estimates.

Table 5.36. Broodstock collected, spawning escapements, natural and hatchery-origin recruits (NOR and HOR), and natural and hatchery replacement rates (NRR and HRR; with and without harvest) for spring Chinook in the Chiwawa River basin, brood years 1989-2007; NP = no hatchery program.

Brood year	Broodstock Collected	Spawning Escapement	Harvest not included				Harvest included			
			HOR	NOR	HRR	NRR	HOR	NOR	HRR	NRR
1989	28	713	180	194	6.43	0.27	204	282	7.29	0.40
1990	19	571	1	34	0.05	0.06	19	40	1.00	0.07
1991	32	242	32	2	1.00	0.01	35	2	1.09	0.01
1992	113	676	31	46	0.27	0.07	32	48	0.28	0.07
1993	100	233	282	159	2.82	0.68	286	163	2.86	0.70
1994	13	184	21	37	1.62	0.20	21	38	1.62	0.21
1995	NP	33		66		2.00		69		2.09
1996	18	58	77	255	4.28	4.40	79	279	4.39	4.81
1997	120	182	2,232	716	18.60	3.93	2,609	794	21.74	4.36
1998	48	91	991	350	20.65	3.85	1,185	372	24.69	4.09
1999	NP	94		10		0.11		11		0.12
2000	48	346	354	699	7.38	2.02	377	733	7.85	2.12
2001	382	1,725	1,805	309	4.73	0.18	1,861	317	4.87	0.18
2002	84	707	721	244	8.58	0.35	780	254	9.29	0.36
2003	119	270	697	107	5.86	0.40	781	115	6.56	0.43
2004	296	858	2,523	276	8.52	0.32	2,990	298	10.10	0.35
2005	283	598	1,386	396	4.90	0.66	1,515	409	5.35	0.68
2006	398	529	1,837	964	4.62	1.82	2,616	1,213	6.57	2.29
2007	169	1,296	844	474	4.99	0.37	1,249	575	7.39	0.44
Average	**134**	**495**	**824**	**281**	**6.19**	**1.14**	**979**	**316**	**7.23**	**1.25**

Smolt-to-Adult Survivals

Smolt-to-adult survival ratios (SARs) were calculated as the number of hatchery adult recaptures divided by the number of tagged hatchery smolts released. SARs were based on CWT returns. For the available brood years, SARs have ranged from 0.00036 to 0.01562 for hatchery spring Chinook (Table 5.37).

Table 5.37. Smolt-to-adult ratios (SARs) for Chiwawa hatchery spring Chinook, brood years 1989-2007.

Brood year	Number of tagged smolts released[a]	Estimated adult captures[b]	SAR
1989	42,707	204	0.00478
1990	52,798	19	0.00036
1991	61,088	35	0.00057
1992	82,976	31	0.00037

Brood year	Number of tagged smolts released[a]	Estimated adult captures[b]	SAR
1993	221,316	284	0.00128
1994	27,135	21	0.00077
1995	No hatchery program		
1996	12,767	67	0.00525
1997	259,585	2,549	0.00982
1998	71,571	1,118	0.01562
1999	No hatchery program		
2000	46,726	375	0.00803
2001	374,129	1,846	0.00493
2002	145,074	760	0.00524
2003	216,702	765	0.00353
2004	491,987	2,979	0.00606
2005	489,664	1,506	0.00308
2006	548,777	2,604	0.00475
2007	292,682	1,247	0.00426
Average	***202,217***	***965***	***0.00463***

[a] Includes all tag codes and CWT released fish (CWT + Ad Clip fish and CWT-only fish).

[b] Includes estimated recoveries (spawning ground, hatcheries, harvest, etc.) and observed recoveries if estimated recoveries were unavailable.

5.8 ESA/HCP Compliance

Broodstock Collection

The collection of 2011 Brood Chiwawa River spring Chinook broodstock was consistent with the 2011 Upper Columbia River salmon and steelhead broodstock objectives and site-based broodstock collection protocols. Specifically, broodstock collection targeted hatchery and natural-origin fish at the Chiwawa Weir. In-season adjustments were made to the number of hatchery and natural-origin spring Chinook collected for broodstock as needed and were based on in-season escapement monitoring at Tumwater Dam and estimated Chiwawa run-escapement.

Trapping at the Chiwawa Weir began on 6 June 2011 and concluded on 6 August 2011. Broodstock collection targeted natural-origin spring Chinook and hatchery-origin spring Chinook as needed to attain a minimum 33% natural-origin broodstock and a maximum 33% extraction of the estimated natural-origin return to the Chiwawa River.

The 2011 brood collection retained a total of 181 spring Chinook, including 80 natural-origin fish, representing a 44% natural-origin broodstock. The brood successfully met the minimum targeted 33% natural-origin composition.

Both passive (low abundance periods) and active (high abundance periods) trapping were used to collect spring Chinook at Tumwater Dam. During passive trapping, the trap was checked and fish were processed several times per day. At the Chiwawa Weir, the trap was operated passively, checked several times per day, and fish were processed once daily. Trapping at the Chiwawa Weir generally followed a four-up and three-down schedule, and operated only as needed to meet weekly collection objectives consistent with the 2011 collection protocol or as adjusted based on in-season run escapement monitoring and ESA Section 10 Permit 1196 requirements. All spring Chinook, steelhead, and bull trout that were captured were anesthetized with tricaine methanesulfonate (MS-222) and subject to water-to-water transfers during handling. All fish were allowed to fully recover before release.

The estimated broodstock extraction rate of natural-origin Chiwawa spring Chinook and overall extraction of spring Chinook upstream from Tumwater Dam comply with provisions of ESA Permit 1196.

No additional spring Chinook were handled and released as a function of maintaining, at minimum, 33% natural-origin spring Chinook in the broodstock. About 400 bull trout were captured and released. To minimize fallback or impingement on the weir, all spring Chinook and bull trout were released unharmed about 10 km upstream from the weir.

Hatchery Rearing and Release

The rearing and release of 2011 brood Chiwawa spring Chinook was completed without incident. No mortality events occurred that exceeded 10% of the population. Fish were acclimated on Chiwawa River water with regulated amounts of Wenatchee river water to prevent frazzle ice formation during the winter months (see Section 5.2).

The release of 2011 brood Chiwawa spring Chinook smolts totaled 281,821 spring Chinook, representing 94.6% of program objectives and complied with the ESA Section 10 Permit 1196 program level of 298,000 smolts. Lower than expected eyed egg to ponding survival contributed primarily to the shortfall in production.

Hatchery Effluent Monitoring

Per ESA Permits 1196, 1347, 1395, 18118, 18119, and 18121, permit holders shall monitor and report hatchery effluents in compliance with applicable National Pollution Discharge Elimination Systems (NPDES) (EPA 1999) permit limitations. There was one NPDES violation reported at the Chelan PUD Hatchery facilities (specifically Chiwawa Ponds due to high river flows resulting from rapid snow melt) during the period 1 January through 31 December 2013. NPDES monitoring and reporting for Chelan PUD Hatchery Programs during 2013 are provided in Appendix F.

Smolt and Emigrant Trapping

Per ESA Section 10 Permit No. 1196, the permit holders are authorized a direct take of up to 20% of the emigrating spring Chinook population during juvenile emigration monitoring and a lethal take not to exceed 2% of the fish captured (NMFS 2003). Based on the estimated wild spring Chinook population (smolt trap expansion) and hatchery juvenile spring Chinook population estimate (hatchery release data) for the Wenatchee River basin, the reported spring Chinook encounters during 2013 emigration monitoring complied with take provisions in the Section 10 permit. Spring Chinook encounter and mortality rates for each trap site (including PIT tag mortalities) are detailed in Table 5.38. Additionally, juvenile fish captured at the trap locations were handled consistent with provisions in ESA Section 10 Permit 1196, Section B.

Table 5.38. Estimated take of Upper Columbia River spring Chinook resulting from juvenile emigration monitoring in the Wenatchee River basin, 2013.

Trap location	Population estimate			Number trapped			Total	Take allowed under Permit
	Wild[a]	Hatchery[b]	Sub-yearling[c]	Wild	Hatchery	Sub-yearling		
Chiwawa Trap								
Population	47,511	346,248	67,982	7,626	30,751	14,831	53,208	
Encounter rate	NA	NA	NA	0.1605	0.0888	0.2182	0.1152	0.20
Mortality[e]	NA	NA	NA	78	7	69	219	
Mortality rate	NA	NA	NA	0.0016	0.0002	0.0047	0.0041	0.02
Upper Wenatchee Trap								
Population	NA[d]	13,963	NA[d]	88	7	165[f]	260	
Encounter rate	NA	NA	NA	NA	0.0005	NA	0.0186	0.20
Mortality[e]	NA	NA	NA	2	0	2	4	
Mortality rate	NA	NA	NA	0.0227	0.0000	0.0121	0.0154	0.02
Lower Wenatchee Trap								
Population	NA	NA	NA	NA	NA	NA	NA	
Encounter rate	NA	NA	NA	NA	NA	NA	NA	0.20
Mortality[e]	NA	NA	NA	NA	NA	NA	NA	
Mortality rate	NA	NA	NA	NA	NA	NA	NA	0.02
Wenatchee River basin Total								
Population	47,511	360,211	67,982	7,714	30,758	14,996	53,468	
Encounter rate	NA	NA	NA	0.1624	0.0854	0.2206	0.1124	0.20
Mortality[e]	NA	NA	NA	80	7	71	158	
Mortality rate	NA	NA	NA	0.0104	0.0002	0.0047	0.0030	0.02

[a] Smolt population estimate derived from juvenile emigration trap data.

[b] 2012 smolt release data for the Wenatchee River basin.

[c] Based on size, date of capture, and location of capture, subyearling Chinook encountered at the Lower Wenatchee Trap are categorized as summer Chinook.

[d] Insufficient numbers of natural-origin spring Chinook were encountered to derive a population estimate.

[e] Combined trapping and PIT tagging mortality.

[f] Subyearling Chinook fry captured prior to July 1 were considered summer Chinook fry, above number represents capture after July 1.

Spawning Surveys

Spring Chinook spawning ground surveys were conducted in the Wenatchee River basin during 2013, as authorized by ESA Section 10 Permits 18118, 18119, and 18121. Because of the difficulty of quantifying the level of take associated with spawning ground surveys, the Permit does not specify a take level associated with these activities, even though it does authorize implementation of spawning ground surveys. Therefore, no take levels are reported. However, to minimize potential effects to established redds, wading was restricted to the extent practical, and extreme caution was used to avoid established redds when wading was required.

Spring Chinook Reproductive Success Study

ESA Section 10 Permit 1196 (expired) and new Section 10 Permits 18118, 18119, and 18121 specifically provide authorization to capture, anesthetize, biologically sample, PIT tag, and release adult spring Chinook at Tumwater Dam for reproductive success studies and general program monitoring. During 2010 through 2013, all spring Chinook passing Tumwater Dam were enumerated, anesthetize, biologically sampled, PIT tagged, and released (not including hatchery-origin Chinook retained for broodstock) as a component of the reproductive success study (BPA Project No. 2003-039-00). Please refer to Ford et al. (2010, 2011, and 2012) for complete details on the methods and results of the spring Chinook reproductive success study for the period 2010-2013.

SECTION 6: NASON CREEK SPRING CHINOOK

This section of the report focuses on results from monitoring the Nason Creek spring Chinook program, which started with broodstock collection in 2013. Information on spring Chinook collected throughout the Wenatchee River basin is presented in Section 5.

6.1 Broodstock Sampling

This section focuses on results from sampling 2013 Nason Creek spring Chinook broodstock, which were collected in Nason Creek and at Tumwater Dam. Some information for the 2013 return is not available at this time (e.g., age structure and final origin determination). This information will be provided in the 2014 annual report.

Origin of Broodstock

Only natural-origin adults made up the Nason Creek spring Chinook broodstock for return year 2013 (Table 6.1). Natural-origin adults were collected at Tumwater Dam (N = 3) and in Nason Creek (N = 23) from the second week of June through early August. Fish collected at Tumwater Dam through the duration of the return were retained at Eastbank Hatchery until genetic assignment could be made to target spawning aggregates (specifically Nason and Chiwawa). All remaining adults not assigned to the two target spawning aggregates were released upstream from Tumwater Dam or to assigned natal stream.

Table 6.1. Numbers of wild and hatchery Nason Creek spring Chinook collected for broodstock, numbers that died before spawning, and numbers of Chinook spawned in 2013. Unknown origin fish (i.e., undetermined by scale analysis, no CWT or fin clips, and no additional hatchery marks) were considered naturally produced. Mortality includes fish that died of natural causes typically near the end of spawning and were not needed for the program or were surplus fish killed at spawning.

Brood year	Wild spring Chinook					Hatchery spring Chinook					Total number spawned
	Number collected	Prespawn loss	Mortality	Number spawned	Number released	Number collected	Prespawn loss	Mortality	Number spawned	Number released	
2013	26	0	1	25	0	0	0	0	0	0	25
Average[a]	*26*	*0*	*1*	*25*	*0*	*0*	*0*	*0*	*0*	*0*	*25*

[a] Origin determinations should be considered preliminary pending scale analyses.

Age/Length Data

Ages were determined from scales and/or coded wire tags (CWT) collected from broodstock. Age data for the 2013 return year are not yet available (Table 6.2).

Table 6.2. Percent of hatchery and wild spring Chinook of different ages (total age) collected from broodstock in 2013.

Return year	Origin	Total age			
		2	3	4	5
2013	Wild	NA	NA	NA	NA
	Hatchery	NA	NA	NA	NA
Average	***Wild***	NA	NA	NA	NA
	Hatchery	NA	NA	NA	NA

Length at age for Nason Creek wild and hatchery spring Chinook are not yet available (Table 6.3).

Table 6.3. Mean fork length (cm) at age (total age) of hatchery and wild spring Chinook collected from broodstock in 2013; N = sample size and SD = 1 standard deviation.

Return year	Origin	Spring Chinook fork length (cm)											
		Age-2			Age-3			Age-4			Age-5		
		Mean	N	SD	Mean	N	SD	Mean	N	SD	Mean	N	SD
2013	Wild	--	--	--	--	--	--	--	--	--	--	--	--
	Hatchery	--	--	--	--	--	--	--	--	--	--	--	--
Average	***Wild***	--	--	--	--	--	--	--	--	--	--	--	--
	Hatchery	--	--	--	--	--	--	--	--	--	--	--	--

Sex Ratios

Male spring Chinook in the 2013 return year made up 50% of the adults collected. This resulted in an overall male to female ratios of 1.00:1.00 (Table 6.4).

Table 6.4. Numbers of male and female wild and hatchery spring Chinook collected for broodstock in 2013. Ratios of males to females are also provided.

Return year	Number of wild spring Chinook			Number of hatchery spring Chinook			Total M/F ratio
	Males (M)	Females (F)	M/F	Males (M)	Females (F)	M/F	
2013	13	13	1.00:1.00	0	0	--	--
Total	***13***	***13***	***1.00:1.00***	***0***	***0***	**--**	**--**

Fecundity

The mean fecundity for the 2013 return of Nason Creek spring Chinook was 4,052 eggs per female (Table 6.5). This was less than the expected fecundity of 4,400 eggs per female assumed in the broodstock protocol.

Table 6.5. Mean fecundity of wild, hatchery, and all female spring Chinook collected for broodstock in 2013.

Return year	Mean fecundity		
	Wild	Hatchery	Total
2013	4,052	0	4,052
Average	***4,052***	***0***	***4,052***

6.2 Hatchery Rearing

Rearing History

Number of eggs taken

Based on the unfertilized egg-to-release survival standard of 81%, a total of 147,059 eggs were required to meet the program release goal of 125,000 smolts for brood year 2013 (Table 6.6). The green egg take for the 2013 brood year was 34% of program goal. This was largely because of the low number of Nason Creek broodstock collected at Tumwater Dam.

ESA Permit 18118 sets limits on the percentage of the total run and total number of natural-origin fish in the broodstock to meet the conservation program. Applying these criteria to the low total abundance of spring Chinook salmon to the Nason Creek basin, and the low abundance of natural-origin fish returning to the basin, has resulted in the program not meeting production goals.

Table 6.6. Numbers of eggs taken from spring Chinook broodstock in 2013.

Return year	Number of eggs taken
2013	49,720
Average	***49,720***

Number of acclimation days

There is currently no juvenile release information because the Nason Creek spring Chinook program started with return year 2013. Juveniles from the 2013 brood will be released in 2015 (Table 6.7).

Table 6.7. Number of days spring Chinook broods were acclimated and water source, brood year 2013; NA = not available.

Brood year	Release year	Transfer date	Release date	Number of days and water source	
				Total	Nason Creek
2013	2015	NA	NA	NA	NA

Release Information

Numbers released

There is currently no juvenile release information because the Nason Creek spring Chinook program started with return year 2013. Juveniles from the 2013 brood will be released in 2015 (Table 6.8).

Table 6.8. Numbers of spring Chinook smolts tagged and released from the hatchery, brood year 2013. The release target for Nason Creek spring Chinook is 125,000 smolts.

Brood year	Release year	Type of release	CWT mark rate	Number released that were PIT tagged	Number of smolts released	Total number of smolts released
2013	2015	NA	NA	NA	NA	NA

Numbers tagged

There is currently no juvenile release information because the Nason Creek spring Chinook program started with return year 2013. Juveniles from the 2013 brood will be tagged in 2014 and released in 2015 (Tables 6.8 and 6.9).

Table 6.9. Summary of PIT-tagging activities for Nason Creek hatchery spring Chinook, brood year 2013.

Brood year	Release year	Number of fish tagged	Number of tagged fish that died	Number of tags shed	Number of tagged fish released
2013	2015	NA	NA	NA	NA

Fish size and condition at release

There is currently no juvenile release information because the Nason Creek spring Chinook program started with return year 2013. Lengths and weights of juvenile spring Chinook from the 2013 brood will be measured in 2015 (Table 6.10).

Table 6.10. Mean lengths (FL, mm), weight (g and fish/pound), and coefficient of variation (CV) of spring Chinook smolts released from the hatchery, brood year 2013. Size targets are provided in the last row of the table.

Brood year	Release year	Fork length (mm)		Mean weight	
		Mean	CV	Grams (g)	Fish/pound
2013	2015	NA	NA	NA	NA
Average		***NA***	***NA***	***NA***	***NA***
Targets		***176***	***9.0***	***37.8***	***12***

Survival Estimates

There is currently limited juvenile survival information because the Nason Creek spring Chinook program started with return year 2013. Survival of juveniles from the 2013 brood will be assessed in 2015 (Table 6.11).

Table 6.11. Hatchery life-stage survival rates (%) for spring Chinook, brood year 2013. Survival standards or targets are provided in the last row of the table.

Brood year	Collection to spawning		Unfertilized egg-eyed	Eyed egg-ponding	30 d after ponding	100 d after ponding	Ponding to release	Transport to release	Unfertilized egg-release
	Female	Male							
2013	100.0	100.0	96.2	NA	NA	NA	NA	NA	NA
Average	***100.0***	***100.0***	***96.2***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***
Standard	***90.0***	***85.0***	***92.0***	***98.0***	***97.0***	***93.0***	***90.0***	***95.0***	***81.0***

6.3 Disease Monitoring

Results of 2013 adult broodstock bacterial kidney disease (BKD) monitoring indicated that most females (61.5%) had ELISA values less than 0.199. About 92% of the females had ELISA values less than 0.120, which would have required about 8% of the progeny to be reared at densities not to exceed 0.06 fish per pound (Table 6.12).

Table 6.12. Proportion of bacterial kidney disease (BKD) titer groups for the Nason Creek spring Chinook broodstock, brood year 2013. Also included are the proportions to be reared at either 0.125 fish per pound or 0.060 fish per pound.

Brood year	Optical density values by titer group				Proportion at rearing densities (fish per pound, fpp)	
	Very Low (≤ 0.099)	Low (0.1-0.199)	Moderate (0.2-0.449)	High (≥ 0.450)	≤ 0.125 fpp (<0.119)	≤ 0.060 fpp (>0.120)
2013	0.6154	0.3846	--	--	0.9231	0.0769
Average	***0.6154***	***0.3846***	***--***	***--***	***0.9231***	***0.0769***

6.4 Natural Juvenile Productivity

During 2012, juvenile spring Chinook were sampled at the Nason Creek trap.

Smolt and Emigrant Estimates

Numbers of spring Chinook smolts and emigrants were estimated at the Nason Creek trap in 2013.

Nason Creek Trap

The Nason Creek Trap operated between 1 March and 30 November 2013. During that time period the trap was inoperable for 48 days because of low stream discharge. Daily trap efficiencies were estimated from a flow-efficiency regression model. The daily number of fish captured was expanded by the estimated trap efficiency to estimate daily total emigration.

Wild yearling spring Chinook (2011 brood year) were primarily captured from March through June 2013 (Figure 6.1). Based on capture efficiencies estimated from the flow model, the total number of wild yearling Chinook emigrating from Nason Creek was 2,414 (±650). Combining the total number of subyearling spring Chinook (17,991) that emigrated during the fall of 2012 with the total number of yearling Chinook (2,414) that emigrated during 2013 resulted in a total emigrant estimate of 20,405 (±3,890) spring Chinook for the 2011 brood year (Table 6.13).

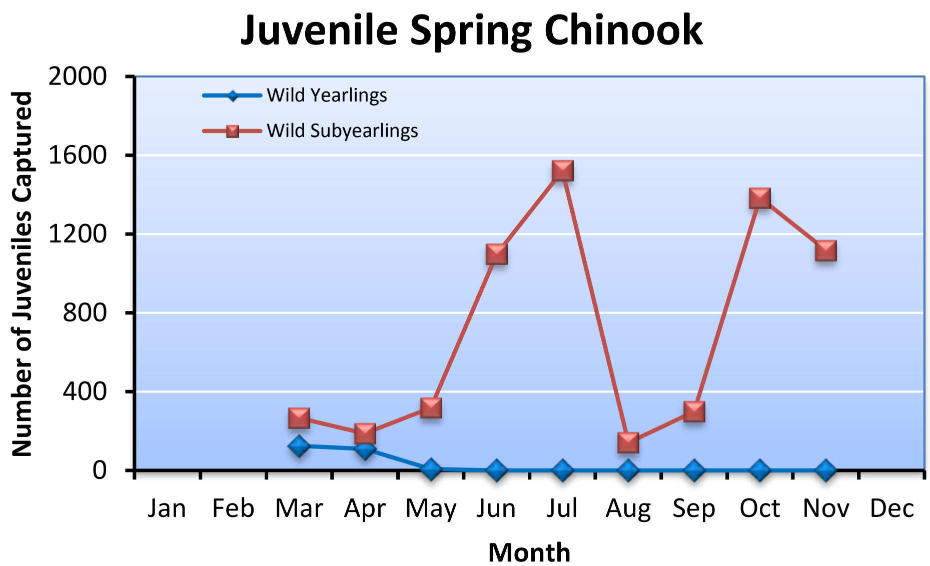


Figure 6.1. Monthly captures of wild subyearling and yearling spring Chinook at the Nason Creek Trap, 2013.

Table 6.13. Numbers of redds and juvenile spring Chinook at different life stages in the Nason Creek basin for brood years 2002-2012.

Brood year	Number of redds	Egg deposition[a]	Number of subyearling emigrants[b]	Number of smolts produced within Nason Creek basin	Number of emigrants
2002	294	1,368,276	ND	9,084	9,084
2003	83	485,052	7,899	2,096	9,995
2004	169	811,031	12,569	3,267	15,836
2005	193	835,111	7,280	7,732	15,012
2006	152	657,248	4,144	7,822	11,966
2007	101	448,541	16,626	5,631	22,257
2008	336	1,542,576	23,182	3,617	26,799
2009	167	763,691	27,720	1,697	29,417
2010	188	806,718	8,734	3,529	12,263
2011	170	745,450	17,991	2,414	20,405
2012	413	1,744,099	28,110	--	--
Average	***206***	***927,981***	***15,426***	***4,689***	***17,303***

[a] Egg deposition is calculated as the number of redds times the fecundity of both wild and hatchery spring Chinook salmon (from Table 5.5.

[b] Subyearling emigrants does not include fry that left the watershed before 1 July.

Wild subyearling spring Chinook (2012 brood year) were captured between 1 July and 30 November 2013. Based on capture efficiencies estimated from the flow model, the total number of wild subyearling parr Chinook from the Nason Creek basin was 28,110 (±4,612).

Yearling spring Chinook sampled in 2013 averaged 91 mm in length, 7.9 g in weight, and had a mean condition of 1.03 (Table 6.14). These size estimates were less than the overall mean of yearling spring Chinook sampled in previous years (overall means: 93 mm, 8.6 g, and condition of 1.06). Subyearling spring Chinook sampled in 2012 at the Nason Creek Trap averaged 70 mm in length, averaged 3.8 g, and had a mean condition of 1.03 (Table 6.14). These sizes were less than the overall mean of subyearling spring Chinook sampled in previous years (overall means, 76 mm, 5.0 g, and condition of 1.07).

Table 6.14. Mean fork length (mm), weight (g), and condition factor of subyearling and yearling spring Chinook collected in the Nason Creek Trap, 2004-2013. Numbers in parentheses indicate 1 standard deviation.

Sample year	Life stage	Sample size[a]	Mean size		
			Length (mm)	Weight (g)	Condition (K)
2004	Subyearling	656	82 (7)	5.9 (1.7)	1.04 (0.11)
	Yearling	323	92 (8)	8.2 (2.3)	1.04 (0.08)
2005	Subyearling	872	76 (9)	4.8 (1.7)	1.02 (0.13)
	Yearling	276	94 (7)	8.7 (2.0)	1.04 (0.12)
2006	Subyearling	1422	73 (9)	3.9 (1.9)	0.92 (0.16)
	Yearling	362	91 (7)	7.5 (1.8)	0.98 (0.11)
2007	Subyearling	609	78 (14)	5.9 (2.6)	1.15 (0.16)
	Yearling	678	88 (9)	7.4 (2.4)	1.05 (0.13)
2008	Subyearling	1,001	75 (14)	5.0 (2.5)	1.10 (0.11)
	Yearling	881	96 (6)	9.5 (2.0)	1.06 (0.09)
2009	Subyearling	2,147	72 (11)	4.4 (2.1)	1.08 (0.08)
	Yearling	162	96 (8)	9.6 (2.4)	1.08 (0.09)
2010	Subyearling	3,032	81 (11)	6.2 (2.3)	1.13 (0.10)
	Yearling	366	97 (7)	10.2 (2.3)	1.10 (0.09)
2011	Subyearling	1,064	72 (13)	4.7 (2.5)	1.13 (0.12)
	Yearling	150	89 (10)	7.7 (1.8)	1.09 (0.12)
2012	Subyearling	2,141	78 (11)	5.3 (2.0)	1.05 (0.09)
	Yearling	363	93 (6)	9.3 (2.2)	1.11 (0.08)
2013	Subyearling	4,408	70 (11)	3.8 (1.7)	1.03 (0.10)
	Yearling	239	91 (7)	7.9 (2.1)	1.03 (0.07)
Average	***Subyearling***	***1,735***	***76***	***5.0***	***1.07***
	Yearling	***380***	***93***	***8.6***	***1.06***

[a] Sample size represents the number of fish that were measured for both length and weight.

Freshwater Productivity

Both productivity and survival estimates for different life stages of spring Chinook in the Nason Creek watershed are provided in Table 6.15. Estimates for brood year 2011 fall within the ranges estimated over the period of brood years 2002-2011. During that period, freshwater productivities ranged from 10-44 smolts/redd and 31-220 emigrants/redd. Survivals during the same period ranged from 0.2-1.3% for egg-smolt and 0.7-5.0% for egg-emigrants.

Table 6.15. Productivity (fish/redd) and survival (%) estimates for different juvenile life stages of spring Chinook in the Nason Creek watershed for brood years 2002-2012; ND = no data. These estimates were derived from data in Table 6.13.

Brood year	Smolts/Redd[a]	Emigrants/ Redd	Egg-Smolt[a] (%)	Egg-Emigrant (%)
2002	31	31	0.7	0.7
2003	25	120	0.4	2.1
2004	19	94	0.4	2.0
2005	40	78	0.9	1.8
2006	51	79	1.2	1.8
2007	56	220	1.3	5.0
2008	11	80	0.2	1.7
2009	10	176	0.2	3.9
2010	19	65	0.4	1.5
2011	14	120	0.3	2.7
Average	***28***	***106***	***0.6***	***2.3***

[a] These estimates include Nason Creek smolts produced only within the Nason Creek basin.

Seeding level (egg deposition) explained most of the variability in productivity and survival of juvenile spring Chinook in the Nason Creek watershed. That is, for estimates based on smolts produced within the Nason Creek watershed, survival and productivity decreased as seeding levels increased (Figure 6.2). This suggests that density dependence regulates juvenile productivity and survival within the Nason Creek watershed.

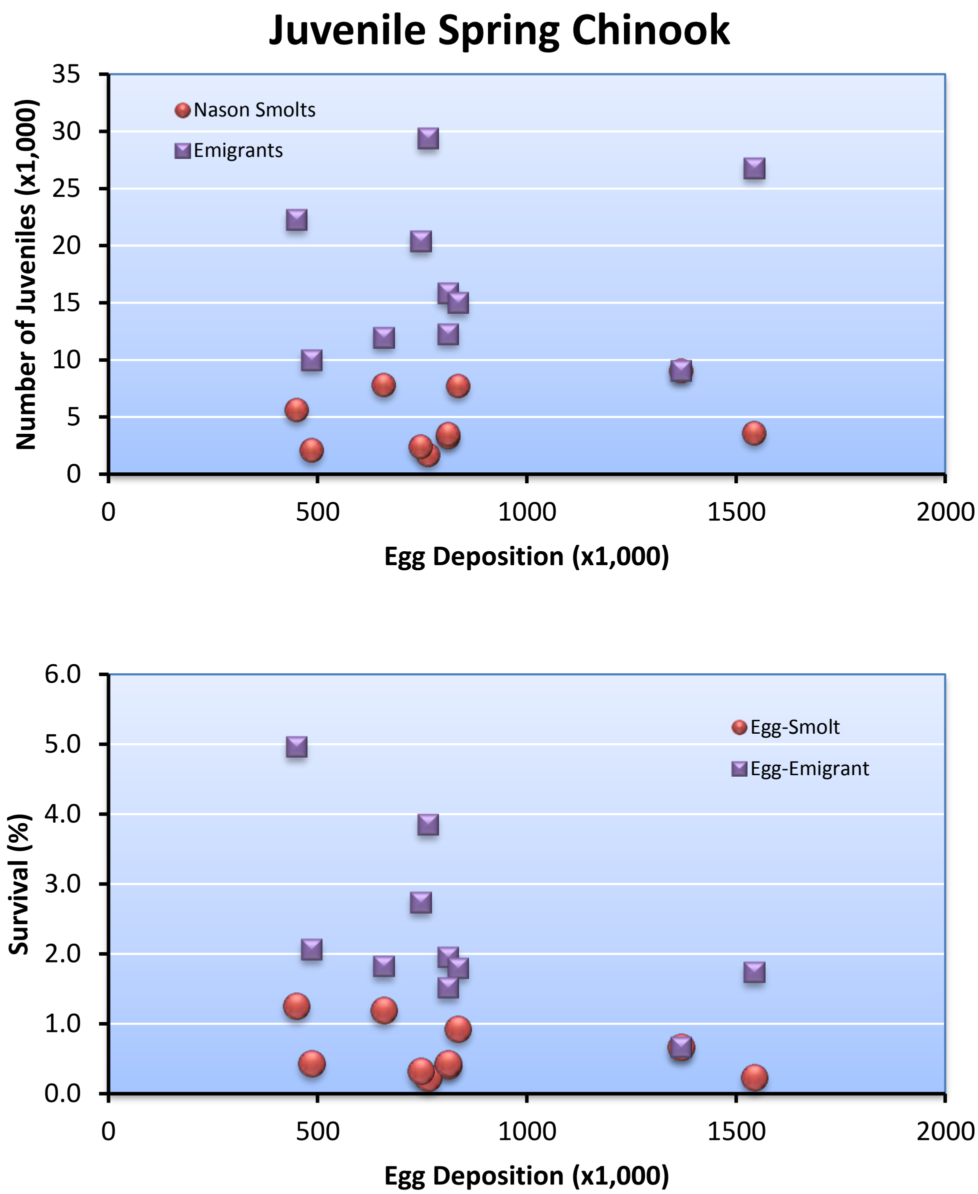


Figure 6.2. Relationships between seeding levels (egg deposition) and juvenile life-stage survivals and productivities for Nason Creek spring Chinook, brood years 2002-2011. Nason Creek smolts are smolts produced only in the Nason Creek watershed.

6.5 Spawning Surveys

Surveys for spring Chinook redds were conducted during August through September, 2013, in the Chiwawa River (including Rock, Phelps, Big Meadow, and Chikamin creeks), Nason Creek, Icicle Creek, Peshastin Creek (including Ingalls Creek), Upper Wenatchee River (including Chiwaukum Creek), Little Wenatchee River, and White River (including the Napeequa River and Panther Creek). See Section 5.5 for a complete coverage of spring Chinook redd surveys in the Wenatchee River basin. In the following section we describe the number and distribution of redds within the Nason Creek basin.

Redd Counts and Distribution

A total of 212 spring Chinook redds were counted in Nason Creek in 2013 (Table 6.16). This is higher than the average of 147 redds counted during the period 1989-2013 in Nason Creek. Redds were not distributed evenly among the four reaches in Nason Creek. Most were located in Reaches 1, 3, and 4 (Table 6.16).

Table 6.16. Numbers and proportions of spring Chinook redds counted within different reaches within Nason Creek during August through September, 2013.

Stream/watershed	Reach	Number of redds	Proportion of redds within stream/watershed
Nason	Nason 1 (N1)	64	0.30
	Nason 2 (N2)	27	0.13
	Nason 3 (N3)	68	0.32
	Nason 4 (N4)	53	0.25
Total		***212***	***1.00***

Spawn Timing

Spring Chinook began spawning during the first week of August in Nason Creek and peaked the fifth week of August (Figure 6.3).

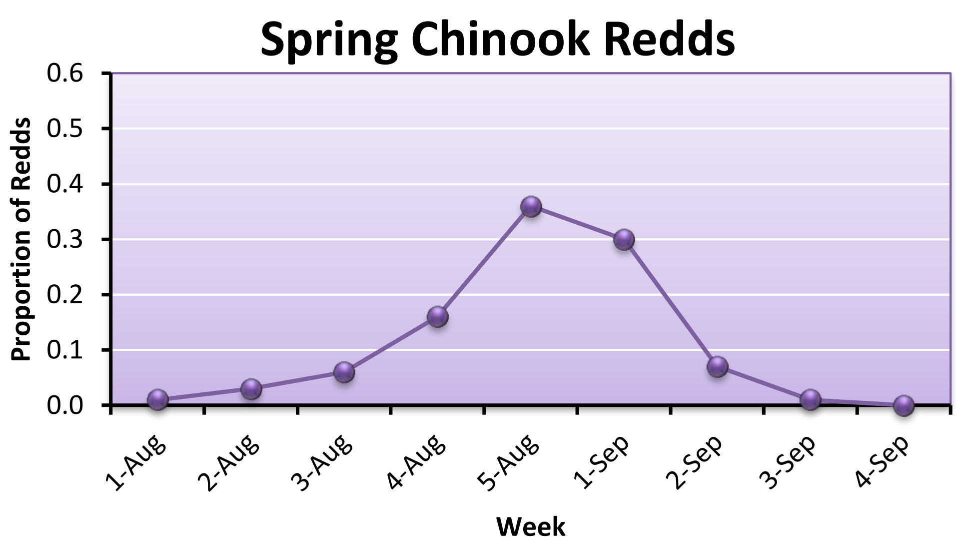


Figure 6.3. Proportion of spring Chinook redds counted during different weeks within Nason Creek, August through September 2013.

Spawning Escapement

Spawning escapement for spring Chinook was calculated as the number of redds times the male-to-female ratio (i.e., fish per redd expansion factor) estimated from broodstock and fish sampled at adult trapping sites. The estimated fish per redd ratio for spring Chinook upstream from

Tumwater in 2013 was 1.94 (based on sex ratios estimated at Tumwater Dam). Multiplying this ratio by the number of redds counted in Nason Creek resulted in a total spawning escapement of 411 spring Chinook. The estimated total spawning escapement of spring Chinook in 2013 was greater than the overall average of 328 spring Chinook in Nason Creek (see Table 5.22).

6.6 Carcass Surveys

Surveys for spring Chinook carcasses were conducted during August through September, 2013, in the Chiwawa River (including Rock, Phelps, Big Meadow, and Chikamin creeks), Nason Creek, Icicle Creek, Peshastin Creek (including Ingalls Creek), Upper Wenatchee River (including Chiwaukum Creek), Little Wenatchee River, and White River (including the Napeequa River and Panther Creek). See Section 5.6 for coverage of spring Chinook carcass surveys in the Wenatchee River basin.

In the Nason Creek watershed, the spatial distribution of hatchery and wild fish was not equal among survey reaches (Table 6.17). A larger percentage of hatchery fish were found in the lower reaches (N1 and N2; Mouth to Highway 2) than were wild fish. This general trend was also apparent in the pooled data (Figure 6.4). It should be noted that the hatchery fish spawning in Nason Creek are strays from the Chiwawa spring Chinook Program. Nason Creek hatchery fish will return to Nason Creek beginning in 2016 as age-3 fish.

Table 6.17. Numbers of wild and hatchery spring Chinook carcasses sampled within different reaches in the Nason Creek watershed, 1999-2013. See Table 2.8 for description of survey reaches.

Survey year	Origin	Survey Reach				Total
		N-1	N-2	N-3	N-4	
1999	Wild	2	3	0	0	**5**
	Hatchery	0	0	0	0	**0**
2000	Wild	19	21	0	9	**49**
	Hatchery	11	9	0	1	**21**
2001	Wild	25	22	0	41	**88**
	Hatchery	91	54	0	22	**167**
2002	Wild	16	34	0	37	**87**
	Hatchery	33	29	0	35	**97**
2003	Wild	6	19	0	22	**47**
	Hatchery	3	9	0	3	**15**
2004	Wild	29	33	18	24	**104**
	Hatchery	42	26	11	3	**82**
2005	Wild	19	6	11	7	**43**
	Hatchery	130	17	22	4	**173**
2006	Wild	24	17	28	9	**78**
	Hatchery	50	31	17	14	**112**
2007	Wild	2	13	8	6	**29**
	Hatchery	54	77	26	15	**172**
2008	Wild	14	13	16	10	**53**
	Hatchery	102	39	36	13	**190**
2009	Wild	1	12	10	16	**39**

Survey year	Origin	Survey Reach				Total
		N-1	N-2	N-3	N-4	
	Hatchery	25	21	20	23	**89**
2010	Wild	3	6	6	4	**19**
	Hatchery	47	29	30	16	**122**
2011	Wild	8	11	11	5	**35**
	Hatchery	22	12	21	8	**63**
2012	Wild	24	11	65	7	**107**
	Hatchery	95	37	70	23	**225**
2013	Wild	4	2	9	9	**24**
	Hatchery	52	12	28	26	**118**
Average	***Wild***	***13***	***15***	***12***	***14***	***54***
	Hatchery	***50***	***27***	***19***	***14***	***110***

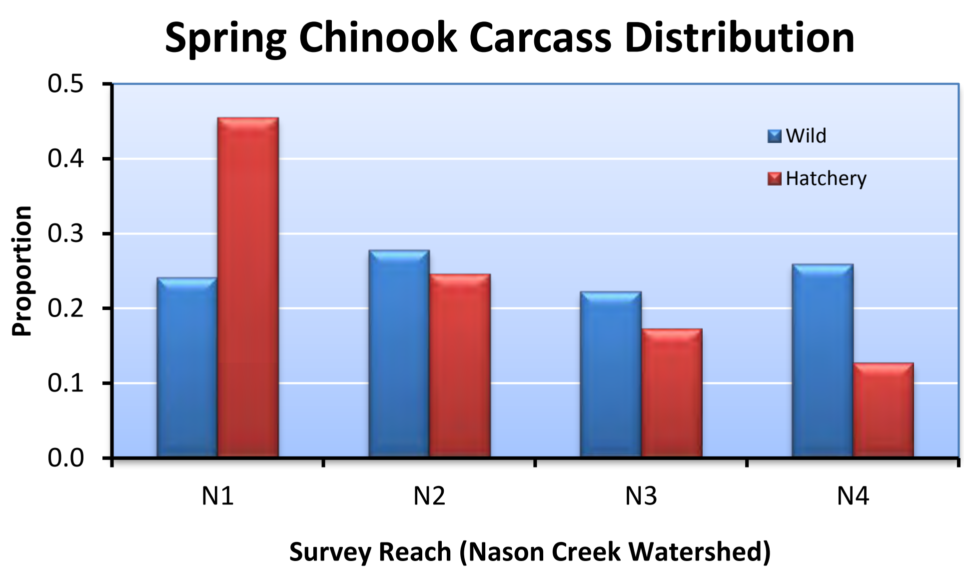


Figure 6.4. Distribution of wild and hatchery produced carcasses in different reaches in the Nason Creek watershed, 1999-2013. Reach codes are described in Table 2.8.

6.7 Life History Monitoring

Life history characteristics of spring Chinook were assessed by examining carcasses on spawning grounds and fish collected at broodstock collection sites, and by reviewing tagging data and fisheries statistics.

Migration Timing

See Section 5.7 for a description of migration timing of spring Chinook at Tumwater Dam.

Age at Maturity

Most of the wild and hatchery spring Chinook sampled during the period 1999-2013 in the Nason Creek watershed were age-4 fish (total age) (Table 6.18; Figure 6.5). On average, hatchery fish made up a higher percentage of age-3 Chinook than did wild fish. In contrast, a higher proportion of age-5 wild fish returned than did age-5 hatchery fish. Thus, wild fish tended to return at an older age than hatchery fish.

Table 6.18. Numbers of wild and hatchery spring Chinook of different ages (total age) sampled on spawning grounds in the Nason Creek watershed, 1999-2013.

Sample year	Origin	Total age					Sample size
		2	3	4	5	6	
1999	Wild	0	0	5	0	0	**5**
	Hatchery	0	0	0	0	0	**0**
2000	Wild	0	1	45	0	0	**46**
	Hatchery	0	18	3	0	0	**21**
2001	Wild	0	0	63	13	0	**76**
	Hatchery	0	5	159	3	0	**167**
2002	Wild	0	0	58	23	0	**81**
	Hatchery	0	0	85	11	0	**96**
2003	Wild	0	4	3	36	0	**43**
	Hatchery	0	3	1	5	0	**9**
2004	Wild	0	1	101	1	0	**103**
	Hatchery	0	57	23	2	0	**82**
2005	Wild	0	1	25	17	0	**43**
	Hatchery	0	3	170	0	0	**173**
2006	Wild	0	0	60	18	0	**78**
	Hatchery	0	12	78	22	0	**112**
2007	Wild	0	0	18	11	0	**29**
	Hatchery	0	123	40	9	0	**172**
2008	Wild	0	2	46	4	0	**52**
	Hatchery	0	21	163	6	0	**190**
2009	Wild	0	1	36	2	0	**39**
	Hatchery	0	19	65	4	0	**88**
2010	Wild	0	1	18	0	0	**19**
	Hatchery	0	5	116	1	0	**122**
2011	Wild	0	3	24	8	0	**35**
	Hatchery	0	33	17	13	0	**63**
2012	Wild	0	1	89	17	0	**107**
	Hatchery	0	25	198	2	0	**225**
2013	Wild	0	0	19	5	0	**24**
	Hatchery	0	22	92	3	0	**117**
Average	***Wild***	***0***	***1***	***41***	***10***	***0***	***52***
	Hatchery	***0***	***23***	***81***	***5***	***0***	***109***

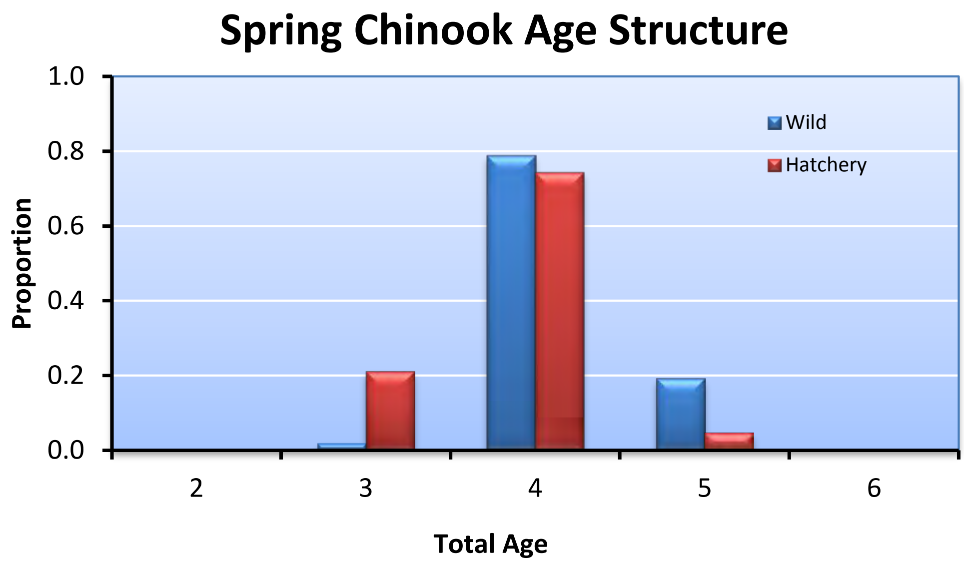


Figure 6.5. Proportions of wild and hatchery spring Chinook of different total ages sampled on spawning grounds in the Nason Creek watershed for the combined years 1999-2013.

Size at Maturity

On average, hatchery and wild spring Chinook of a given age differed little in length (Table 6.19). Differences were usually no more than 1-2 cm between hatchery and wild fish of the same age.

Table 6.19. Mean lengths (POH in cm; ±1SD) and sample sizes (in parentheses) of different ages (total age) of male and female spring Chinook of wild and hatchery-origin sampled in the Nason Creek watershed, 1999-2013.

Return year	Total age	Mean length (cm)			
		Male		Female	
		Wild	Hatchery	Wild	Hatchery
1999	3	0	0	0	0
	4	71 ±2 (2)	0	64 ±2 (3)	0
	5	0	0	0	0
	6	0	0	0	0
2000	3	46 ±0 (1)	44 ±4 (14)	0	52 ±10 (4)
	4	62 ±4 (19)	0	63 ±3 (25)	60 ±1 (3)
	5	0	0	0	0
	6	0	0	0	0
2001	3	0	47 ±12 (5)	0	0
	4	65 ±4 (21)	66 ±5 (36)	63 ±4 (42)	63 ±4 (123)
	5	81 ±5 (3)	0	72 ±3 (10)	71 ±7 (3)
	6	0	0	0	0
2002	3	0	0	0	0
	4	62 ±6 (24)	66 ±5 (35)	63 ±4 (34)	62 ±5 (50)
	5	77 ±4 (12)	81 ±7 (8)	75 ±3 (11)	71 ±5 (3)

Return year	Total age	Mean length (cm)			
		Male		Female	
		Wild	Hatchery	Wild	Hatchery
	6	0	0	0	0
2003	3	44 ±7 (3)	43 ±5 (3)	0	0
	4	58 ±7 (2)	79 ±0 (1)	67 ±0 (1)	0
	5	75 ±9 (11)	81 ±6 (2)	72 ±6 (25)	71 ±2 (3)
	6	0	0	0	0
2004	3	46 ±0 (1)	43 ±4 (56)	0	0
	4	61 ±4 (35)	60 ±3 (6)	61 ±3 (66)	62 ±4 (17)
	5	0	0	81 ±0 (1)	73 ±4 (2)
	6	0	0	0	0
2005	3	37 ±0 (1)	41 ±7 (3)	0	0
	4	59 ±6 (8)	63 ±4 (54)	61 ±3 (17)	61 ±3 (116)
	5	73 ±5 (4)	0	71 ±1 (13)	0
	6	0	0	0	0
2006	3	0	41 ±3 (12)	0	0
	4	60 ±5 (26)	62 ±3 (29)	61 ±3 (34)	59 ±4 (49)
	5	72 ±5 (10)	73 ±5 (6)	69 ±4 (8)	70 ±4 (16)
	6	0	0	0	0
2007	3	0	44 ±4 (122)	0	51 ±0 (1)
	4	62 ±4 (6)	60 ±7 (13)	63 ±4 (12)	61 ±4 (27)
	5	77 ±5 (7)	67 ±5 (3)	68 ±2 (4)	70 ±2 (6)
	6	0	0	0	0
2008	3	51 ±21 (2)	45 ±5 (20)	0	45 ±0 (1)
	4	60 ±5 (15)	63 ±4 (42)	61 ±3 (31)	63 ±3 (121)
	5	0	77 ±2 (3)	71 ±3 (4)	64 ±7 (3)
	6	0	0	0	0
2009	3	41 ±0 (1)	46 ±5 (18)	0	65 ±0 (1)
	4	60 ±5 (12)	63 ±4 (19)	60 ±3 (24)	61 ±4 (46)
	5	0	71 ±1 (2)	72 ±4 (2)	73 ±3 (2)
	6	0	0	0	0
2010	3	44 ±0 (1)	45 ±5 (5)	0	0
	4	62 ±5 (7)	63 ±4 (42)	61 ±3 (10)	62 ±4 (74)
	5	0	75 ±0 (1)	0	0
	6	0	0	0	0
2011	3	48 ±11 (3)	43 ±4 (31)	0	48 ±2 (2)
	4	61 ±5 (11)	59 ±11 (6)	60 ±5 (12)	63 ±5 (11)
	5	79 ±2 (3)	73 ±3 (6)	75 ±4 (5)	70 ±3 (7)
	6	0	0	0	0
2012	3	41 ±0 (1)	42 ±3 (24)	0	0
	4	61 ±7 (35)	60 ±5 (45)	61 ±4 (54)	60 ±4 (151)
	5	77 ±4 (6)	0	66 ±5 (11)	70 ±3 (2)
	6	0	0	0	0

Return year	Total age	Mean length (cm)			
		Male		Female	
		Wild	Hatchery	Wild	Hatchery
2013	3	0	41 ±4 (21)	0	0
	4	63 ±6 (7)	62 ±4 (22)	60 ±4 (11)	61 ±4 (70)
	5	0	75 ±0 (1)	68 ±3 (5)	68 ±1 (2)
	6	0	0	0	0

Contribution to Fisheries

Because the Nason Creek program began in 2013, there will be no harvest information on Nason Creek hatchery spring Chinook until about 2017.

Straying

Stray rates will be determined by examining CWTs recovered on spawning grounds within and outside the Wenatchee River basin. Targets for strays based on return year (recovery year) within the Wenatchee River basin should be less than 10% and targets for strays outside the Wenatchee River basin should be less than 5%. The target for brood year stray rates should be less than 5%. Straying of Nason Creek spring Chinook will be estimated beginning in 2016 or 2017 when the 2013 brood fish return.

Genetics

Because the Nason Creek spring Chinook program began in 2013 with the collection of broodstock, there are no studies that examine the effects of the program on the genetics of natural-origin spring Chinook in the Wenatchee River basin. However, genetic studies were conducted to determine the potential effects of the Chiwawa Supplementation Program on natural-origin spring Chinook in the upper Wenatchee River basin (Blankenship et al. 2007; the entire report is appended as Appendix J). This work included the analysis of Nason Creek spring Chinook. Researchers collected microsatellite DNA allele frequencies from temporally replicated natural and hatchery-origin spring Chinook to statistically assign individual fish to specific demes (locations) within the Wenatchee population.

Significant differences in allele frequencies were observed within and among major spawning areas in the Upper Wenatchee River basin. However, these differences made up only a very small portion of the overall variation, indicating genetic similarity among the major spawning areas. There was no evidence that the Chiwawa program has changed the genetic structure (allele frequency) of spring Chinook in Nason Creek and the White River, despite the presence of hatchery-origin spawners in both systems.

Proportion of Natural Influence

Another method for assessing the genetic risk of a supplementation program is to determine the influence of the hatchery and natural environments on the adaptation of the composite population. This is estimated by the proportion of natural-origin fish in the hatchery broodstock (pNOB) and the proportion of hatchery-origin fish in the natural spawning escapement (pHOS). The ratio pNOB/(pHOS+pNOB) is the Proportion of Natural Influence (PNI). The larger the ratio (PNI), the greater the strength of selection in the natural environment relative to that of the hatchery environment. In order for the natural environment to dominate selection, PNI should be greater than 0.50, and important integrated populations should have a PNI of at least 0.67 (HSRG/WDFW/NWIFC 2004).

For the first brood year (2013), the PNI was less than 0.67 (Table 6.20). Failure to meet the PNI goal for 2013 was the result of high pHOS caused by strays from the Chiwawa hatchery program.

Table 6.20. Proportionate natural influence (PNI) of the Nason spring Chinook supplementation program for brood year 2013. PNI was calculated as the proportion of naturally produced Chinook in the hatchery broodstock (pNOB) divided by the proportion of hatchery Chinook on the spawning grounds (pHOS) plus pNOB. NOS = number of natural-origin Chinook on the spawning grounds; HOS = number of hatchery-origin Chinook on the spawning grounds; NOB = number of natural-origin Chinook collected for broodstock; and HOB = number of hatchery-origin Chinook included in hatchery broodstock.

Brood year	Spawners			Broodstock			PNI
	NOS	HOS	pHOS	NOB	HOB	pNOB	
2013	75	336	0.82	26	0	1.00	0.55
Average	***75***	***336***	***0.82***	***26***	***0***	***1.00***	***0.55***

Natural and Hatchery Replacement Rates

Natural replacement rates (NRR) were calculated as the ratio of natural-origin recruits (NOR) to the parent spawning population (spawning escapement). Natural-origin recruits are naturally produced (wild) fish that survive to contribute to harvest (directly or indirectly), to broodstock, and to spawning grounds. We do not account for fish that died in route to the spawning grounds (migration mortality) or died just before spawning (pre-spawn mortality) (see Appendix B in Hillman et al. 2012). We calculated NORs with and without harvest. NORs without harvest include all returning fish that either returned to the basin or were collected as wild broodstock. NORs with harvest include all fish harvested and are based on a brood year harvest rates from the Chiwawa Hatchery program. For brood years 1996-2007, NRR for spring Chinook in Nason Creek averaged 1.21 (range, 0.12-5.41) if harvested fish were not include in the estimate and 1.31 (range, 0.13-5.75) if harvested fish were included in the estimate (Table 6.21). NRRs for more recent brood years will be calculated as soon as all tag recoveries and sampling rates have been loaded into the database.

Hatchery replacement rates (HRR) are the hatchery adult-to-adult returns and will be calculated as the ratio of hatchery-origin recruits (HOR) to the parent broodstock collected. These rates should be greater than the NRRs. HRRs will be calculated beginning with the return of 2013 brood fish.

Table 6.21. Spawning escapements, natural-origin recruits (NOR), and natural replacement rates (NRR; with and without harvest) for spring Chinook in the Nason Creek watershed, brood years 1996-2007.

Brood year	Spawning Escapement	Harvest not included		Harvest included	
		NOR	NRR	NOR	NRR
1996	83	233	2.81	255	3.07
1997	122	270	2.21	299	2.45

Brood year	Spawning Escapement	Harvest not included		Harvest included	
		NOR	NRR	NOR	NRR
1998	64	346	5.41	368	5.75
1999	22	14	0.64	15	0.68
2000	270	325	1.20	341	1.26
2001	598	74	0.12	76	0.13
2002	603	123	0.20	128	0.21
2003	202	63	0.31	68	0.34
2004	507	129	0.25	139	0.27
2005	347	155	0.45	160	0.46
2006	271	118	0.44	148	0.55
2007	463	209	0.45	254	0.55
Average	***296***	***172***	***1.21***	***188***	***1.31***

Smolt-to-Adult Survivals

Smolt-to-adult survival ratios (SARs) will be calculated as the number of hatchery adult recaptures divided by the number of tagged hatchery smolts released. SARs will be calculated with the return of the 2013 brood fish.

6.8 ESA/HCP Compliance

Broodstock Collection

No broodstock were collected in 2011. The first broodstock were collected in 2013.

Hatchery Rearing and Release

There was no production for the 2011 brood Nason Creek spring Chinook program, because no 2011 broodstock were collected. The first broodstock were collected in 2013.

Hatchery Effluent Monitoring

Per ESA Permits 1196, 1347, 1395, 18118, 18119, and 18121, permit holders shall monitor and report hatchery effluents in compliance with applicable National Pollution Discharge Elimination Systems (NPDES) (EPA 1999) permit limitations. There was one NPDES violation reported at PUD Hatchery facilities during the period 1 January through 31 December 2013. NPDES monitoring and reporting for Grant PUD Hatchery Programs during 2013 are provided in Appendix F.

Smolt and Emigrant Trapping

Per ESA Section 10 Permit No. 1196, the permit holders are authorized a direct take of 20% of the emigrating spring Chinook population during juvenile emigration monitoring and a lethal take not to exceed 2% of the fish captured (NMFS 2003). Based on the estimated wild spring Chinook population (smolt trap expansion) and hatchery juvenile spring Chinook population estimate (hatchery release data) for the Wenatchee River basin, the reported spring Chinook encounters during 2013 emigration monitoring complied with take provisions in the Section 10 permit. Spring Chinook encounter and mortality rates for each trap site (including PIT tag mortalities) are detailed in Table 6.22. Additionally, juvenile fish captured at the trap locations were handled consistent with provisions in ESA Section 10 Permit 1196, Section B.

Table 6.22. Estimated take of Upper Columbia River spring Chinook resulting from juvenile emigration monitoring in the Wenatchee River basin, 2013.

Trap location	Population estimate			Number trapped			Total	Take allowed under Permit
	Wild[a]	Hatchery[b]	Sub-yearling[c]	Wild	Hatchery	Sub-yearling		
Chiwawa Trap								
Population	47,511	346,248	67,982	7,626	30,751	14,831	53,208	
Encounter rate	NA	NA	NA	0.1605	0.0888	0.2182	0.1152	0.20
Mortality[e]	NA	NA	NA	78	7	69	219	
Mortality rate	NA	NA	NA	0.0016	0.0002	0.0047	0.0041	0.02
Upper Wenatchee Trap								
Population	NA[d]	13,963	NA[d]	88	7	165[f]	260	
Encounter rate	NA	NA	NA	NA	0.0005	NA	0.0186	0.20
Mortality[e]	NA	NA	NA	2	0	2	4	
Mortality rate	NA	NA	NA	0.0227	0.0000	0.0121	0.0154	0.02
Lower Wenatchee Trap								
Population	NA	NA	NA	NA	NA	NA	NA	
Encounter rate	NA	NA	NA	NA	NA	NA	NA	0.20
Mortality[e]	NA	NA	NA	NA	NA	NA	NA	
Mortality rate	NA	NA	NA	NA	NA	NA	NA	0.02
Wenatchee River basin Total								
Population	47,511	360,211	67,982	7,714	30,758	14,996	53,468	
Encounter rate	NA	NA	NA	0.1624	0.0854	0.2206	0.1124	0.20
Mortality[e]	NA	NA	NA	80	7	71	158	
Mortality rate	NA	NA	NA	0.0104	0.0002	0.0047	0.0030	0.02

[a] Smolt population estimate derived from juvenile emigration trap data.

[b] 2012 smolt release data for the Wenatchee River basin.

[c] Based on size, date of capture, and location of capture, subyearling Chinook encountered at the Lower Wenatchee Trap are categorized as summer Chinook.

[d] Insufficient numbers of natural-origin spring Chinook were encountered to derive a population estimate.

[e] Combined trapping and PIT tagging mortality.

[f] Subyearling Chinook fry captured prior to July 1 were considered summer Chinook fry, above number represents capture after July 1.

Spawning Surveys

Spring Chinook spawning ground surveys were conducted in the Wenatchee River basin during 2013, as authorized by ESA Section 10 Permits 18118, 18119, and 18121. Because of the difficulty of quantifying the level of take associated with spawning ground surveys, the Permit does not specify a take level associated with these activities, even though it does authorize implementation of spawning ground surveys. Therefore, no take levels are reported. However, to minimize potential effects to established redds, wading was restricted to the extent practical, and extreme caution was used to avoid established redds when wading was required.

Spring Chinook Reproductive Success Study

ESA Section 10 Permit 1196 (expired) and new Section 10 Permits 18118, 18119, and 18121 specifically provide authorization to capture, anesthetize, biologically sample, PIT tag, and release adult spring Chinook at Tumwater Dam for reproductive success studies and general program monitoring. During 2010 through 2013, all spring Chinook passing Tumwater Dam were enumerated, anesthetized, biologically sampled, PIT tagged, and released (not including hatchery-origin and natural-origin Chinook retained for broodstock) as a component of the reproductive success study (BPA Project No. 2003-039-00). Please refer to Ford et al. (2010, 2011, and 2012) for complete details on the methods and results of the spring Chinook reproductive success study for the period 2010-2013.

SECTION 7: WENATCHEE SUMMER CHINOOK

7.1 Broodstock Sampling

This section focuses on results from sampling 2011-2012 Wenatchee summer Chinook broodstock, which were collected at Dryden and Tumwater dams. Complete information is not currently available for the 2013 brood (this information will be provided in the 2014 annual report).

Origin of Broodstock

Consistent with the broodstock collection protocol, both the 2011 and 2012 broodstock consisted primarily of natural-origin (adipose fin present and no CWT) summer Chinook (Table 7.1). Less than 1% of the 2012 broodstock was comprised of hatchery-origin fish (hatchery-origin was determined by examination of scales and/or CWTs).

Table 7.1. Numbers of wild and hatchery summer Chinook collected for broodstock, numbers that died before spawning, and numbers of Chinook spawned in the Wenatchee River basin, 1989-2012. Unknown origin fish (i.e., undetermined by scale analysis, no CWT or fin clips, and no additional hatchery marks) were considered naturally produced. Mortality includes fish that died of natural causes typically near the end of spawning and were not needed for the program and surplus fish killed at spawning.

Brood year	Wild summer Chinook					Hatchery summer Chinook					Total number spawned
	Number collected	Prespawn loss	Mortality	Number spawned	Number released	Number collected	Prespawn loss	Mortality	Number spawned	Number released	
1989	346	29	27	290	0	0	0	0	0	0	290
1990	87	6	24	57	0	0	0	0	0	0	57
1991	128	9	14	105	0	0	0	0	0	0	105
1992	341	48	19	274	0	0	0	0	0	0	274
1993	480	28	46	406	0	44	0	0	44	0	450
1994	363	29	1	333	0	55	1	0	54	0	387
1995	382	15	4	363	0	16	0	0	16	0	378
1996	331	34	34	263	0	3	0	0	3	0	266
1997	225	14	6	205	0	15	1	1	13	0	218
1998	378	40	39	299	0	94	4	12	78	0	377
1999	250	7	1	242	0	238	1	1	236	0	478
2000	298	18	5	275	0	194	7	7	180	0	455
2001	311	41	60	210	0	182	8	38	136	0	346
2002	469	28	32	409	0	13	1	2	10	0	419
2003	488	90	61	337	0	8	1	0	7	0	344
2004	494	24	46	424	0	2	0	0	2	0	426
2005	491	29	19	397	46	3	0	0	3	0	400
2006	483	29	21	433	0	5	1	0	4	0	437
2007	415	53	99	263	0	4	0	1	3	0	266
2008	400	11	11	378	0	72	2	1	69	0	447
2009	482	22	8	452	0	9	1	0	8	0	460
2010	427	14	25	388	0	7	2	0	5	0	393
2011	398	11	11	376	0	7	0	0	7	0	405

Brood year	Wild summer Chinook					Hatchery summer Chinook					Total number spawned
	Number collected	Prespawn loss	Mortality	Number spawned	Number released	Number collected	Prespawn loss	Mortality	Number spawned	Number released	
2012	273	5	1	267	0	1	0	0	1	0	268
Average	***364***	***26***	***26***	***310***	***2***	***41***	***1***	***3***	***37***	***0***	***348***

Age/Length Data

Ages of summer Chinook broodstock were determined from analysis of scales and/or CWTs. Broodstock collected from the 2011 return consisted primarily of age-4 and age-5 natural-origin Chinook (91%). Age-2, 3, and 6 natural-origin fish collectively made up 9% of the broodstock (Table 7.2). Of the hatchery Chinook included in the broodstock, age-3 and age-5 fish comprised 33% and 67%, respectively, of the hatchery-origin broodstock collected.

Broodstock collected from the 2012 return consisted primarily of age-4 and age-5 natural-origin Chinook (96%). Age-3 natural-origin fish made up 3% of the broodstock (Table 7.2). The one hatchery Chinook included in the broodstock was an age-5 fish.

Table 7.2. Percent of hatchery and wild Wenatchee summer Chinook of different ages (total age) collected from broodstock in the Wenatchee River basin, 1991-2012.

Return Year	Origin	Total age				
		2	3	4	5	6
1991	Wild	0.0	4.6	36.8	57.5	1.1
	Hatchery	0.0	0.0	0.0	0.0	0.0
1992	Wild	0.0	2.6	40.4	50.9	6.1
	Hatchery	0.0	0.0	0.0	0.0	0.0
1993	Wild	0.0	1.5	35.7	60.4	2.3
	Hatchery	0.0	0.0	93.2	6.8	0.0
1994	Wild	0.0	1.0	33.7	64.3	1.0
	Hatchery	0.0	0.0	1.9	98.1	0.0
1995	Wild	0.0	3.3	19.2	76.3	1.2
	Hatchery	0.0	0.0	0.0	0.0	100.0
1996	Wild	0.0	4.6	40.1	53.3	2.0
	Hatchery	0.0	0.0	33.3	66.7	0.0
1997	Wild	0.0	2.3	42.6	53.2	1.9
	Hatchery	0.0	26.7	66.7	6.7	0.0
1998	Wild	0.0	5.5	34.7	58.6	1.2
	Hatchery	0.0	5.3	68.1	20.2	6.4
1999	Wild	0.5	1.9	39.0	56.3	2.3
	Hatchery	0.0	1.3	23.2	72.2	3.4
2000	Wild	2.6	6.3	24.6	66.5	0.0
	Hatchery	0.0	24.2	14.9	42.8	18.0
2001	Wild	0.3	16.6	53.6	27.7	1.7
	Hatchery	0.0	6.1	80.5	10.4	3.0

Return Year	Origin	Total age				
		2	3	4	5	6
2002	Wild	0.7	8.4	61.6	28.5	0.7
	Hatchery	0.0	0.0	41.7	58.3	0.0
2003	Wild	0.9	2.8	31.4	64.8	0.0
	Hatchery	0.0	12.5	25.0	62.5	0.0
2004	Wild	0.2	3.6	10.1	83.9	2.1
	Hatchery	0.0	0.0	50.0	50.0	0.0
2005	Wild	0.0	4.3	53.5	35.1	7.1
	Hatchery	0.0	0.0	0.0	100.0	0.0
2006	Wild	0.9	0.9	14.9	82.1	1.1
	Hatchery	0.0	0.0	0.0	80.0	20.0
2007	Wild	3.1	15.0	18.7	46.6	16.6
	Hatchery	0.0	0.0	0.0	100.0	0.0
2008	Wild	0.5	6.4	65.5	26.0	1.6
	Hatchery	0.0	2.9	13.0	69.6	14.5
2009	Wild	1.1	6.9	45.8	46.8	0.0
	Hatchery	0.0	0.0	11.1	88.9	0.0
2010	Wild	1.0	6.3	66.1	26.6	0.0
	Hatchery	0.0	0.0	62.5	37.5	0.0
2011	Wild	0.8	8.2	50.3	40.4	0.3
	Hatchery	0.0	42.9	14.3	42.9	0.0
2012	Wild	0.0	3.5	47.2	49.2	0.0
	Hatchery	0.0	0.0	0.0	100.0	0.0
Average	***Wild***	***0.6***	***5.3***	***39.3***	***52.5***	***2.3***
	Hatchery	***0.0***	***5.5***	***27.2***	***50.6***	***7.5***

Mean lengths of natural-origin summer Chinook of a given age differed little between return years 2011 and 2012 (Table 7.3). Mean lengths of age-3 Chinook differed between years by about 5 cm. The one hatchery fish that was included in broodstock was about 13 cm smaller than its natural counterparts in the 2012 brood (Table 7.3).

Table 7.3. Mean fork length (cm) at age (total age) of hatchery and wild Wenatchee summer Chinook collected from broodstock in the Wenatchee River basin, 1991-2012; N = sample size and SD = 1 standard deviation.

Return year	Origin	Summer Chinook fork length (cm)														
		Age-2			Age-3			Age-4			Age-5			Age-6		
		Mean	N	SD	Mean	N	SD	Mean	N	SD	Mean	N	SD	Mean	N	SD
1991	Wild	-	0	-	-	4	-	-	32	-	-	50	-	-	1	-
	Hatchery	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-
1992	Wild	-	0	-	66	3	10	69	46	5	81	58	3	87	7	1
	Hatchery	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-

Return year	Origin	Summer Chinook fork length (cm)														
		Age-2			Age-3			Age-4			Age-5			Age-6		
		Mean	N	SD	Mean	N	SD	Mean	N	SD	Mean	N	SD	Mean	N	SD
1993	Wild	-	0	-	68	6	10	84	138	9	98	235	6	100	9	6
	Hatchery	-	0	-	-	0	-	79	41	8	101	3	8	-	0	-
1994	Wild	-	0	-	74	3	5	86	101	8	96	193	7	106	3	7
	Hatchery	-	0	-	-	0	-	75	1	-	90	53	8	-	0	-
1995	Wild	-	0	-	66	11	8	85	64	7	97	255	6	106	4	7
	Hatchery	-	0	-	-	0	-	-	0	-	-	0	-	91	16	8
1996	Wild	-	0	-	69	14	5	86	121	6	97	161	6	104	6	5
	Hatchery	-	0	-	-	0	-	63	1	-	96	2	4	-	0	-
1997	Wild	-	0	-	54	5	10	85	92	7	98	115	6	97	4	9
	Hatchery	-	0	-	46	4	2	74	10	4	98	1	-	-	0	-
1998	Wild	-	0	-	66	19	9	85	119	7	99	201	7	106	4	7
	Hatchery	-	0	-	53	5	2	77	64	8	95	19	8	98	6	8
1999	Wild	42	1	-	65	4	6	86	83	6	97	120	7	103	5	8
	Hatchery	-	0	-	52	3	6	79	55	7	90	171	6	100	8	6
2000	Wild	43	7	3	60	17	7	84	67	5	98	181	6	-	0	-
	Hatchery	-	0	-	53	47	7	76	29	8	93	83	7	102	35	9
2001	Wild	48	1	-	66	48	7	88	155	7	97	80	6	102	5	3
	Hatchery	-	0	-	51	10	3	75	132	8	91	17	8	100	5	8
2002	Wild	51	3	3	64	37	8	89	270	7	100	125	7	99	7	5
	Hatchery	-	0	-	-	0	-	78	5	8	95	7	5	-	0	-
2003	Wild	41	4	2	58	13	4	87	144	8	100	297	7	-	0	-
	Hatchery	-	0	-	40	1	-	78	2	4	101	5	8	-	0	-
2004	Wild	51	1	-	69	17	5	84	47	8	99	392	6	109	10	7
	Hatchery	-	0	-	-	0	-	84	1	-	108	1	-	-	0	-
2005	Wild	-	0	-	68	20	7	86	247	8	95	162	6	101	33	6
	Hatchery	-	0	-	-	0	-	-	0	-	90	3	9	-	0	-
2006	Wild	44	4	7	63	4	11	88	66	7	99	363	6	96	5	7
	Hatchery	-	0	-	-	0	-	-	0	-	99	4	7	100	1	-
2007	Wild	44	12	5	65	58	7	89	72	8	99	180	7	102	64	6
	Hatchery	-	0	-	-	0	-	-	0	-	90	4	5	-	0	-
2008	Wild	46	2	3	69	24	7	90	247	6	98	98	7	105	6	9
	Hatchery	-	0	-	63	2	14	81	9	7	93	48	6	99	10	5
2009	Wild	46	5	5	68	31	8	89	207	8	101	209	6	-	0	-
	Hatchery	-	0	-	61	4	7	81	1	-	98	8	14	-	0	-
2010	Wild	45	4	4	70	26	9	89	273	7	99	110	6	-	0	-
	Hatchery	-	0	-	-	0	-	72	5	8	88	3	7	-	0	-
2011	Wild	49	3	3	66	30	7	88	183	7	98	147	7	114	1	-
	Hatchery	-	0	-	55	3	2	90	1	-	81	3	5	-	0	-
2012	Wild	-	0	-	71	9	4	87	120	7	96	125	7	-	0	-
	Hatchery	-	0	-	-	0	-	-	0	-	83	1	-	-	0	-

Return year	Origin	Summer Chinook fork length (cm)														
		Age-2			Age-3			Age-4			Age-5			Age-6		
		Mean	N	SD	Mean	N	SD	Mean	N	SD	Mean	N	SD	Mean	N	SD
Average	*Wild*	*46*	*3*	*4*	*66*	*18*	*7*	*86*	*132*	*7*	*97*	*175*	*6*	*102*	*9*	*6*
	Hatchery	*-*	*0*	*-*	*53*	*5*	*5*	*77*	*18*	*7*	*94*	*21*	*7*	*99*	*6*	*7*

Sex Ratios

Male summer Chinook in the 2011 broodstock made up about 50% of the adults collected, resulting in an overall male to female ratio of 0.99:1.00 (Table 7.4.). In 2012, males made up about 50% of the adults collected, resulting in an overall male to female ratio of 1.02:1.00 (Table 7.4). The ratios in 2012 were nearly equal to the 1:1 ratio goal in the broodstock protocol.

Table 7.4. Numbers of male and female wild and hatchery summer Chinook collected for broodstock in the Wenatchee River basin, 1989-2012. Ratios of males to females are also provided.

Return year	Number of wild summer Chinook			Number of hatchery summer Chinook			Total M/F ratio
	Males (M)	Females (F)	M/F	Males (M)	Females (F)	M/F	
1989	166	180	0.92:1.00	0	0	-	0.92:1.00
1990	45	39	1.15:1.00	0	0	-	1.15:1.00
1991	60	68	0.88:1.00	0	0	-	0.88:1.00
1992	154	187	0.82:1.00	0	0	-	0.82:1.00
1993	208	228	0.91:1.00	35	9	3.89:1.00	1.03:1.00
1994	158	179	0.88:1.00	24	31	0.77:1.00	0.87:1.00
1995	169	213	0.79:1.00	1	15	0.07:1.00	0.75:1.00
1996	150	181	0.83:1.00	2	1	2.00:1.00	0.84:1.00
1997	104	121	0.86:1.00	15	0	-	0.98:1.00
1998	211	167	1.26:1.00	64	30	2.13:1.00	1.40:1.00
1999	130	120	1.08:1.00	108	130	0.83:1.00	0.95:1.00
2000	153	145	1.06:1.00	112	82	1.37:1.00	1.17:1.00
2001	187	124	1.51:1.00	132	50	2.64:1.00	1.83:1.00
2002	266	203	1.31:1.00	5	8	0.63:1.00	1.28:1.00
2003	270	218	1.24:1.00	5	3	1.67:1.00	1.24:1.00
2004	230	264	0.87:1.00	1	1	1.00:1.00	0.87:1.00
2005	291	200	1.46:1.00	2	1	2.00:1.00	1.46:1.00
2006	237	246	0.96:1.00	1	4	0.25:1.00	0.95:1.00
2007	239	176	1.36:1.00	2	2	1.00:1.00	1.35:1.00
2008	208	192	1.08:1.00	29	43	0.67:1.00	1.01:1.00
2009	223	236	0.94:1.00	25	7	3.57:1.00	1.02:1.00
2010	217	198	1.10:1.00	5	2	2.50:1.00	1.12:1.00
2011	198	200	0.99:1.00	4	3	1.33:1.00	0.99:1.00
2012	138	135	1.02:1.00	1	0	-	1.03:1.00
Total	***4,412***	***4,220***	***1.05:1.00***	***573***	***422***	***1.36:1.00***	***1.07:1.00***

Fecundity

Fecundities for the 2011 and 2012 returns of summer Chinook averaged 4,913 and 4,801 eggs per female, respectively (Table 7.5). These values are close to the overall average of 5,149 eggs per female. Mean observed fecundities for the 2011 and 2012 returns were near the expected fecundity of 5,000 eggs per female assumed in the broodstock protocol.

Table 7.5. Mean fecundity of wild, hatchery, and all female summer Chinook collected for broodstock in the Wenatchee River basin, 1989-2012; NA = not available.

Return year	Mean fecundity		
	Wild	Hatchery	Total
1989*	NA	NA	5,280
1990*	NA	NA	5,436
1991*	NA	NA	4,333
1992*	NA	NA	5,307
1993*	NA	NA	5,177
1994*	NA	NA	5,899
1995*	NA	NA	4,402
1996*	NA	NA	4,941
1997	5,385	5,272	5,390
1998	5,393	4,825	5,297
1999	5,036	4,942	4,987
2000	5,464	5,403	5,441
2001	5,280	4,647	5,097
2002	5,502	5,027	5,484
2003	5,357	5,696	5,361
2004	5,372	6,681	5,377
2005	5,045	6,391	5,053
2006	5,126	5,633	5,133
2007	5,124	4,510	5,115
2008	5,147	4,919	5,108
2009	5,308	4,765	5,291
2010	4,971	3,323	4,963
2011	4,943	2,983	4,913
2012	4,801	NA	4,801
Average	***5,203***	***5,001***	***5,149***

* Individual fecundities were not tracked with females until 1997.

7.2 Hatchery Rearing

Rearing History

Number of eggs taken

Based on the unfertilized egg-to-release survival standard of 81%, a total of 1,066,667 eggs were required to meet the program release goal of 864,000 smolts for brood years 1989-2011. An evaluation of the program in 2012 determined that 617,285 eggs are needed to meet the revised release goal of 500,001 smolts. This revised goal will begin with brood year 2012. From 1989 to 2011, the egg take goal was reached in seven of those years (Table 7.6). The egg take in 2012 exceeded the revised goal of 617,285 eggs.

Table 7.6. Numbers of eggs taken from Wenatchee summer Chinook broodstock, 1989-2012.

Return year	Number of eggs taken
1989	829,012
1990	163,109
1991	247,000
1992	827,911
1993	1,133,852
1994	999,364
1995	949,531
1996	756,000
1997	554,617
1998	854,997
1999	1,182,130
2000	1,113,159
2001	733,882
2002	1,049,255
2003	901,095
2004	1,311,051
2005	883,669
2006	1,190,757
2007	655,201
2008	1,145,330
2009	1,217,028
2010	947,875
2011	959,202
2012	633,677
Average (1989-2011)	***895,871***
Average (2012-present)	***633,677***

Number of acclimation days

The 2011 brood Wenatchee summer Chinook were transferred to Dryden Pond between 25 and 29 March 2013. These fish received 26-30 days of acclimation on Wenatchee River water before being released on 24 April 2013 (Table 7.7).

Table 7.7. Number of days Wenatchee summer Chinook were acclimated at Dryden Pond, brood years 1989-2011. Numbers in parenthesis represents the number of days fish reared at Chiwawa Ponds.

Brood year	Release year	Transfer date	Release date	Number of days
1989	1991	2-Mar	7-May	66
1990	1992	19-Feb	2-May	73
1991	1993	10-Mar	8-May	59
1992	1994	1-Mar	6-May	66
1993	1995	3-Mar	1-May	59
1994	1996	2-Oct	6-May	217 (154)
		5-Mar	6-May	62
1995	1997	16-Oct	8-May	205 (139)
		27-Feb	8-May	70
1996	1998	6-Oct	28-Apr	204 (142)
		25-Feb	28-Apr	62
1997	1999	23-Feb	27-Apr	63
1998	2000	5-Mar	1-May	57
1999	2001	8-Mar	23-Apr	46
2000	2002	1-Mar	6-May	66
2001	2003	19-Feb	23-Apr	63
2002	2004	5-Mar	23-Apr	49
2003	2005	15-Mar	25-Apr	41
2004	2006	25-Mar	27-Apr	33
2005	2007	15-Mar	30-Apr	46
2006	2008	11-14-Mar	28-Apr	45-48
2007	2009	30-31-Mar	29-Apr	29-30
2008	2010	9-12, 15, 22-Mar	28-Apr	38-51
2009	2011	15-18, 21-Mar, 22-Apr	26-Apr	5-43
2010	2012	26-30-Mar	25-Apr	26-30
2011	2013	25-29-Mar	24-Apr	26-30

Release Information

Numbers released

The 2011 Wenatchee summer Chinook program achieved 96% of the 864,000 target goal with about 827,709 fish being released (Table 7.8).

Table 7.8. Numbers of Wenatchee summer Chinook smolts released from the hatchery, 1989-2011. The release target for Wenatchee summer Chinook is 864,000 smolts.

Brood year	Release year	CWT mark rate	Number released with PIT tags	Number of smolts released
1989	1991	0.2013	0	720,000
1990	1992	0.9597	0	124,440
1991	1993	0.9957	0	191,179
1992	1994	0.9645	0	627,331
1993	1995	0.9881	0	900,429
1994	1996	0.9697	0	797,350
1995	1997	0.9725	0	687,439
1996	1998	0.9758	0	600,127
1997	1999	0.9913	0	438,223
1998	2000	0.9869	0	649,612
1999	2001	0.9728	0	1,005,554
2000	2002	0.9723	0	929,496
2001	2003	0.9868	0	604,668
2002	2004	0.9644	0	835,645
2003	2005	0.9778	0	653,764
2004	2006	0.9698	0	892,926
2005	2007	0.9596	0	644,182
2006	2008	0.9676	0	51,550[a]
		0.9676	0	899,107
2007	2009	0.9768	0	456,805
2008	2010	0.9664	10,035	888,811
2009	2011	0.9767	29,930	843,866
2010	2012	0.9964	0	792,746
2011	2013	0.9904	5,020	827,709
Average		***0.9438***	***1,874***	***696,148***

[a] Represents high Elisa group planted directly in the Wenatchee River at Leavenworth Boat Launch.

Numbers tagged

The 2011 brood Wenatchee summer Chinook were 99.0% CWT and adipose fin-clipped (Table 7.8).

In 2013, a total of 10,303 Wenatchee summer Chinook (brood year 2012) were tagged at Eastbank Hatchery on 24-27 September 2013. These fish were tagged in raceways #1 and #2.

Those tagged in raceway #1 were designated as the "small-fish" group, while those tagged in raceway #2 were designated as the "big-fish" group. This is part of the NOAA, CPUD, and GPUD size-target study. Fish were not fed during tagging or for two days before and after tagging. Fish in the small-fish group averaged 74 mm in length and 4.2 g at time of tagging, while those in the big-fish group averaged 73 mm in length and 4.5 g. A total of 9,788 PIT-tagged summer Chinook were released from the Dryden facilities on 30 April 2014 (5,048 from the small-fish group and 4,740 from the big-fish group). A total of 469 fish died (90 in the small-fish group and 379 in the big-fish group) and 46 other fish shed their tags (12 in the small-fish group and 34 in the big-fish group) during the period between tagging and release.

An additional 10,301 Wenatchee summer Chinook were tagged at Eastbank Hatchery on 30 September to 3 October 2013. These fish were tagged in water reuse circular ponds #1 and #2. Those tagged in circular pond #1 were designated as the "small-fish" group, while those tagged in circular pond #2 were designated as the "big fish" group. Fish were not fed during tagging or for two days before and after tagging. Fish in the small-fish group averaged 76 mm in length and 4.9 g at time of tagging, while those in the big-fish group averaged 75 mm in length and 4.9 g. A total of 10,123 PIT-tagged summer Chinook were released from the Dryden facilities on 30 April 2014 (5,041 from the small-fish group and 5,082 from the big-fish group). A total of 178 fish died (109 in the small-fish group and 69 in the big-fish group) and no fish shed their tags during the period between tagging and release.

Table 7.9 summarizes the number of hatchery summer Chinook that have been PIT-tagged and released into the Wenatchee River.

Table 7.9. Summary of PIT-tagging activities for Wenatchee hatchery summer Chinook, brood years 2008-2012.

Brood year	Release year	Number of fish tagged	Number of tagged fish that died	Number of tags shed	Number of tagged fish released
2008	2010	10,100	64	1	10,035
2009	2011	10,108 (Control)	140	3	9,965
		10,100 (R1)	129	0	9,971
		10,099 (R2)	105	0	9,994
2010	2012	0	0	0	0
2011	2013	5,100	80	0	5,020
2012	2014 (Raceway)	5,150 (Small fish)	90	12	5,048
		5,153 (Big fish)	379	34	4,740
2012	2014 (Reuse Circular)	5,150 (Small fish)	109	0	5,041
		5,151 (Big fish)	69	0	5,082

Fish size and condition at release

About 827,709 summer Chinook from the 2011 brood were released from Dryden Pond using an unmonitored forced method on 24 April 2013. Size at release was 84.7% and 91.2% of the target fork length and weight goals, respectively. This brood year exceeded the target CV for length

(Table 7.10). Since the program began, Wenatchee summer Chinook have not met the target length and CV values. The target weight (fish/pound or FPP) of juvenile fish has been met occasionally.

Table 7.10. Mean lengths (FL, mm), weight (g and fish/pound), and coefficient of variation (CV) of Wenatchee summer Chinook smolts released from the hatchery, brood years 1989-2011; NA = not available. Size targets are provided in the last row of the table.

Brood year	Release year	Fork length (cm)		Mean weight	
		Mean	CV	Grams (g)	Fish/pound
1989	1991	158	13.7	45.4	10
1990	1992	155	14.2	45.4	10
1991	1993	156	15.5	42.3	11
1992	1994	152	13.1	40.1	10
1993	1995	149	NA	34.9	13
1994	1996	138	NA	21.7	21
1995	1997	149	12.2	42.5	11
1996	1998	151	16.6	43.2	10
1997	1999	154	10.1	42.8	11
1998	2000	166	9.7	53.1	9
1999	2001	137	16.1	29.0	16
2000	2002	148	14.6	37.1	12
2001	2003	148	NA	38.9	12
2002	2004	146	15.1	37.3	14
2003	2005	147	13.2	36.5	12
2004	2006	147	10.7	35.4	13
2005	2007	153	16.3	40.6	11
2006	2008	136	21.5	29.2	16
2007	2009	163	21.6	49.7	9
2008	2010	166	15.0	52.0	9
2009	2011	152	15.9	39.0	12
2010	2012	154	17.2	43.1	11
2011	2013	149	13.8	41.4	11
Average		***151***	***14.8***	***40.0***	***12***
Targets		***176***	***9.0***	***45.4***	***10***

Survival Estimates

Overall survival of the 2011 brood Wenatchee summer Chinook from green (unfertilized) egg to release was higher than the standard set for the program. This was in part because of a high ponding to release survival (Table 7.11).

Table 7.11. Hatchery life-stage survival rates (%) for Wenatchee summer Chinook, brood years 1989-2011. Survival standards or targets are provided in the last row of the table.

Brood year	Collection to spawning		Unfertilized egg-eyed	Eyed egg-ponding	30 d after ponding	100 d after ponding	Ponding to release	Transport to release	Unfertilized egg-release
	Female	Male							
1989	90.0	93.4	90.9	97.0	99.7	99.3	98.5	99.4	86.9
1990	89.7	95.6	80.9	96.6	99.6	99.2	97.7	98.8	76.3
1991	88.2	98.3	86.9	96.1	99.3	98.5	94.9	98.1	77.4
1992	84.3	92.2	79.8	97.8	99.9	99.9	97.1	98.1	75.8
1993	92.4	95.9	84.2	97.5	99.6	99.3	96.7	98.8	79.4
1994	90.7	95.3	83.7	100	99.2	97.0	95.3	98.4	79.8
1995	94.7	98.2	86.0	100	96.7	96.4	74.9	90.8	72.4
1996	84.6	96.1	84.1	100	97.9	97.7	94.4	97.7	79.4
1997	89.3	98.3	82.6	97.3	97.1	96.9	98.3	98.2	79.0
1998	85.3	94.6	80.9	98.3	99.4	98.6	95.6	99.8	76.0
1999	98.4	98.3	90.4	97.9	98.1	97.9	96.2	99.4	85.1
2000	93.0	96.6	88.3	98.0	99.6	99.3	96.5	98.9	83.5
2001	87.4	91.5	90.6	97.7	99.8	99.6	93.1	93.3	82.4
2002	93.8	94.1	85.1	99.8	98.1	97.6	93.7	96.5	79.6
2003	77.4	85.1	80.5	98.1	99.6	99.1	91.9	93.5	72.6
2004	92.8	97.8	85.7	87.8	99.9	99.6	86.6	92.1	65.1
2005	97.3	89.6	83.5	98.0	99.7	99.4	89.1	99.5	72.9
2006	92.4	95.2	85.6	98.4	99.3	98.4	94.8	97.2	79.8
2007	73.6	97.5	73.7	97.9	99.5	98.7	96.6	99.1	69.7
2008	96.6	97.9	90.4	97.3	99.4	98.7	88.2	89.6	77.6
2009	95.1	95.6	92.0	99.6	97.3	97.3	84.8	98.2	78.1
2010	94.7	97.8	96.1	99.3	97.6	97.1	87.2	90.3	83.2
2011	98.0	96.4	92.3	97.9	99.5	98.9	95.9	97.3	86.7
Average	***90.4***	***95.3***	***85.8***	***97.8***	***98.9***	***98.5***	***93.0***	***96.7***	***78.2***
Standard	***90.0***	***85.0***	***92.0***	***98.0***	***97.0***	***93.0***	***90.0***	***95.0***	***81.0***

7.3 Disease Monitoring

Rearing of the 2011 brood Wenatchee summer Chinook was similar to previous years with fish being held on well water before being transferred to Dryden Pond for final acclimation in March 2013. Fish were transferred to Dryden pond from 25-29 March. Increased mortality caused by external fungus began to occur during the acclimation period at Dryden pond at which time a formalin treatment was initiated in an attempt to prevent the fungus from proliferating.

Results of the 2013 adult broodstock bacterial kidney disease (BKD) monitoring indicated that most females (99.1%) had ELISA values less than 0.199. The one female that had an ELISA value greater than 0.120 was not included in the program and the eggs were culled. All remaining females had ELISA values less than 0.120, which means that none of the progeny needed to be reared at densities less than 0.06 fish per pound (Table 7.12).

Table 7.12. Proportion of bacterial kidney disease (BKD) titer groups for the Wenatchee summer Chinook broodstock, brood years 1997-2013. Also included are the proportions to be reared at either 0.125 fish per pound or 0.060 fish per pound.

Brood year[a]	Optical density values by titer group				Proportion at rearing densities (fish per pound, fpp)	
	Very Low (≤ 0.099)	Low (0.1-0.199)	Moderate (0.2-0.449)	High (≥ 0.450)	≤ 0.125 fpp (<0.119)	≤ 0.060 fpp (>0.120)
1997	0.7714	0.0857	0.0381	0.1048	0.8095	0.1905
1998	0.3067	0.2393	0.1656	0.2883	0.4479	0.5521
1999	0.9590	0.0123	0.0123	0.0164	0.9713	0.0287
2000	0.6268	0.1053	0.1627	0.1053	0.7321	0.2679
2001	0.6513	0.0263	0.0987	0.2237	0.6776	0.3224
2002	0.7868	0.0457	0.0711	0.0964	0.8325	0.1675
2003	0.9825	0.0000	0.0058	0.0117	0.9825	0.0175
2004	0.9593	0.0081	0.0163	0.0163	0.9675	0.0325
2005	0.9833	0.0056	0.0000	0.0111	0.9833	0.0167
2006	0.9134	0.0563	0.0000	0.0303	0.9351	0.0649
2007	0.9535	0.0078	0.0078	0.0310	0.9535	0.0465
2008	0.9868	0.0088	0.0044	0.0000	0.9868	0.0132
2009	0.9957	0.0000	0.0000	0.0043	0.9957	0.0043
2010	0.9897	0.0025	0.0000	0.0025	0.9949	0.0051
2011	0.9585	0.0363	0.0000	0.0052	0.9896	0.0104
2012	0.9697	0.0303	0.0000	0.0000	1.0000	0.0000
2013	0.8120	0.1790	0.0000	0.0090	0.8890	0.1110
Average	***0.8592***	***0.0500***	***0.0343***	***0.0563***	***0.8911***	***0.1089***

[a] Individual ELISA samples were not collected before the 1997 brood.

7.4 Natural Juvenile Productivity

During 2013, juvenile summer Chinook were sampled at the Lower Wenatchee Trap located near the Town of Cashmere. Because the lower Wenatchee Trap operated in a new location in 2013, the historic flow-discharge relationships are invalid and new models to estimate trap efficiency must be developed for all species. Until the new models are developed (2-3 years) all estimates of juvenile abundance should be considered preliminary.

Emigrant Estimates

Lower Wenatchee Trap

The Lower Wenatchee Trap operated between 13 February and 31 October 2013. During that time period the trap was inoperable for 22 days because of high river flows, debris, snow/ice, mechanical failure, or major hatchery releases. During the nine-month sampling period, a total of 52,652 wild subyearling Chinook were captured at the Lower Wenatchee Trap. Based on six capture efficiencies estimated from the flow model, the total number of wild subyearling Chinook that emigrated past the Lower Wenatchee Trap was 6,286,648 (±794,773). Because 175 summer Chinook redds were observed downstream from the trap in 2012, the total number of summer Chinook emigrating from the Wenatchee River in 2013 was expanded using the ratio of the number of redds downstream from the trap to the number upstream from the trap. This resulted in a total summer Chinook emigrant estimate of 6,759,024 fish. Most of these fish emigrated during May (Figure 7.1). Monthly captures and mortalities of all fish collected at the Lower Wenatchee Trap are reported in Appendix B.

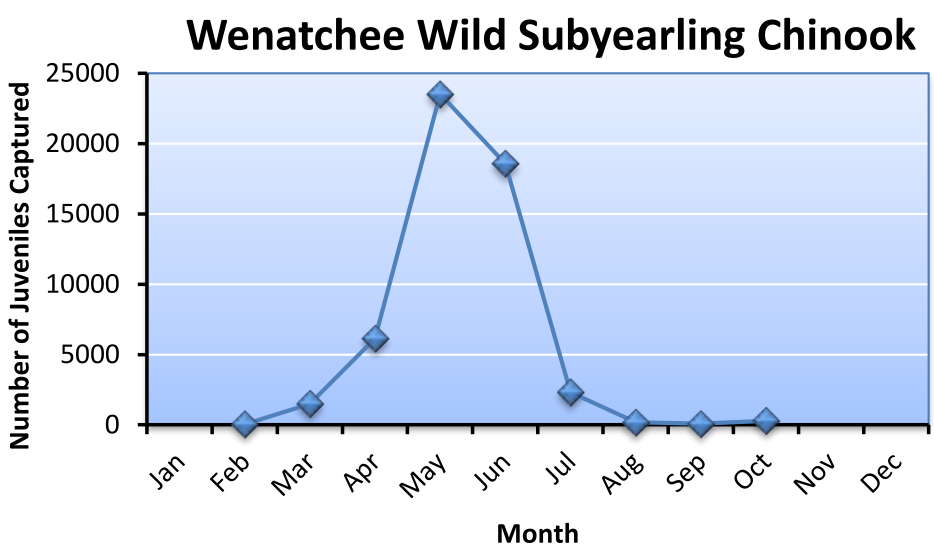


Figure 7.1. Numbers of wild subyearling Chinook captured at the Lower Wenatchee Trap during February through October, 2013.

7.5 Spawning Surveys

Surveys for Wenatchee summer Chinook redds were conducted from late 16 September to 1 November 2013 in the Wenatchee River and Icicle Creek. Both peak counts and total counts (based on expansion factors; Murdoch and Peven 2005) were conducted in the river (see Appendix H for more details).

Redd Counts

A peak count of 2,917 summer Chinook redds was estimated in 2013 based on ground surveys conducted in the Wenatchee River and Icicle Creek (Table 7.13). A total count of 3,241 redds was estimated in 2013 based on expanded peak counts in the Wenatchee River basin (Table 7.13).

Table 7.13. Peak and total numbers of redds counted in the Wenatchee River basin, 1989-2013; NA = not available. Total counts are based on expanded peak counts (see Appendix H for more information).

Survey year	Peak redd count	Total count (peak expansion)
1989	3,331	4,215
1990	2,479	3,103
1991	2,180	2,748
1992	2,328	2,913
1993	2,334	2,953
1994	2,426	3,077
1995	1,872	2,350
1996	1,435	1,814
1997	1,388	1,739
1998	1,660	2,230
1999	2,188	2,738
2000	2,022	2,540
2001	2,857	3,550
2002	5,419	6,836
2003	4,281	5,268
2004	4,003	4,874
2005	2,895	3,538
2006*	7,233	8,896
2007*	1,870	1,970
2008*	2,361	2,800
2009*	2,688	3,441
2010*	2,564	3,261
2011*	2,592	3,078
2012*	2,303	2,504
2013*	2,917	3,241
Average	***2,785***	***3,427***

* Peak and total counts include 68, 13, 23, 21, 11, 9, 2, and 42 redds counted in Icicle Creek in 2006-2013, respectively.

Redd Distribution

Summer Chinook redds were not evenly distributed among reaches within the Wenatchee River basin in 2013 (Table 7.14; Figure 7.2). Most of the spawning occurred upstream from the Leavenworth Bridge in Reaches 6, 9, and 10. The highest density of redds occurred in Reach 6 near the confluence of the Icicle River.

Table 7.14. Peak and total numbers of summer Chinook redds counted in different reaches in the Wenatchee River basin during September through mid-November, 2013. Reach codes are described in Table 2.10.

Survey reach	Peak redd count	Total count (peak expansion)
Wenatchee 1 (W1)	11	11
Wenatchee 2 (W2)	161	161
Wenatchee 3 (W3)	253	311
Wenatchee 4 (W4)	28	36
Wenatchee 5 (W5)	102	102
Wenatchee 6 (W6)	1,027	1,090
Wenatchee 7 (W7)	135	164
Wenatchee 8 (W8)	189	223
Wenatchee 9 (W9)	550	578
Wenatchee 10 (W10)	461	523
Icicle Creek (I1)	42	42
Totals	***2,959***	***3,241***

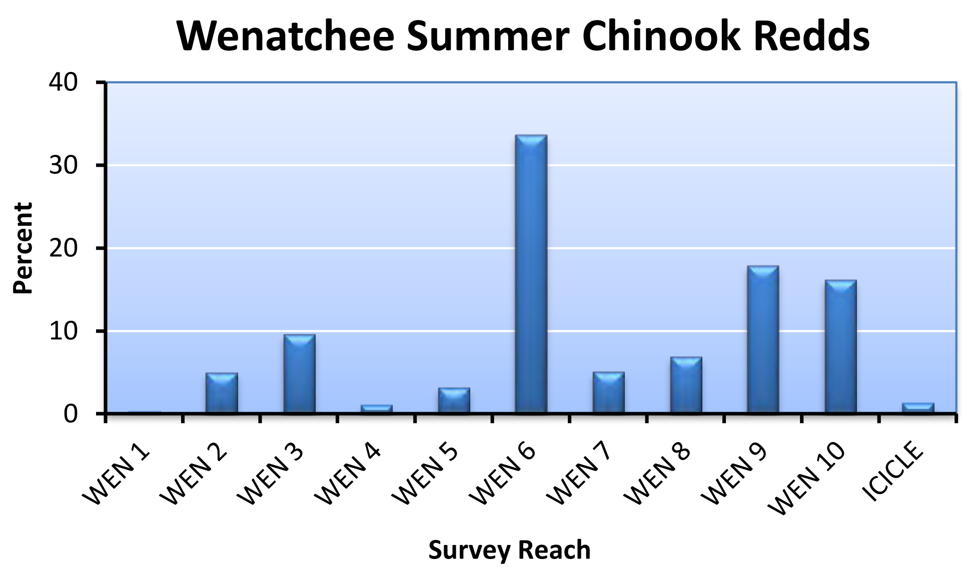


Figure 7.2. Percent of the total number (based on peak expansion) of summer Chinook redds counted in different reaches in the Wenatchee River basin during September through early-November, 2013. Reach codes are described in Table 2.10.

Spawn Timing

In 2013, spawning in the Wenatchee River began during the last week of September, peaked the third week of October, and ended in the first week in November (Figure 7.3).

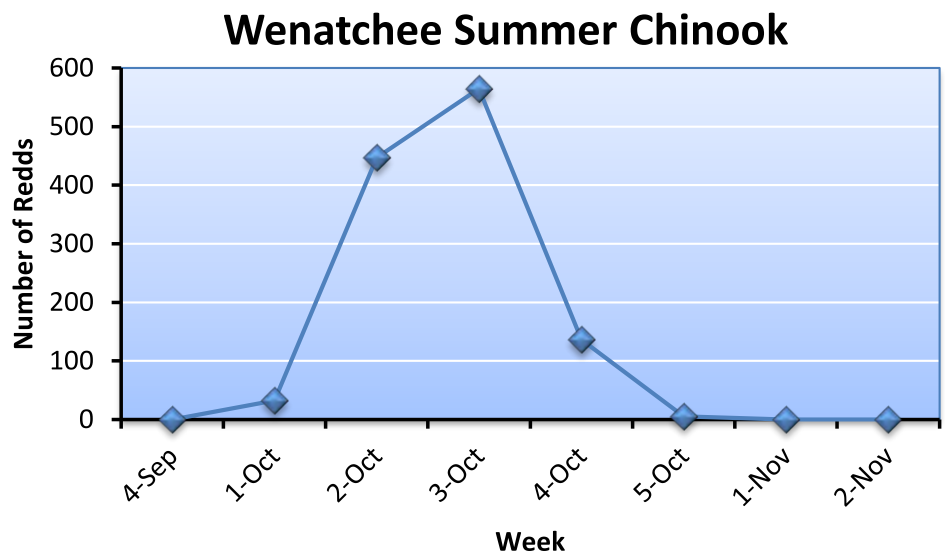


Figure 7.3. Number of new summer Chinook redds counted during different weeks in the Wenatchee River, September through mid-November 2013 (based on mapping counts).

Spawning Escapement

Spawning escapement for Wenatchee summer Chinook was calculated as the total number of redds (expanded peak counts) times the fish per redd ratio estimated from broodstock and fish sampled at adult trapping sites. The estimated fish per redd ratio for summer Chinook in 2013 was 3.15. Multiplying this ratio by the number of redds counted in the Wenatchee River basin resulted in a total spawning escapement of 10,209 summer Chinook (Table 7.15).

Table 7.15. Spawning escapements for summer Chinook in the Wenatchee River basin, return years 1989-2013. Number of redds is based on expanded peak redd counts.

Return year	Fish/Redd	Redds	Total spawning escapement
1989	3.40	4,215	14,331
1990	3.50	3,103	10,861
1991	3.70	2,748	10,168
1992	4.00	2,913	11,652
1993	3.20	2,953	9,450
1994	3.30	3,077	10,154
1995	3.30	2,350	7,755
1996	3.40	1,814	6,168
1997	3.40	1,739	5,913
1998	2.40	2,230	5,352
1999	2.00	2,738	5,476
2000	2.17	2,540	5,512
2001	3.20	3,550	11,360
2002	2.30	6,836	15,723
2003	2.24	5,268	11,800

Return year	Fish/Redd	Redds	Total spawning escapement
2004	2.15	4,874	10,479
2005	2.46	3,538	8,703
2006	2.00	8,896	17,792
2007	2.33	1,970	4,590
2008	2.32	2,800	6,496
2009	2.42	3,441	8,327
2010	2.29	3,261	7,468
2011	3.20	3,078	9,850
2012	3.41	2,504	8,539
2013	3.15	3,241	10,209
Average	***2.85***	***3,427***	***9,766***

7.6 Carcass Surveys

Surveys for Wenatchee summer Chinook carcasses were conducted during late September to early November 2013 in the Wenatchee River and Icicle Creek.

Number sampled

A total of 1,847 summer Chinook carcasses were sampled during October through early November in the Wenatchee River basin in 2013 (Table 7.16).

Table 7.16. Numbers of summer Chinook carcasses sampled within each survey reach in the Wenatchee River basin, 1993-2013. Reach codes are described in Table 2.10.

Survey year	Number of summer Chinook carcasses											
	W-1	W-2	W-3	W-4	W-5	W-6	W-7	W-8	W-9	W-10	Icicle	Total
1993	68	151	696	13	82	150	215	41	0	0	0	**1,416**
1994	0	6	25	1	21	50	20	49	131	1	0	**304**
1995	0	10	14	0	0	117	50	37	20	0	0	**248**
1996	0	5	84	42	10	206	27	37	43	0	0	**454**
1997	1	47	127	5	29	312	8	80	70	13	0	**692**
1998	6	81	159	4	1	270	32	395	354	65	0	**1,367**
1999	0	169	112	16	35	932	68	146	185	79	0	**1,742**
2000	8	118	178	9	85	693	82	121	172	208	0	**1,674**
2001	0	49	138	31	0	338	36	124	101	94	0	**911**
2002	0	249	189	0	205	848	0	341	564	166	6	**2,568**
2003	6	369	195	72	149	768	66	266	537	58	40	**2,526**
2004	8	157	193	177	173	1,086	103	346	493	409	16	**3,161**
2005	8	85	106	39	46	709	70	140	353	258	7	**1,821**
2006	22	140	160	64	112	953	435	343	703	658	18	**3,608**
2007	3	15	49	10	26	475	38	38	96	91	8	**849**
2008	10	34	63	38	36	676	47	42	106	144	8	**1,204**

Survey year	Number of summer Chinook carcasses											
	W-1	W-2	W-3	W-4	W-5	W-6	W-7	W-8	W-9	W-10	Icicle	Total
2009	11	29	43	32	27	389	16	58	240	175	6	**1,026**
2010	3	31	98	57	122	681	135	49	124	194	15	**1,509**
2011	5	88	126	19	38	1,332	77	45	211	289	9	**2,239**
2012	8	82	95	22	40	600	53	62	173	183	0	**1,318**
2013	3	100	149	22	109	767	5	60	353	265	14	**1,847**
Average	***8***	***96***	***143***	***32***	***64***	***588***	***75***	***134***	***239***	***160***	***7***	***1,547***

Carcass Distribution and Origin

Summer Chinook carcasses were not evenly distributed among reaches within the Wenatchee River basin in 2013 (Table 7.16; Figure 7.4). Most of the carcasses in the Wenatchee River basin were found upstream from the Leavenworth Bridge. The highest percentage of carcasses (42%) was sampled in Reach 6 near the confluence of the Icicle River.

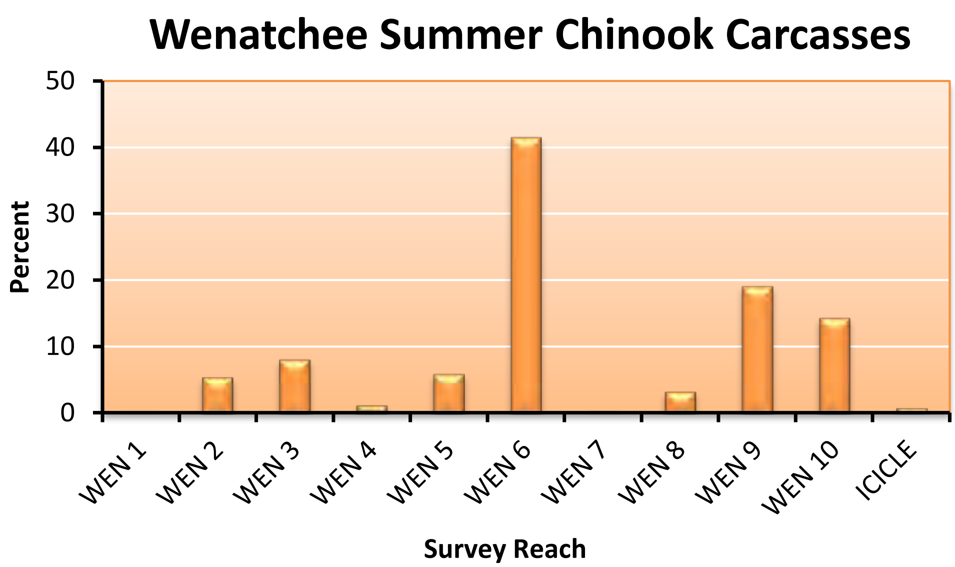


Figure 7.4. Percent of summer Chinook carcasses sampled within different reaches in the Wenatchee River basin during September through mid-November, 2013. Reach codes are described in Table 2.10.

Numbers of wild and hatchery-origin summer Chinook carcasses sampled in 2013 will be available after analysis of CWTs and scales. Based on the available data (1993-2012), most fish, regardless of origin, were found in Reach 6 (Leavenworth Bridge to Icicle Road Bridge) (Table 7.17). In general, a larger percentage of wild fish were found in the upper reaches than were hatchery fish (Figure 7.5). In contrast, a larger percentage of hatchery fish were found in reaches downstream from the Icicle Road Bridge.

Table 7.17. Numbers of wild and hatchery summer Chinook carcasses sampled within different reaches in the Wenatchee River basin, 1993-2012.

Survey year	Origin	Survey reach											Total
		W-1	W-2	W-3	W-4	W-5	W-6	W-7	W-8	W-9	W-10	Icicle	
1993	Wild	59	146	660	12	82	133	213	40	0	0	0	**1,345**
	Hatchery	9	5	36	1	0	17	2	1	0	0	0	**71**
1994	Wild	0	2	18	1	19	36	20	49	130	1	0	**276**
	Hatchery	0	4	7	0	2	14	0	0	1	0	0	**28**
1995	Wild	0	4	11	0	0	105	50	35	20	0	0	**225**
	Hatchery	0	6	3	0	0	12	0	2	0	0	0	**23**
1996	Wild	0	5	82	40	9	196	27	37	43	0	0	**439**
	Hatchery	0	0	2	2	1	10	0	0	0	0	0	**15**
1997	Wild	1	38	112	5	22	266	8	80	69	13	0	**614**
	Hatchery	0	9	15	0	7	46	0	0	1	0	0	**78**
1998	Wild	6	62	124	3	1	191	29	374	327	62	0	**1,179**
	Hatchery	0	19	35	1	0	79	3	21	27	3	0	**188**
1999	Wild	0	88	70	8	18	600	58	137	169	75	0	**1,223**
	Hatchery	0	81	42	8	17	332	10	9	16	4	0	**519**
2000	Wild	5	78	115	8	57	485	75	110	167	200	0	**1,300**
	Hatchery	3	40	63	1	28	208	7	11	5	8	0	**374**
2001	Wild	0	37	100	9	0	245	32	122	97	91	0	**733**
	Hatchery	0	12	38	22	0	93	4	2	4	3	0	**178**
2002	Wild	0	151	127	0	103	479	0	330	558	161	3	**1,912**
	Hatchery	0	98	62	0	102	369	0	11	6	5	3	**656**
2003	Wild	5	261	147	32	111	519	62	252	498	57	15	**1,959**
	Hatchery	1	108	48	40	38	249	4	14	39	1	25	**567**
2004	Wild	7	124	163	120	112	749	90	316	481	399	11	**2,572**
	Hatchery	1	33	30	56	61	337	13	30	12	10	5	**588**
2005	Wild	4	49	78	24	26	399	66	125	336	244	0	**1,351**
	Hatchery	4	36	28	15	20	310	4	15	17	14	7	**470**
2006	Wild	15	91	122	44	75	688	388	309	646	593	5	**2,976**
	Hatchery	7	49	38	20	37	265	47	34	57	65	13	**632**
2007	Wild	1	7	24	1	10	197	34	30	95	81	3	**483**
	Hatchery	2	8	25	9	16	278	4	8	1	10	5	**366**
2008	Wild	7	15	38	24	21	361	41	31	98	133	2	**771**
	Hatchery	3	19	25	14	15	315	6	11	8	11	6	**433**
2009	Wild	6	22	32	23	19	288	13	55	236	173	4	**871**
	Hatchery	5	7	11	9	8	101	3	3	4	2	2	**155**
2010	Wild	2	22	62	44	64	477	125	47	121	192	0	**1,156**
	Hatchery	1	9	36	13	58	204	10	2	3	2	15	**353**
2011	Wild	4	46	75	11	25	914	74	45	211	287	3	**1,695**
	Hatchery	1	42	51	7	13	418	3	0	0	2	6	**543**
2012	Wild	4	49	72	14	24	491	47	62	173	182	0	**1,118**

Survey year	Origin	Survey reach											Total
		W-1	W-2	W-3	W-4	W-5	W-6	W-7	W-8	W-9	W-10	Icicle	
	Hatchery	4	33	23	8	16	109	6	0	0	1	0	**200**
Average	***Wild***	***6***	***65***	***112***	***21***	***40***	***391***	***73***	***129***	***224***	***147***	***2***	***24,198***
	Hatchery	***2***	***31***	***31***	***11***	***22***	***188***	***6***	***9***	***10***	***7***	***4***	***6,437***

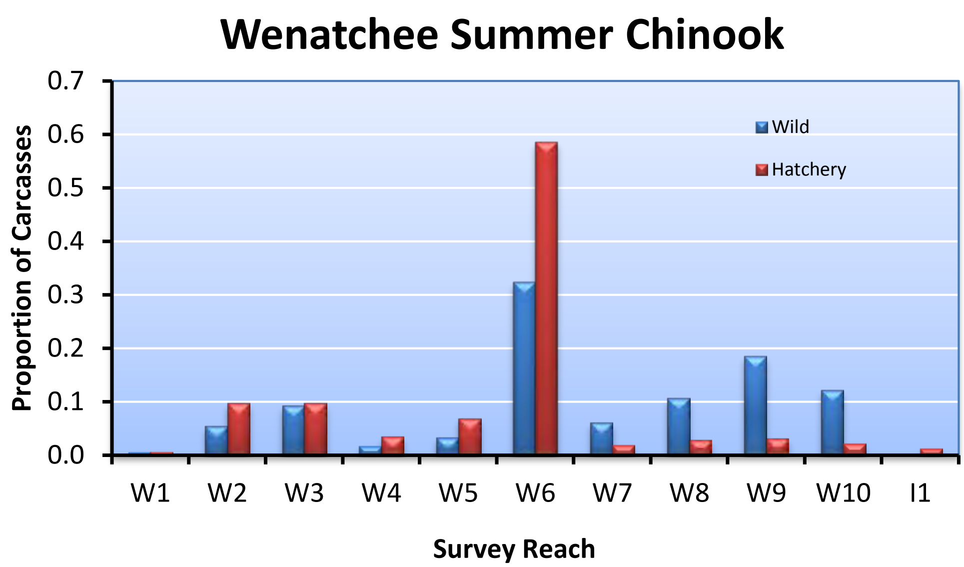


Figure 7.5. Distribution of wild and hatchery produced carcasses in different reaches in the Wenatchee River basin, 1993-2012. Reach codes are described in Table 2.10.

Sampling Rate

If escapement is based on total numbers of redds (based on peak expansion), then about 18% of the total spawning escapement of summer Chinook in the Wenatchee River basin was sampled in 2013 (Table 7.18). Sampling rates among survey reaches varied from 1 to 34%.

Table 7.18. Number of redds and carcasses, total spawning escapement, and sampling rates for summer Chinook in the Wenatchee River basin, 2013.

Sampling reach	Total number of redds	Total number of carcasses	Total spawning escapement	Sampling rate
Wenatchee 1 (W1)	11	3	35	0.09
Wenatchee 2 (W2)	161	100	507	0.20
Wenatchee 3 (W3)	311	149	980	0.15
Wenatchee 4 (W4)	36	22	113	0.19
Wenatchee 5 (W5)	102	109	321	0.34
Wenatchee 6 (W6)	1,090	767	3,434	0.22
Wenatchee 7 (W7)	164	5	517	0.01
Wenatchee 8 (W8)	223	60	702	0.09

Sampling reach	Total number of redds	Total number of carcasses	Total spawning escapement	Sampling rate
Wenatchee 9 (W9)	578	353	1,821	0.19
Wenatchee 10 (W10)	523	265	1,647	0.16
Icicle Creek (I1)	42	14	132	0.11
Total	***3,199***	***1,833***	***10,209***	***0.18***

Length Data

Mean lengths (POH, cm) of male and female summer Chinook carcasses sampled during surveys in the Wenatchee River basin in 2013 are provided in Table 7.19. The average size of males and females sampled in the Wenatchee River basin were 63 cm and 69 cm, respectively.

Table 7.19. Mean lengths (postorbital-to-hypural length; cm) and standard deviations (in parentheses) of male and female summer Chinook carcasses sampled in different streams/watersheds in the Wenatchee River basin, 2013.

Stream/watershed	Mean length (cm)	
	Male	Female
Wenatchee 1 (W1)	58.0 (11.3)	58.0 (0)
Wenatchee 2 (W2)	62.3 (10.7)	67.6 (4.8)
Wenatchee 3 (W3)	63.5 (11.2)	69.0 (5.4)
Wenatchee 4 (W4)	47.8 (13.3)	73.6 (3.7)
Wenatchee 5 (W5)	59.7 (10.5)	69.6 (7.5)
Wenatchee 6 (W6)	62.4 (10.5)	69.1 (5.4)
Wenatchee 7 (W7)	51.0 (15.6)	72.0 (7.0)
Wenatchee 8 (W8)	62.3 (10.8)	69.7 (5.2)
Wenatchee 9 (W9)	65.3 (9.5)	69.2 (6.2)
Wenatchee 10 (W10)	63.9 (7.3)	69.2 (5.7)
Icicle Creek (I1)		
Total	***62.8 (10.3)***	***69.1 (5.6)***

7.7 Life History Monitoring

Life history characteristics of Wenatchee summer Chinook were assessed by examining carcasses on spawning grounds and fish collected or examined at broodstock collection sites, and by reviewing tagging data and fisheries statistics.

Migration Timing

Migration timing of hatchery and wild Wenatchee summer Chinook was determined from broodstock data and stock assessment data collected at Dryden Dam. Sampling at Dryden Dam occurs from early July through mid-October. During the early part of the migration, hatchery summer Chinook arrived about one week later than wild Chinook (Table 7.20). This pattern carries through the migration distribution of summer Chinook at Dryden Dam. By the end of the migration, hatchery fish continue to pass Dryden about five to six weeks after 90% of the wild fish have passed the dam.

Table 7.20. The week that 10%, 50% (median), and 90% of the wild and hatchery summer Chinook salmon passed Dryden Dam, 2007-2013. The average week is also provided. Migration timing is based on collection of summer Chinook broodstock at Dryden Dam.

Survey year	Origin	Wenatchee Summer Chinook Migration Time (week)				Sample size
		10 Percentile	50 Percentile	90 Percentile	Mean	
2007	Wild	28	31	37	31	274
	Hatchery	30	33	41	35	305
2008	Wild	29	31	40	32	219
	Hatchery	32	37	41	37	576
2009	Wild	27	29	41	31	469
	Hatchery	28	34	42	35	382
2010	Wild	30	33	35	32	403
	Hatchery	29	30	33	30	268
2011	Wild	30	31	34	32	293
	Hatchery	32	34	39	35	304
2012	Wild	30	32	39	33	247
	Hatchery	31	37	41	36	366
2013	Wild	28	30	34	31	494
	Hatchery	29	33	39	33	570
Average	***Wild***	***28***	***31***	***35***	***32***	***2,399***
	Hatchery	***29***	***34***	***41***	***35***	***2,771***

Age at Maturity

Because hatchery summer Chinook are released after one year of rearing and natural-origin summer Chinook migrate primarily as age-0 fish, total ages will differ between hatchery and natural-origin Chinook (see Hillman et al. 2011). Therefore, in this section, we evaluated age at maturity by comparing differences in salt (ocean) ages between the two groups.

Most of the wild and hatchery summer Chinook sampled during the period 1993-2012 in the Wenatchee River basin were salt age-3 fish (Table 7.21; Figure 7.6). A higher percentage of salt age-4 wild Chinook returned to the basin than did salt age-4 hatchery Chinook. In contrast, a higher proportion of salt age-1 and 2 hatchery fish returned than did salt age-1 and 2 wild fish. Thus, a higher percentage of wild fish returned at an older age than did hatchery fish.

Table 7.21. Proportions of wild and hatchery summer Chinook of different salt (ocean) ages sampled on spawning grounds in the Wenatchee River basin, 1993-2012.

Sample year	Origin	Salt age					Sample size
		1	2	3	4	5	
1993	Wild	0.02	0.24	0.62	0.12	0.00	1,224
	Hatchery	0.03	0.91	0.03	0.03	0.00	64

Sample year	Origin	Salt age					Sample size
		1	2	3	4	5	
1994	Wild	0.02	0.21	0.45	0.32	0.00	257
	Hatchery	0.00	0.14	0.86	0.00	0.00	21
1995	Wild	0.02	0.15	0.65	0.18	0.00	216
	Hatchery	0.00	0.00	0.05	0.95	0.00	21
1996	Wild	0.01	0.25	0.66	0.08	0.00	512
	Hatchery	0.00	0.33	0.33	0.29	0.05	21
1997	Wild	0.01	0.24	0.57	0.18	0.00	561
	Hatchery	0.05	0.20	0.67	0.08	0.00	75
1998	Wild	0.02	0.23	0.66	0.09	0.00	1,041
	Hatchery	0.03	0.49	0.38	0.10	0.00	187
1999	Wild	0.01	0.34	0.55	0.10	0.00	1,087
	Hatchery	0.01	0.15	0.79	0.05	0.00	510
2000	Wild	0.02	0.20	0.64	0.15	0.00	1,181
	Hatchery	0.07	0.11	0.66	0.15	0.00	342
2001	Wild	0.01	0.16	0.74	0.08	0.00	653
	Hatchery	0.05	0.76	0.14	0.04	0.00	181
2002	Wild	0.00	0.14	0.62	0.24	0.00	1,744
	Hatchery	0.01	0.16	0.80	0.02	0.00	646
2003	Wild	0.01	0.07	0.51	0.41	0.00	1,653
	Hatchery	0.05	0.07	0.75	0.12	0.00	530
2004	Wild	0.00	0.12	0.32	0.54	0.01	2,233
	Hatchery	0.08	0.57	0.25	0.10	0.00	566
2005	Wild	0.00	0.12	0.75	0.13	0.00	1,190
	Hatchery	0.02	0.09	0.86	0.03	0.00	450
2006	Wild	0.00	0.02	0.27	0.71	0.00	2,972
	Hatchery	0.02	0.16	0.24	0.57	0.00	299
2007	Wild	0.01	0.09	0.31	0.53	0.07	480
	Hatchery	0.00	0.15	0.75	0.07	0.03	275
2008	Wild	0.01	0.06	0.76	0.17	0.00	767
	Hatchery	0.02	0.12	0.76	0.11	0.00	329
2009	Wild	0.01	0.07	0.51	0.41	0.00	797
	Hatchery	0.10	0.36	0.49	0.05	0.00	132
2010	Wild	0.01	0.18	0.65	0.16	0.00	1,068
	Hatchery	0.00	0.49	0.47	0.03	0.00	294
2011	Wild	0.01	0.11	0.60	0.29	0.00	1,533
	Hatchery	0.06	0.04	0.90	0.01	0.00	472
2012	Wild	0.01	0.14	0.49	0.37	0.00	1,018
	Hatchery	0.02	0.88	0.07	0.02	0.00	165

Sample year	Origin	Salt age					Sample size
		1	2	3	4	5	
Average	***Wild***	***0.01***	***0.16***	***0.57***	***0.26***	***0.00***	***1,109***
	Hatchery	***0.03***	***0.31***	***0.51***	***0.14***	***0.00***	***279***

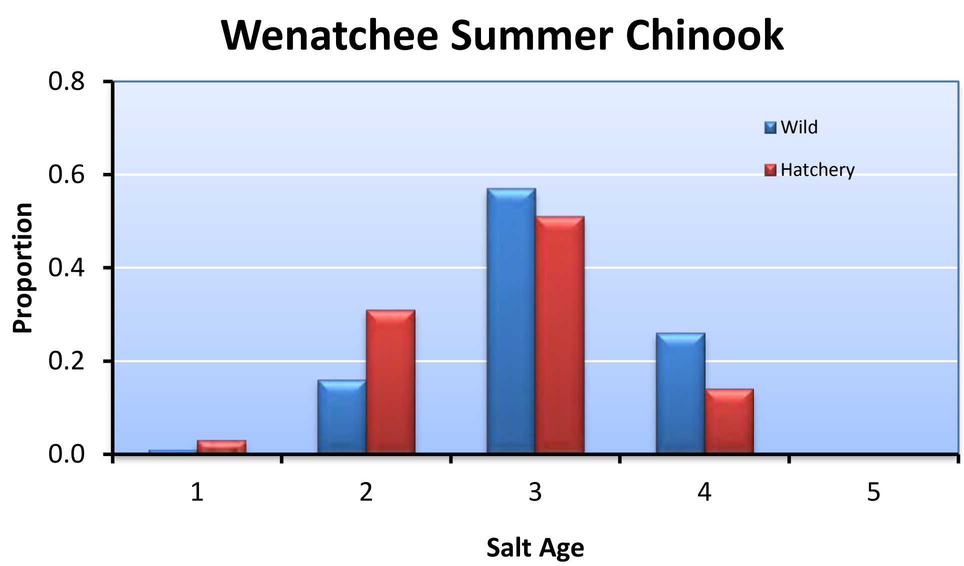


Figure 7.6. Proportions of wild and hatchery summer Chinook of different salt (ocean) ages sampled at broodstock collection sites and on spawning grounds in the Wenatchee River basin for the combined years 1993-2012.

Size at Maturity

On average, hatchery summer Chinook were about 5 cm smaller than wild summer Chinook sampled in the Wenatchee River basin (Table 7.22). This is likely because a higher percentage of wild fish returned as salt age-3 and 4 fish than did hatchery fish. Analyses for the five-year reports will compare sizes of hatchery and wild fish of the same age groups and sex.

Table 7.22. Mean lengths (POH; cm) and variability statistics for wild and hatchery summer Chinook sampled in the Wenatchee River basin, 1993-2012; SD = 1 standard deviation.

Sample year	Origin	Sample size	Summer Chinook length (POH; cm)			
			Mean	SD	Minimum	Maximum
1993[a]	Wild	1,344	73	8	33	94
	Hatchery	68	61	9	37	83
1994[a]	Wild	276	73	8	31	89
	Hatchery	25	70	8	54	85
1995[a]	Wild	225	75	7	48	87
	Hatchery	23	74	7	57	85
1996[a]	Wild	210	74	7	43	92
	Hatchery	9	66	12	52	84

Sample year	Origin	Sample size	Summer Chinook length (POH; cm)			
			Mean	SD	Minimum	Maximum
1997	Wild	614	74	8	29	99
	Hatchery	79	69	10	29	83
1998	Wild	1,179	73	8	28	97
	Hatchery	188	67	10	37	87
1999	Wild	1,217	72	8	29	95
	Hatchery	518	71	8	26	94
2000	Wild	1,301	71	10	24	94
	Hatchery	369	69	11	33	91
2001	Wild	728	70	9	30	93
	Hatchery	178	63	10	28	86
2002	Wild	1,911	72	8	39	94
	Hatchery	656	71	8	34	95
2003	Wild	1,943	74	9	24	105
	Hatchery	554	69	10	26	97
2004	Wild	2,570	72	9	32	98
	Hatchery	584	59	11	25	91
2005	Wild	1,352	69	7	41	92
	Hatchery	469	69	8	39	91
2006	Wild	3,249	74	6	29	99
	Hatchery	350	71	9	35	90
2007	Wild	566	73	9	29	92
	Hatchery	269	70	7	45	87
2008	Wild	836	69	8	29	89
	Hatchery	363	70	9	24	94
2009	Wild	872	71	8	30	94
	Hatchery	153	64	11	32	84
2010	Wild	1,147	68	8	32	92
	Hatchery	351	65	10	25	87
2011	Wild	1,698	68	8	33	101
	Hatchery	541	66	9	34	85
2012	Wild	1,118	70	7	29	91
	Hatchery	200	59	7	40	79
Pooled	***Wild***	***24,356***	***72***	***8***	***24***	***105***
	Hatchery	***5,947***	***67***	***9***	***24***	***97***

[a] These years include sizes reported in annual reports. The data contained in the WDFW database do not include all these data.

Contribution to Fisheries

Most of the harvest on hatchery-origin Wenatchee summer Chinook occurred in the ocean (Table 7.23). Ocean harvest has made up 47% to 100% of all hatchery Wenatchee summer Chinook harvested. Total harvest on early brood years (1990-1996 and 2007) was lower than for brood years 1997-2006.

Table 7.23. Estimated number and percent (in parentheses) of hatchery-origin Wenatchee summer Chinook captured in different fisheries, brood years 1989-2007.

Brood year	Ocean fisheries	Columbia River Fisheries			Total
		Tribal	Commercial (Zones 1-5)	Recreational (sport)	
1989	1,510 (51)	1,432 (48)	0 (0)	20 (1)	2,957
1990	30 (100)	0 (0)	0 (0)	0 (0)	30
1991	30 (63)	0 (0)	0 (0)	18 (38)	48
1992	147 (79)	39 (21)	0 (0)	0 (0)	186
1993	35 (58)	25 (42)	0 (0)	0 (0)	60
1994	641 (91)	62 (9)	2 (0)	0 (0)	705
1995	558 (98)	9 (2)	5 (1)	0 (0)	572
1996	195 (96)	3 (1)	0 (0)	6 (3)	204
1997	2,982 (95)	49 (2)	12 (0)	106 (3)	3,149
1998	4,924 (92)	128 (2)	16 (0)	287 (5)	5,355
1999	1,548 (84)	168 (9)	21 (1)	104 (6)	1,841
2000	7,888 (73)	1,248 (12)	447 (4)	1,224 (11)	10,807
2001	1,048 (60)	238 (14)	106 (6)	364 (21)	1,756
2002	1,471 (56)	557 (21)	189 (7)	430 (16)	2,647
2003	805 (49)	484 (30)	89 (5)	257 (16)	1,635
2004	408 (47)	218 (25)	70 (8)	167 (19)	863
2005	1,334 (58)	481 (21)	186 (8)	287 (13)	2,288
2006	3,780 (52)	1,969 (27)	406 (6)	1,142 (16)	7,297
2007	210 (60)	81 (23)	6 (2)	53 (15)	350
Average	***1,555 (72)***	***378 (16)***	***82 (3)***	***235 (10)***	***2,250***

Straying

Stray rates were determined by examining CWTs recovered on spawning grounds within and outside the Wenatchee River basin. Targets for strays based on return year (recovery year) and brood year should be less than 5%.

Hatchery-origin Wenatchee summer Chinook have strayed into the Entiat, Chelan, Methow, and Okanogan River basins and into the Hanford Reach (Table 7.24). In four different years, Wenatchee summer Chinook strays have made up more than 5% of the spawning escapement in the Chelan Tailrace. They have made up more than 5% of the spawning escapement in the Entiat River basin in six different years and in the Methow River basin in seven different years. Few have strayed into the Okanogan River basin or into the Hanford Reach.

Table 7.24. Number and percent of spawning escapements within other non-target basins that consisted of hatchery-origin Wenatchee summer Chinook, return years 1994-2010. For example, for return year 2000, 3% of the summer Chinook escapement in the Methow River basin consisted of hatchery-origin Wenatchee summer Chinook. Percent strays should be less than 5%.

Return year	Methow		Okanogan		Chelan		Entiat		Hanford Reach	
	Number	%	Number	%	Number	%	Number	%	Number	%
1994	0	0.0	75	1.9	-	-	-	-	-	-
1995	0	0.0	0	0.0	-	-	-	-	-	-
1996	0	0.0	0	0.0	-	-	-	-	-	-
1997	0	0.0	0	0.0	-	-	-	-	-	-
1998	25	3.7	0	0.0	0	0.0	0	0.0	0	0.0
1999	20	2.0	3	0.1	0	0.0	0	0.0	13	0.1
2000	36	3.0	13	0.4	0	0.0	0	0.0	0	0.0
2001	163	5.9	57	0.5	30	3.0	0	0.0	0	0.0
2002	153	3.3	53	0.4	40	6.9	74	14.8	0	0.0
2003	80	2.0	24	0.7	44	10.5	132	19.1	26	0.0
2004	113	5.2	42	0.6	30	7.1	0	0.0	0	0.0
2005	245	9.6	67	0.8	51	9.7	49	13.4	0	0.0
2006	170	6.2	12	0.1	12	2.9	18	3.1	0	0.0
2007	127	9.3	5	0.1	9	4.8	18	7.3	20	0.1
2008	87	4.5	24	0.3	10	2.0	31	9.7	0	0.0
2009	101	5.7	13	0.2	2	0.3	12	4.8	0	0.0
2010	208	8.3	35	0.6	55	4.9	34	7.8	0	0.0
Total	***1,528***	***4.7***	***423***	***0.4***	***283***	***4.2***	***368***	***8.1***	***59***	***0.0***

Based on brood year analyses, on average, about 12% of the hatchery-origin Wenatchee summer Chinook returns have strayed into non-target spawning areas, exceeding the target of 5% (Table 7.25). Depending on brood year, percent strays into non-target spawning areas have ranged from 0-20%. In addition, on average, about 5% have strayed into non-target hatchery programs, but straying into non-target programs has declined over time.

Table 7.25. Number and percent of hatchery-origin Wenatchee summer Chinook that homed to target spawning areas and the target hatchery program, and number and percent that strayed to non-target spawning areas and non-target hatchery programs, by brood years 1989-2007. Percent stays should be less than 5%.

Brood year	Homing				Straying			
	Target stream		Target hatchery		Non-target streams		Non-target hatcheries	
	Number	%	Number	%	Number	%	Number	%
1989	1,352	62.9	60	2.8	75	3.5	662	30.8
1990	74	84.1	1	1.1	0	0.0	13	14.8
1991	15	65.2	0	0.0	0	0.0	8	34.8
1992	375	84.8	7	1.6	0	0.0	60	13.6

Brood year	Homing				Straying			
	Target stream		Target hatchery		Non-target streams		Non-target hatcheries	
	Number	%	Number	%	Number	%	Number	%
1993	67	72.8	9	9.8	4	4.3	12	13.0
1994	890	71.8	207	16.7	61	4.9	81	6.5
1995	748	74.8	139	13.9	48	4.8	65	6.5
1996	261	70.4	42	11.3	53	14.3	15	4.0
1997	3,609	83.0	171	3.9	397	9.1	170	3.9
1998	1,790	78.5	11	0.5	416	18.2	64	2.8
1999	507	79.7	0	0.0	121	19.0	8	1.3
2000	2,745	83.0	0	0.0	526	15.9	37	1.1
2001	521	82.0	0	0.0	105	16.5	9	1.4
2002	1,521	85.3	10	0.6	244	13.7	8	0.4
2003	1,268	88.6	42	2.9	112	7.8	9	0.6
2004	497	84.2	3	0.5	72	12.2	18	3.1
2005	1,126	84.0	1	0.1	193	14.4	21	1.6
2006	2,693	79.8	0	0.0	612	18.1	71	2.1
2007	87	77.7	0	0.0	22	19.6	3	2.7
Total	***20,059***	***79.5***	***703***	***2.8***	***3,061***	***12.1***	***1,334***	***5.3***

Genetics

Genetic studies were conducted to investigate relationships among temporally replicated collections of summer Chinook from the Wenatchee River, Methow River, and Okanogan River in the upper Columbia River basin (Kassler et al. 2011; the entire report is appended as Appendix K). Samples from the Eastbank Hatchery – Wenatchee stock, Eastbank Hatchery – Methow/Okanogan (MEOK) stock, and Wells Hatchery were also included in the analysis. Samples of natural and hatchery-origin summer Chinook were analyzed and compared to determine if the supplementation program has affected the genetic structure of these populations. The study also calculated the effective number of breeders for collection locations of natural and hatchery-origin summer Chinook from 1993 and 2008.

In general, population differentiation was not observed among the temporally replicated collection locations. A single collection from the Okanogan River (1993) was the only collection showing statistically significant differences. The effective number of breeders was not statistically different from the early collection in 1993 in comparison to the late collection in 2008. Overall, these analyses revealed a lack of differentiation among the temporal replicates from the same locations and among the collection from different locations, suggesting the populations have been homogenized or that there has been substantial gene flow among populations. Additional comparisons among summer-run and fall-run Chinook populations in the upper Columbia River were conducted to determine if there was any differentiation between Chinook with different run timing. These analyses revealed pairwise F_{ST} values that were less than 0.01 for the collections of summer Chinook to collections of fall Chinook from Hanford

Reach, lower Yakima River, Priest Rapids, and Umatilla. Collections of fall Chinook from Crab Creek, Lyons Ferry Hatchery, Marion Drain, and Snake River had pairwise F_{ST} values that were higher in comparison to the collections of summer Chinook. The consensus clustering analysis did not provide good statistical support to the groupings, but did show relationships among collections based on geographic proximity. Overall the summer and fall run Chinook that have historically been spawned together were not differentiated while fall Chinook from greater geographic distances were differentiated.

Proportion of Natural Influence

Another method for assessing the genetic risk of a supplementation program is to determine the influence of the hatchery and natural environments on the adaptation of the composite population. This is estimated by the proportion of natural-origin fish in the hatchery broodstock (pNOB) and the proportion of hatchery-origin fish in the natural spawning escapement (pHOS). The ratio pNOB/(pHOS+pNOB) is the Proportion of Natural Influence (PNI). The larger the ratio (PNI), the greater the strength of selection in the natural environment relative to that of the hatchery environment. In order for the natural environment to dominate selection, PNI should be greater than 0.50, and important integrated populations should have a PNI of at least 0.67 (HSRG/WDFW/NWIFC 2004).

For all brood years the PNI has been greater than or equal to 0.67 (Table 7.26). This suggests that the natural environment has a greater influence on adaptation of Wenatchee summer Chinook than does the hatchery environment.

Table 7.26. Proportionate natural influence (PNI) of the Wenatchee summer Chinook supplementation program for brood years 1989-2012. PNI was calculated as the proportion of naturally produced Chinook in the hatchery broodstock (pNOB) divided by the proportion of hatchery Chinook on the spawning grounds (pHOS) plus pNOB. NOS = number of natural-origin Chinook on the spawning grounds; HOS = number of hatchery-origin Chinook on the spawning grounds; NOB = number of natural-origin Chinook collected for broodstock; and HOB = number of hatchery-origin Chinook included in hatchery broodstock.

Brood year	Spawners			Broodstock			PNI
	NOS	HOS	pHOS	NOB	HOB	pNOB	
1989	14,331	0	0.00	290	0	1.00	1.00
1990	10,861	0	0.00	57	0	1.00	1.00
1991	10,168	0	0.00	105	0	1.00	1.00
1992	11,652	0	0.00	274	0	1.00	1.00
1993	8,849	600	0.06	406	44	0.90	0.94
1994	8,476	1,678	0.17	333	54	0.86	0.83
1995	6,862	894	0.12	363	16	0.96	0.89
1996	6,004	165	0.03	263	3	0.99	0.97
1997	5,408	505	0.09	205	13	0.94	0.91
1998	4,611	741	0.14	299	78	0.79	0.85
1999	4,101	1,375	0.25	242	236	0.51	0.67
2000	4,462	1,051	0.19	275	180	0.60	0.76
2001	9,414	1,946	0.17	210	136	0.61	0.78

Brood year	Spawners			Broodstock			PNI
	NOS	HOS	pHOS	NOB	HOB	pNOB	
2002	11,892	3,831	0.24	409	10	0.98	0.80
2003	10,025	1,775	0.15	337	7	0.98	0.87
2004	9,220	1,259	0.12	424	2	1.00	0.89
2005	6,862	1,841	0.21	397	3	0.99	0.83
2006	16,060	1,732	0.10	433	4	0.99	0.91
2007	3,173	1,417	0.31	263	3	0.99	0.76
2008	4,794	1,702	0.26	378	69	0.85	0.77
2009	7,113	1,214	0.15	452	8	0.98	0.87
2010	5,879	1,589	0.21	388	5	0.99	0.83
2011	8,155	1,695	0.17	376	7	0.98	0.85
2012	7,327	1,212	0.14	267	1	1.00	0.88
Average	***8,154***	***1,176***	***0.14***	***310***	***37***	***0.91***	***0.87***

Natural and Hatchery Replacement Rates

Natural replacement rates (NRR) were calculated as the ratio of natural-origin recruits (NOR) to the parent spawning population (spawning escapement). Natural-origin recruits are naturally produced (wild) fish that survive to contribute to harvest (directly or indirectly), to broodstock, and to spawning grounds. We do not account for fish that died in route to the spawning grounds (migration mortality) or died just before spawning (pre-spawn mortality) (see Appendix B in Hillman et al. 2012). We calculated NORs with and without harvest. NORs without harvest include all returning fish that either returned to the basin or were collected as wild broodstock. NORs with harvest include all fish harvested and are based on a brood year harvest rates from the hatchery program. For brood years 1989-2006, NRR for summer Chinook in the Wenatchee averaged 0.90 (range, 0.16-2.92) if harvested fish were not include in the estimate and 2.51 (range, 0.34-9.81) if harvested fish were included in the estimate (Table 7.27). NRRs for more recent brood years will be calculated as soon as all tag recoveries and sampling rates have been loaded into the database.

Hatchery replacement rates (HRR) are the hatchery adult-to-adult returns and were calculated as the ratio of hatchery-origin recruits (HOR) to the parent broodstock collected. These rates should be greater than the NRRs and greater than or equal to 5.30 (the calculated target value in Murdoch and Peven 2005). HRRs exceeded NRRs in 14 of the 18 years of data, regardless if harvest was or was not included in the estimate (Table 7.27). Hatchery replacement rates for Wenatchee summer Chinook have exceeded the estimated target value of 5.30 in three or eight of the 18 years of data depending on if harvest was or was not included in the estimate.

Table 7.27. Broodstock collected, spawning escapements, natural and hatchery-origin recruits (NOR and HOR), and natural and hatchery replacement rates (NRR and HRR; with and without harvest) for summer Chinook in the Wenatchee River basin, brood years 1989-2006.

Brood year	Broodstock Collected	Spawning Escapement	Harvest not included				Harvest included			
			HOR	NOR	HRR	NRR	HOR	NOR	HRR	NRR
1989	346	14,331	2,149	9,182	6.21	0.64	5,111	21,810	14.77	1.52
1990	87	10,861	88	9,478	1.01	0.87	118	12,825	1.36	1.18
1991	128	10,168	23	5,554	0.18	0.55	71	17,142	0.55	1.69
1992	341	11,652	442	5,865	1.30	0.50	630	8,403	1.85	0.72
1993	524	9,450	92	5,388	0.18	0.57	157	8,906	0.30	0.94
1994	418	10,154	1,239	4,223	2.96	0.42	1,945	6,640	4.65	0.65
1995	398	7,755	1,000	5,284	2.51	0.68	1,574	8,374	3.95	1.08
1996	334	6,168	371	4,440	1.11	0.72	575	6,938	1.72	1.12
1997	240	5,913	4,214	9,684	17.56	1.64	7,389	16,725	30.79	2.83
1998	472	5,352	2,281	15,645	4.83	2.92	7,686	52,500	16.28	9.81
1999	488	5,476	636	12,069	1.30	2.20	2,478	47,329	5.08	8.64
2000	492	5,512	3,308	3,868	6.72	0.70	14,169	16,530	28.80	3.00
2001	493	11,360	635	19,089	1.29	1.68	2,401	72,307	4.87	6.37
2002	482	15,723	1,783	4,952	3.70	0.31	4,448	12,380	9.23	0.79
2003	496	11,800	1,431	1,843	2.89	0.16	3,080	3,972	6.21	0.34
2004	496	10,479	586	7,471	1.18	0.71	1,447	18,538	2.92	1.77
2005	494	8,703	1,271	5,158	2.57	0.59	3,564	14,016	7.21	1.61
2006	488	17,792	1,213	6,802	2.49	0.38	7,991	21,525	16.38	1.21
Average	***401***	***9,925***	***1,265***	***7,555***	***3.33***	***0.90***	***3,602***	***20,381***	***8.72***	***2.51***

Smolt-to-Adult Survivals

Smolt-to-adult survival ratios (SARs) were calculated as the number of hatchery adult recaptures divided by the number of tagged hatchery smolts released. SARs were based on CWT returns. For the available brood years, SARs have ranged from 0.00037 to 0.01552 for hatchery summer Chinook in the Wenatchee River basin (Table 7.28).

Table 7.28. Smolt-to-adult ratios (SARs) for Wenatchee hatchery summer Chinook, brood years 1989-2007.

Brood year	Number of tagged smolts released[a]	Estimated adult captures[b]	SAR
1989	144,905	1,026	0.00708
1990	119,214	115	0.00096
1991	190,371	71	0.00037
1992	605,055	613	0.00101
1993	210,626	152	0.00072
1994	452,340	1,919	0.00424

Brood year	Number of tagged smolts released[a]	Estimated adult captures[b]	SAR
1995	668,409	1,538	0.00230
1996	585,590	567	0.00097
1997	480,418	7,456	0.01552
1998	641,109	7,563	0.01180
1999	988,328	2,455	0.00248
2000	903,368	13,765	0.01524
2001	596,618	2,377	0.00398
2002	805,919	4,302	0.00534
2003	639,381	3,018	0.00472
2004	603,942	1,438	0.00238
2005	631,492	3,581	0.00567
2006	931,880	10,493	0.01126
2007	453,719	462	0.00102
Average	***560,668***	***3,311***	***0.00511***

[a] Includes all tag codes and CWT released fish (CWT + Ad Clip fish and CWT-only fish).

[b] Includes estimated recoveries (spawning ground, hatcheries, harvest, etc.) and observed recoveries if estimated recoveries were unavailable.

7.8 ESA/HCP Compliance

Broodstock Collection

Per the 2011 broodstock collection protocol, 489 natural-origin (adipose fin present) summer Chinook adults were targeted for collection at Dryden and Tumwater dams. The actual 2011 collection totaled 405 summer Chinook (398 natural-origin and seven hatchery-origin; the hatchery-origin fish were not direct collections but rather adipose present non-wired fish with a hatchery scale pattern) in combination from Dryden Dam and Tumwater Dam. Trapping began 2 July and ended 27 August 2011.

Summer Chinook and steelhead broodstock collections occurred concurrently at Dryden Dam; therefore, steelhead and spring Chinook encounters at Dryden Dam during Wenatchee summer Chinook broodstock collection were attributable to steelhead broodstock collections authorized under ESA Permit 1395 take authorizations. No steelhead or spring Chinook takes were associated with the Wenatchee summer Chinook collection.

Consistent with impact minimization measures in ESA Permit 1347, all ESA-listed species handled during summer Chinook broodstock collection were subject to water-to-water transfers or anesthetized if removed from the water during handling.

Hatchery Rearing and Release

The 2011 Wenatchee summer Chinook program released an estimated 827,709 smolts, representing 95.8% of the 864,000 programmed production and was within the 10% overage allowance identified in ESA permit 1347.

Hatchery Effluent Monitoring

Per ESA Permits 1196, 1347, 1395, 18118, 18119, and 18121, permit holders shall monitor and report hatchery effluents in compliance with applicable National Pollution Discharge Elimination Systems (NPDES) (EPA 1999) permit limitations. There was one NPDES violation reported at PUD Hatchery facilities during the period 1 January through 31 December 2013. NPDES monitoring and reporting for Chelan PUD Hatchery Programs during 2013 are provided in Appendix F.

Smolt and Emigrant Trapping

ESA-listed spring Chinook and steelhead were encountered during operation of the Lower Wenatchee Trap. ESA takes are reported in the steelhead (Section 3.8) and spring Chinook (Section 5.8) sections and are not repeated here.

Spawning Surveys

Summer Chinook spawning ground surveys conducted in the Wenatchee River basin during 2013 were consistent with ESA Section 10 Permit No. 1347. Because of the difficulty of quantifying the level of take associated with spawning ground surveys, the Permit does not specify a take level associated with these activities, even though it does authorize implementation of spawning ground surveys. Therefore, no take levels are reported. However, to minimize potential effects to established redds, wading was restricted to the extent practical, and extreme caution was used to avoid established redds when wading was required.

SECTION 8: METHOW SUMMER CHINOOK

8.1 Broodstock Sampling

This section focuses on results from sampling 2011-2012 Methow summer Chinook broodstock, which were collected in the East and West Ladders of Wells Dam in 2011 and 2012. Summer Chinook adults collected at Wells Dam are also used in the Okanogan/Similkameen supplementation program. Complete information is not currently available for the 2013 return (this information will be provided in the 2014 annual report).

Origin of Broodstock

Both 2011 and 2012 broodstock consisted almost entirely of natural-origin (adipose fin present) summer Chinook (Table 8.1). These fish were used for both the Methow and Okanogan supplementation programs. In 2011, to meet production goals, hatchery-origin adults were collected in concert with natural-origin fish. About 1% of the 2012 broodstock were comprised of hatchery-origin fish (hatchery-origin was determined by examination of scales and CWTs).

Table 8.1. Numbers of wild and hatchery summer Chinook collected for broodstock, numbers that died before spawning, and numbers of Chinook spawned for the Methow/Okanogan programs, 1989-2012. Unknown origin fish (i.e., undetermined by scale analysis, no CWT or fin clips, and no additional hatchery marks) were considered naturally produced. Mortality includes fish that died of natural causes typically near the end of spawning and were not needed for the program and surplus fish killed at spawning.

Brood year	Wild summer Chinook					Hatchery summer Chinook					Total number spawned
	Number collected	Prespawn loss	Mortality	Number spawned	Number released	Number collected	Prespawn loss	Mortality	Number spawned	Number released	
1989[a]	1,419	72	-	1,297	-	341	17	-	312	-	1,609
1990[a]	864	34	-	828	-	214	8	-	206	-	1,034
1991[a]	1,003	59	-	924	-	341	20	-	314	-	1,238
1992[a]	312	6	-	297	-	428	9	-	406	-	703
1993[a]	813	48	-	681	-	464	28	-	388	-	1,069
1994	385	33	11	341	12	266	15	7	244	1	585
1995	254	13	10	173	58	351	28	9	240	74	413
1996	316	15	11	290	0	234	2	9	223	0	513
1997	214	11	5	198	0	308	24	20	264	0	462
1998	239	28	58	153	0	348	18	119	211	0	364
1999	248	5	19	224	0	307	2	16	289	0	513
2000	184	15	5	164	0	373	17	17	339	0	503
2001	135	8	36	91	0	423	29	128	266	0	357
2002	270	2	21	247	0	285	11	33	241	0	488
2003	449	14	53	381	0	112	2	9	101	0	482
2004	541	23	12	506	0	17	0	1	16	0	522
2005	551	29	76	391	55	12	2	0	9	1	400
2006	579	50	10	500	19	12	2	0	10	0	510
2007	504	22	26	456	0	19	0	2	17	0	473
2008	418	5	9	404	0	41	0	0	41	0	445

Brood year	Wild summer Chinook					Hatchery summer Chinook					Total number spawned
	Number collected	Prespawn loss	Mortality	Number spawned	Number released	Number collected	Prespawn loss	Mortality	Number spawned	Number released	
2009	553	31	15	507	0	5	5	0	0	0	507
2010	503	13	6	484	0	8	0	0	8	0	492
2011	498	18	13	467	0	30	4	0	26	0	493
2012[c]	125	5	0	98	22	3	0	0	1	2	99
Average[b]	***367***	***18***	***21***	***320***	***9***	***166***	***8***	***19***	***134***	***4***	***595***

[a] Number of fish spawned and collected during these years included fish retained from the right- and left-bank ladder traps at Wells Dam and fish collected from the volunteer channel. There was no distinction made between fish collected at trap locations and program (i.e., aggregated population used for Wells, Methow, and Okanogan summer Chinook programs).
[b] Because of bias from aggregating the spawning population from 1989-1993, averages are based on adult numbers collected from 1994-2011.
[c] Twenty four additional fish were collected in order to fulfill the collection of Okanogan summer Chinook broodstock. These fish were subsequently released when collection quotas were reached from purse seine efforts at the mouth of the Okanogan River.

Age/Length Data

Ages of summer Chinook broodstock were determined from analysis of scales and/or CWTs. Broodstock collected from the 2011 return consisted primarily of age-4 and 5 natural-origin Chinook (92.4%) and age-4 and 5 hatchery-origin Chinook (73.1%). Age-2 and 3 natural-origin fish collectively made up 7.6% of the broodstock (Table 8.2). Age-3 hatchery-origin Chinook made up 26.9% of the broodstock (Table 8.2).

Broodstock collected from the 2012 return consisted primarily of age-4 and 5 natural-origin Chinook (95.1%) and age-5 hatchery-origin Chinook. Age-3 natural-origin Chinook made up 3.9% of the broodstock (Table 8.2).

Table 8.2. Percent of hatchery and wild summer Chinook of different ages (total age) collected from broodstock for the Methow/Okanogan programs, 1991-2012.

Return Year	Origin	Total age				
		2	3	4	5	6
1991	Wild	0.5	6.8	35.1	55.4	2.2
	Hatchery	0.5	5.1	36.2	49.0	9.2
1992	Wild	0.0	13.0	36.2	50.7	0.0
	Hatchery	0.0	0.0	0.0	0.0	0.0
1993	Wild	0.0	3.9	75.3	20.8	0.0
	Hatchery	0.0	1.0	85.7	13.3	0.0
1994	Wild	3.1	9.7	26.3	60.3	0.6
	Hatchery	0.0	14.7	11.2	74.0	0.0
1995	Wild	0.0	4.6	15.3	75.6	4.6
	Hatchery	0.0	0.4	13.0	25.6	61.0
1996	Wild	0.0	8.4	56.7	30.4	4.6
	Hatchery	0.0	3.0	31.0	47.0	19.0
1997	Wild	0.5	9.4	53.0	35.1	2.0
	Hatchery	0.0	20.6	11.1	61.8	6.5
1998	Wild	1.1	12.1	56.3	30.5	0.0

Return Year	Origin	Total age				
		2	3	4	5	6
	Hatchery	2.1	18.9	56.2	16.0	6.8
1999	Wild	4.7	5.1	53.7	36.0	0.5
	Hatchery	0.3	3.5	29.3	65.0	1.9
2000	Wild	0.6	14.0	28.7	56.1	0.6
	Hatchery	0.0	27.0	14.3	54.3	4.3
2001	Wild	0.0	23.5	58.8	11.8	5.9
	Hatchery	1.8	21.1	64.6	10.1	2.4
2002	Wild	0.4	17.4	65.6	16.6	0.0
	Hatchery	0.0	2.4	39.4	58.3	0.0
2003	Wild	0.7	3.9	65.8	29.5	0.0
	Hatchery	0.0	5.6	18.7	70.1	5.6
2004	Wild	0.6	15.4	11.6	72.2	0.2
	Hatchery	0.0	6.7	53.3	33.3	6.7
2005	Wild	0.0	17.1	69.9	11.0	1.9
	Hatchery	0.0	10.0	40.0	50.0	0.0
2006	Wild	1.7	3.0	41.0	52.9	1.5
	Hatchery	0.0	16.7	25.0	50.0	8.3
2007	Wild	1.8	15.3	8.2	70.3	4.4
	Hatchery	0.0	0.0	21.1	57.9	21.1
2008	Wild	0.3	17.9	67.1	13.3	1.4
	Hatchery	0.0	7.2	62.7	47.7	2.4
2009	Wild	1.3	10.1	68.7	19.9	0.0
	Hatchery	0.0	0.0	16.7	83.3	0.0
2010	Wild	0.2	16.2	51.0	32.6	0.0
	Hatchery	0.0	12.5	50.0	25.0	12.5
2011	Wild	0.1	7.1	75.5	17.0	0.0
	Hatchery	0.0	30.0	20.0	40.0	0.0
2012	Wild	0.0	3.9	49.0	46.1	1.0
	Hatchery	0.0	0.0	0.0	100.0	0.0
Average	***Wild***	***0.8***	***10.8***	***48.6***	***38.4***	***1.4***
	Hatchery	***0.2***	***9.4***	***31.8***	***46.9***	***7.6***

Mean lengths of natural-origin summer Chinook of a given age differed little between 2011 and 2012 (Table 8.3). Average fork lengths for age-5 natural-origin adults were 6 cm longer than that of age-5 hatchery fish (Table 8.3). Differences in hatchery-origin and natural-origin fish were hard to discern given the small sample size of hatchery-origin fish (i.e., few hatchery fish were included in the broodstock).

Table 8.3. Mean fork length (cm) at age (total age) of hatchery and wild Methow/Okanogan summer Chinook collected from broodstock for the Methow/Okanogan programs, 1991-2012; N = sample size and SD = 1 standard deviation.

Return year	Origin	Summer Chinook fork length (cm)														
		Age-2			Age-3			Age-4			Age-5			Age-6		
		Mean	N	SD	Mean	N	SD	Mean	N	SD	Mean	N	SD	Mean	N	SD
1991	Wild	47	1	-	68	15	6	82	78	10	94	123	8	97	5	5
	Hatchery	47	1	-	49	10	6	78	71	5	91	96	8	96	18	6
1992	Wild	-	0	-	55	9	5	69	25	6	78	35	6	-	0	-
	Hatchery	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-
1993	Wild	-	0	-	72	3	4	86	58	7	98	16	5	-	0	-
	Hatchery	-	0	-	42	1	-	75	84	8	88	13	6	-	0	-
1994	Wild	42	10	6	50	31	7	80	84	9	93	193	8	104	2	13
	Hatchery	-	0	-	49	38	5	76	29	7	88	191	7	-	0	-
1995	Wild	-	0	-	67	6	8	79	20	9	96	99	5	94	6	5
	Hatchery	-	0	-	52	1	-	73	32	9	89	63	9	95	150	7
1996	Wild	-	0	-	68	22	9	83	149	8	95	79	7	101	12	5
	Hatchery	-	0	-	52	7	10	77	72	7	90	109	8	100	44	6
1997	Wild	31	1	-	60	19	7	85	107	8	96	71	7	98	4	11
	Hatchery	-	0	-	45	63	5	72	34	9	92	189	7	97	20	7
1998	Wild	39	2	1	59	23	6	83	107	7	96	58	7	-	0	-
	Hatchery	43	7	6	50	64	6	74	190	7	92	54	8	98	23	5
1999	Wild	38	10	3	64	11	8	82	115	7	96	76	6	104	1	-
	Hatchery	37	1	-	53	11	9	75	92	6	91	204	6	98	6	5
2000	Wild	39	1	-	66	23	7	83	47	6	96	92	5	95	1	-
	Hatchery	-	0	-	54	100	7	78	53	8	92	201	6	99	16	6
2001	Wild	-	0	-	63	4	12	88	10	9	90	2	4	94	1	-
	Hatchery	41	9	3	55	107	9	79	327	8	93	51	7	101	12	9
2002	Wild	56	1	-	65	44	7	88	166	6	100	42	7	-	0	-
	Hatchery	-	0	-	45	6	5	76	100	7	95	148	5	-	0	-
2003	Wild	43	3	6	61	16	6	87	268	7	99	120	6	-	0	-
	Hatchery	-	0	-	55	6	9	73	20	8	91	75	7	102	6	9
2004	Wild	51	3	5	67	78	6	81	59	6	97	367	7	99	1	-
	Hatchery	-	0	-	52	1	-	70	8	5	97	5	8	109	1	-
2005	Wild	-	0	-	68	89	6	83	363	7	94	57	6	101	10	7
	Hatchery	-	0	-	55	1	-	70	4	4	89	5	4	-	0	-
2006	Wild	38	9	3	54	16	4	69	221	6	77	286	5	78	8	4
	Hatchery	-	0	-	42	2	1	62	3	2	69	6	6	76	1	-
2007	Wild	39	8	5	53	69	5	67	37	6	78	317	5	77	20	7
	Hatchery	-	0	-	-	0	-	54	4	2	75	11	5	78	4	3
2008	Wild	41	1	-	55	62	4	69	233	6	76	46	4	82	5	3
	Hatchery	-	0	-	59	6	9	67	52	5	73	23	6	79	2	8
2009	Wild	38	7	5	54	54	5	72	367	5	79	106	5	-	0	-

Return year	Origin	Summer Chinook fork length (cm)														
		Age-2			Age-3			Age-4			Age-5			Age-6		
		Mean	N	SD	Mean	N	SD	Mean	N	SD	Mean	N	SD	Mean	N	SD
	Hatchery	-	0	-	-	0	-	59	1	-	71	5	7	-	0	-
2010	Wild	43	1	-	54	78	5	71	246	5	78	157	5	-	0	-
	Hatchery	-	0	-	57	1	-	67	4	5	79	2	1	89	1	-
2011	Wild	43	2	3	66	32	8	87	338	7	97	76	5	-	0	-
	Hatchery	-	0	-	63	9	11	78	9	6	92	12	9	-	0	-
2012	Wild	-	0	-	70	10	3	84	62	5	96	54	6	-	0	-
	Hatchery	-	0	-	-	0	-	-	0	-	90	1	-	-	0	-
Average	***Wild***	***42***	***3***	***4***	***62***	***32***	***6***	***80***	***144***	***7***	***91***	***112***	***6***	***94***	***3***	***7***
	Hatchery	***42***	***1***	***5***	***52***	***20***	***7***	***72***	***54***	***6***	***87***	***67***	***7***	***94***	***14***	***6***

Sex Ratios

Male summer Chinook in the 2011 broodstock made up about 49.1% of the adults collected, resulting in an overall male to female ratio of 0.96:1.00 (Table 8.4.). In 2012, males made up about 49.0% of the adults collected, resulting in an overall male to female ratio of 0.96:1.00 (Table 8.4). The ratio for both 2011 and 2012 broodstock was below the assumed 1:1 ratio goal in the broodstock protocol.

Table 8.4. Numbers of male and female wild and hatchery summer Chinook collected for broodstock at Wells Dam for the Methow/Okanogan programs, 1991-2012. Ratios of males to females are also provided.

Return year	Number of wild summer Chinook			Number of hatchery summer Chinook			Total M/F ratio
	Males (M)	Females (F)	M/F	Males (M)	Females (F)	M/F	
1989[a]	752	667	1.13:1.00	181	160	1.13:1.00	1.13:1.00
1990[a]	381	482	0.79:1.00	95	120	0.79:1.00	0.79:1.00
1991[a]	443	559	0.79:1.00	151	191	0.79:1.00	0.79:1.00
1992[a]	349	318	1.10:1.00	38	35	1.09:1.00	1.10:1.00
1993[a]	513	300	1.71:1.00	293	171	1.71:1.00	1.71:1.00
1994	205	180	1.14:1.00	165	101	1.63:1.00	1.32:1.00
1995	103	149	0.69:1.00	158	197	0.80:1.00	0.75:1.00
1996	178	138	1.29:1.00	132	102	1.29:1.00	1.29:1.00
1997	102	112	0.91:1.00	174	134	1.30:1.00	1.12:1.00
1998	130	109	1.19:1.00	263	85	3.09:1.00	2.03:1.00
1999	138	110	1.25:1.00	161	146	1.10:1.00	1.17:1.00
2000	82	102	0.80:1.00	243	130	1.87:1.00	1.40:1.00
2001	89	46	1.93:1.00	311	112	2.78:1.00	2.53:1.00
2002	166	104	1.60:1.00	149	136	1.10:1.00	1.31:1.00
2003	255	194	1.31:1.00	61	51	1.20:1.00	1.29:1.00
2004	263	278	0.95:1.00	12	5	2.40:1.00	0.97:1.00
2005	365	186	1.96:1.00	6	6	1.00:1.00	1.93:1.00

Return year	Number of wild summer Chinook			Number of hatchery summer Chinook			Total M/F ratio
	Males (M)	Females (F)	M/F	Males (M)	Females (F)	M/F	
2006	287	292	0.98:1.00	9	3	3.00:1.00	1.00:1.00
2007	228	276	0.83:1.00	11	8	1.38:1.00	0.84:1.00
2008	210	208	1.01:1.00	13	28	0.46:1.00	0.94:1.00
2009	261	292	0.89:1.00	2	3	0.67:1.00	0.89:1.00
2010	248	255	0.97:1.00	5	3	1.67:1.00	0.98:1.00
2011	236	262	0.90:1.00	23	7	3.29:1.00	0.96:1.00
2012	50	53	0.94:1.00	1	0	-	0.96:1.00
Total[b]	***3,596***	***3.346***	***1.07:1.00***	***1,899***	***1,257***	***1.51:1.00***	***1.19:1.00***

[a] Numbers and male to female ratios were derived from the aggregate population collected at Wells Fish Hatchery volunteer channel and left- and right-ladder traps at Wells Dam.
[b] Total values were derived from 1994-present data to exclude aggregate population bias from 1989-1993 returns.

Fecundity

Fecundities for the 2011 and 2012 summer Chinook broodstock averaged 4,578 and 4,470 eggs per female, respectively (Table 8.5). These values are close to the overall average of 4,952 eggs per female. Mean observed fecundities for the 2011 and 2012 returns were slightly below the expected fecundity of 5,000 eggs per female assumed in the broodstock protocol.

Table 8.5. Mean fecundity of wild, hatchery, and all female summer Chinook collected for broodstock at Wells Dam for the Methow/Okanogan programs, 1989-2012; NA = not available.

Return year	Mean fecundity		
	Wild	Hatchery	Total
1989*	NA	NA	4,750
1990*	NA	NA	4,838
1991*	NA	NA	4,819
1992*	NA	NA	4,804
1993*	NA	NA	4,849
1994*	NA	NA	5,907
1995*	NA	NA	4,930
1996*	NA	NA	4,870
1997	5,166	5,296	5,237
1998	5,043	4,595	4,833
1999	4,897	4,923	4,912
2000	5,122	5,206	5,170
2001	5,040	4,608	4,735
2002	5,306	5,258	5,279
2003	5,090	4,941	5,059
2004	5,130	5,118	5,130
2005	4,545	4,889	4,553
2006	4,854	4,824	4,854
2007	5,265	5,093	5,260

Return year	Mean fecundity		
	Wild	Hatchery	Total
2008	4,814	4,588	4,787
2009	5,115	-	5,115
2010	5,124	4,717	5,116
2011	4,594	3,915	4,578
2012	4,470	--	4,470
Average	***4,973***	***4,855***	***4,952***

* Individual fecundities were not assigned to females until 1997 brood.

8.2 Hatchery Rearing

Rearing History

Number of eggs taken

Based on the unfertilized egg-to-release survival standard of 81%, a total of 493,827 eggs were needed to meet the program release goal of 400,000 smolts for brood years 1989-2011. An evaluation of the program in 2012 determined that 246,913 eggs are needed to meet the revised release goal of 200,000 smolts. This revised goal will begin with brood year 2012. From 1989 through 2011, the egg take goal was reached in eight of those years (Table 8.6). From 2012 to present, the egg take goal was not reached in any year, but the numbers were close to the goal (Table 8.6).

Table 8.6. Numbers of eggs taken from summer Chinook broodstock collected at Wells Dam for the Methow/Okanogan programs, 1989-2013.

Return year	Number of eggs taken
1989	482,800
1990	464,097
1991	586,594
1992	486,260
1993	531,490
1994	595,390
1995	491,000
1996	448,000
1997	401,162
1998	389,346
1999	483,726
2000	403,268
2001	279,272
2002	466,530
2003	473,681
2004	537,210
2005	305,826

Return year	Number of eggs taken
2006	509,334
2007	549,802
2008	441,778
2009	560,602
2010	505,188
2011	488,747
2012	245,245
2013	231,136
Average (1989-2011)	***473,091***
Average (2012-present)	***238,191***

Number of acclimation days

Rearing of the 2011 brood Methow summer Chinook was similar to previous years with fish being held on well water before being transferred to Carlton Pond for final acclimation on Methow River water in March 2013 (Table 8.7). Groups of the 1994 and 1995 broods were reared for longer durations at the Methow Fish Hatchery on Methow River water.

Table 8.7. Number of days Methow summer Chinook were acclimated at Carlton Pond, brood years 1989-2011.

Brood year	Release year	Transfer date	Release date	Number of days
1989	1991	15-Mar	6-May	52
1990	1992	26-Feb	28-Apr	61
1991	1993	10-Mar	23-Apr	44
1992	1994	4-Mar	21-Apr	48
1993	1995	18-Mar	2-May	45
1994	1996	25-Sep	28-Apr	215
		19-Mar	28-Apr	40
1995	1997	22-Oct	8-Apr	168
		19-Mar	22-Apr	34
1996	1998	9-Mar	14-Apr	36
1997	1999	10-Mar	20-Apr	41
1998	2000	19-Mar	2-May	44
1999	2001	18-Mar	18-Apr	31
2000	2002	28-Mar	1-May	34
2001	2003	27-Mar	24-Apr	28
2002	2004	16-Mar	24-Apr	39
2003	2005	18-Mar	21-Apr	34

Brood year	Release year	Transfer date	Release date	Number of days
2004	2006	12-Mar	22-Apr	41
2005	2007	12-Mar	15-Apr – 8-May	34-57
2006	2008	4-7-Mar	16-Apr – 2 May	40-59
2007	2009	18-24-Mar	21-Apr	28-34
2008	2010	4-5, 8-9-Mar	4-21-Apr	33-50
2009	2011	25, 29, 31-Mar & 4-Apr	11-25-Apr	8-31
2010	2012	19-21, 24-Mar	23-24-Apr	31-37
2011	2013	13-21-Mar	15-23-Apr	25-41

Release Information

Numbers released

The 2011 brood Methow summer Chinook program achieved 110% of the 400,000 target goal with about 436,092 fish being released volitionally from the ponds on 15-23 April 2013 (Table 8.8).

Table 8.8. Numbers of Methow summer Chinook smolts released from the hatchery, brood years 1989-2011. The release target for Methow summer Chinook is 400,000 smolts.

Brood year	Release year	CWT mark rate	Number of smolts released
1989	1991	0.8529	420,000
1990	1992	0.9485	391,650
1991	1993	0.6972	540,900
1992	1994	0.9752	402,641
1993	1995	0.4623	433,375
1994	1996	0.9851	406,560
1995	1997	0.9768	353,182
1996	1998	0.9221	298,844
1997	1999	0.9884	384,909
1998	2000	0.9429	205,269
1999	2001	0.9955	424,363
2000	2002	0.9928	336,762
2001	2003	0.9902	248,595
2002	2004	0.9913	399,975
2003	2005	0.9872	354,699
2004	2006	0.9848	400,579
2005	2007	0.9897	263,723
2006	2008	0.9783	419,734
2007	2009	0.9837	433,256
2008	2010	0.9394	397,554

Brood year	Release year	CWT mark rate	Number of smolts released
2009	2011	0.9862	404,956
2010	2012	0.9962	439,000
2011	2013	0.9734	436,092
Average		***0.9365***	***382,462***

Numbers tagged

The 2011 brood Methow summer Chinook were 98.4% CWT and adipose fin-clipped (Table 8.8).

A total of 10,099 Methow summer Chinook were tagged at Eastbank Hatchery on 16-19 September 2013. These fish were tagged in raceway #8. Fish were not fed during tagging or for two days before and after tagging. Fish averaged 83 mm in length and 6.4 g at time of tagging. The most recent data indicate that a total of 40 tagged Chinook have died and seven others have shed their tags, leaving 10,052 tagged summer Chinook alive.

Table 8.9 summarizes the number of hatchery summer Chinook that have been PIT-tagged and released into the Methow River.

Table 8.9. Summary of PIT-tagging activities for Methow hatchery summer Chinook, brood years 2008-2011.

Brood year	Release year	Number of fish tagged	Number of tagged fish that died	Number of tags shed	Number of tagged fish released
2008	2010	10,100	4	0	10,096
2009	2011	5,050	17	9	5,024
2010	2012	0	0	0	0
2011	2013	0	0	0	0

Fish size and condition at release

A volitional release of yearling smolts took place between 15 and 23 April 2013. Size at release from the acclimated population was 90.9% and 96% of the respective target fork length and weight goals (Table 8.10). This brood year exceeded the target CV for length by 69.2%.

Table 8.10. Mean lengths (FL, mm), weight (g and fish/pound), and coefficient of variation (CV) of Methow summer Chinook smolts released from the hatchery, brood years 1991-2011. Size targets are provided in the last row of the table.

Brood year	Release year	Fork length (mm)		Mean weight	
		Mean	CV	Grams (g)	Fish/pound
1991	1993	152	13.6	40.3	11
1992	1994	145	16.0	37.2	12
1993	1995	154	8.6	37.1	12
1994	1996	163	8.2	48.2	9
1995	1997	141	9.6	37.0	12

Brood year	Release year	Fork length (mm)		Mean weight	
		Mean	CV	Grams (g)	Fish/pound
1996	1998	199	13.1	105.1	4
1997	1999	153	7.6	39.5	12
1998	2000	164	8.7	51.7	9
1999	2001	153	9.3	41.5	11
2000	2002	170	10.2	54.2	8
2001	2003	167	7.4	52.7	9
2002	2004	148	13.1	35.7	13
2003	2005	148	10.1	35.5	13
2004	2006	142	9.8	31.1	15
2005	2007	158	15.0	42.2	11
2006	2008	156	18.0	42.8	11
2007	2009	138	21.0	32.1	14
2008	2010	155	14.2	42.0	11
2009	2011	170	15.8	56.9	8
2010	2012	145	16.7	34.5	13
2011	2013	160	13.0	43.6	6
Average		***156***	***12.3***	***44.8***	***11***
Targets		***176***	***9.0***	***45.4***	***10***

Survival Estimates

Overall survival of the Methow summer Chinook from green (unfertilized) egg-to-release was above the standard set for the program (Table 8.11). High hatchery survival can be attributed to exceeding the survival standards set for the program at almost every life stage.

It is important to note that the Methow summer Chinook program typically receives progeny from the highest ELISA females, while the lowest titer progeny are reserved for the Okanogan program. The inability to effectively manage bacterial kidney disease at Similkameen Pond during the winter months precludes an even mix of progeny for a given brood year between the two programs. As a result, in some years, poor survival performance at any level may be more directly related to this procedure than a function of the overall program.

Table 8.11. Hatchery life-stage survival rates (%) for Methow summer Chinook, brood years 1989-2011. Survival standards or targets are provided in the last row of the table.

Brood year	Collection to spawning		Unfertilized egg-eyed	Eyed egg-ponding	30 d after ponding	100 d after ponding	Ponding to release	Transport to release	Unfertilized egg-release
	Female	Male							
1989[a]	89.8	99.5	89.9	96.7	99.7	99.4	73.3	98.5	87.0
1990[a]	93.9	99.0	84.9	97.1	81.2	80.6	97.7	99.5	84.4
1991[a]	93.1	95.5	88.2	98.0	99.4	99.1	97.5	99.6	92.2
1992[a]	96.9	99.0	87.8	98.0	99.9	99.9	90.9	98.3	82.8

Brood year	Collection to spawning		Unfertilized egg-eyed	Eyed egg-ponding	30 d after ponding	100 d after ponding	Ponding to release	Transport to release	Unfertilized egg-release
	Female	Male							
1993[a]	82.2	99.4	85.4	97.6	99.8	99.5	92.0	99.4	81.5
1994	96.1	90.0	86.6	100.0	98.1	97.4	73.1	99.1	68.3
1995	91.9	96.2	98.2	84.1	96.5	96.2	92.7	89.6	71.9
1996	95.4	98.1	83.2	100.0	97.7	96.9	86.5	89.0	66.7
1997	91.9	94.6	86.1	98.4	98.7	98.3	98.8	99.7	95.9
1998	84.0	96.2	54.1	98.0	99.4	98.9	96.6	99.9	52.7
1999	98.8	98.7	92.9	96.9	98.0	97.6	96.9	99.9	87.7
2000	90.5	96.9	89.2	98.1	98.5	98.3	94.6	94.4	83.5
2001	96.2	92.3	89.1	97.6	97.2	97.1	97.5	99.8	89.0
2002	97.1	98.1	88.3	99.9	97.7	97.5	96.7	99.9	85.7
2003	96.7	97.5	82.8	98.2	99.7	99.2	93.7	99.9	74.9
2004	93.6	98.2	84.0	97.8	99.6	99.2	98.3	98.5	74.6
2005	97.0	89.6	88.0	95.5	99.6	98.9	96.6	99.9	86.2
2006	92.9	89.5	86.3	98.3	99.6	98.7	97.2	99.5	82.4
2007	92.6	99.6	84.1	98.5	99.7	99.5	98.9	99.8	81.9
2008	99.6	97.9	91.9	99.5	99.3	98.9	98.5	99.9	90.0
2009[b]	93.6	93.5	91.0	97.7	99.7	99.2	98.8	100.0	87.9
2010[c]	96.5	100.0	91.1	100.0	96.4	96.1	95.4	99.5	86.9
2011	94.9	96.4	93.8	97.8	99.7	99.1	98.6	99.9	90.4
Average	***93.7***	***96.3***	***86.8***	***97.6***	***98.0***	***97.6***	***93.9***	***98.4***	***81.9***
Standard	***90.0***	***85.0***	***92.0***	***98.0***	***97.0***	***93.0***	***90.0***	***95.0***	***81.0***

[a] Survival rates were calculated from aggregate population collected at Wells Fish Hatchery volunteer channel and left- and right-ladder traps at Wells Dam.

[b] Survival rates were calculated from aggregate collections at Wells east fish ladder for the Methow and Okanogan/Similkameen programs. About 41% of the total fish collected were used to estimate survival rates.

[c] Survival rates were calculated from aggregate collections at Wells West Ladder for the Methow and Similkameen programs. About 71% of the total fish collected were used to estimate survival rates.

8.3 Disease Monitoring

Results of adult broodstock bacterial kidney disease (BKD) monitoring indicated that all females had ELISA values less than 0.199. Just over 6% of females had ELISA values less than 0.120, which means that none of the progeny needed to be reared at densities not to exceed 0.06 fish per pound (Table 8.12).

Table 8.12. Proportion of bacterial kidney disease (BKD) titer groups for the Methow/Okanogan summer Chinook broodstock, brood years 1997-2013. Also included are the proportions to be reared at either 0.125 fish per pound or 0.060 fish per pound.

Brood year[a]	Optical density values by titer group				Proportion at rearing densities (fish per pound, fpp)	
	Very Low (≤ 0.099)	Low (0.1-0.199)	Moderate (0.2-0.449)	High (≥ 0.450)	≤ 0.125 fpp (<0.119)	≤ 0.060 fpp (>0.120)
1997	0.6267	0.1333	0.0622	0.1778	0.6844	0.3156
1998	0.9632	0.0184	0.0123	0.0061	0.9816	0.0184
1999	0.9444	0.0198	0.0238	0.0119	0.9643	0.0357
2000	0.7476	0.0952	0.0238	0.1333	0.8000	0.2000
2001	0.9801	0.0199	0.0000	0.0000	1.0000	0.0000
2002	0.9567	0.0130	0.0130	0.0173	0.9740	0.0260
2003	0.9620	0.0127	0.0169	0.0084	0.9747	0.0253
2004	0.9585	0.0151	0.0075	0.0189	0.9736	0.0264
2005	0.9884	0.0000	0.0000	0.0116	0.9884	0.0116
2006	0.9962	0.0038	0.0000	0.0000	0.9962	0.0038
2007	0.9202	0.0266	0.0152	0.0380	0.9354	0.0646
2008	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000
2009	0.9891	0.0073	0.0037	0.0000	0.9927	0.0073
2010	0.9960	0.0040	0.0000	0.0000	1.0000	0.0000
2011	0.9766	0.0140	0.0000	0.0093	0.9860	0.0140
2012	0.9341	0.0440	0.0110	0.0110	0.9780	0.0220
2013	0.8776	0.1224	0.0000	0.0000	0.9388	0.0612
Average	***0.9304***	***0.0323***	***0.0111***	***0.0261***	***0.9511***	***0.0489***

[a] Individual ELISA samples were not collected before the 1997 brood.

8.4 Spawning Surveys

Surveys for Methow summer Chinook redds were conducted from late September to mid-November 2013 in the Methow River. Total redd counts (not peak counts) were conducted in the river (see Appendix L for more details).

Redd Counts

A total of 1,551 summer Chinook redds were counted in the Methow River in 2013 (Table 8.13). This was higher than the overall average of 679 redds.

Table 8.13. Total number of redds counted in the Methow River, 1989-2013.

Survey year	Total redd count
1989	149*
1990	418*

Survey year	Total redd count
1991	153
1992	107
1993	154
1994	310
1995	357
1996	181
1997	205
1998	225
1999	448
2000	500
2001	675
2002	2,013
2003	1,624
2004	973
2005	874
2006	1,353
2007	620
2008	599
2009	692
2010	887
2011	941
2012	960
2013	1,551
Average	***679***

* Total counts based on expanded aerial counts.

Redd Distribution

Summer Chinook redds were not evenly distributed among the seven reaches in the Methow River. Most redds (83%) were located in reaches downstream from the town of Twisp (Reaches 1-3) (Table 8.14; Figure 8.1). Few summer Chinook spawned upstream from the Winthrop Bridge in Reaches 6 and 7.

Table 8.14. Total number of summer Chinook redds counted in different reaches on the Methow River during September through early November, 2013. Reach codes are described in Table 2.11.

Survey reach	Total redd count	Percent
Methow 1 (M1)	438	28.2
Methow 2 (M2)	331	21.3
Methow 3 (M3)	510	32.9
Methow 4 (M4)	73	4.7
Methow 5 (M5)	182	11.7
Methow 6 (M6)	6	0.4

Survey reach	Total redd count	Percent
Methow 7 (M7)	11	0.7
Totals	***1,551***	***100.0***

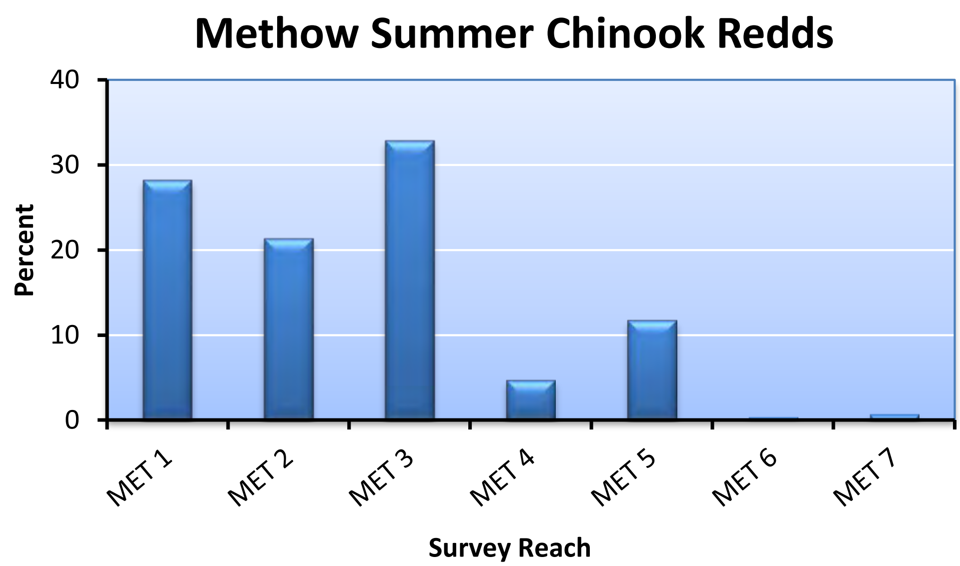


Figure 8.1. Percent of the total number of summer Chinook redds counted in different reaches on the Methow River during September through mid-November, 2013. Reach codes are described in Table 2.11.

Spawn Timing

Spawning in 2013 began the last week of September, peaked the second and third weeks of October, and ended after the second week of November (Figure 8.2). Stream temperatures in the Methow River, when spawning began, varied from 7.5-10.0°C. Peak spawning occurred in the upper reaches of the Methow River during the second week of October and in the lower reaches the following week.

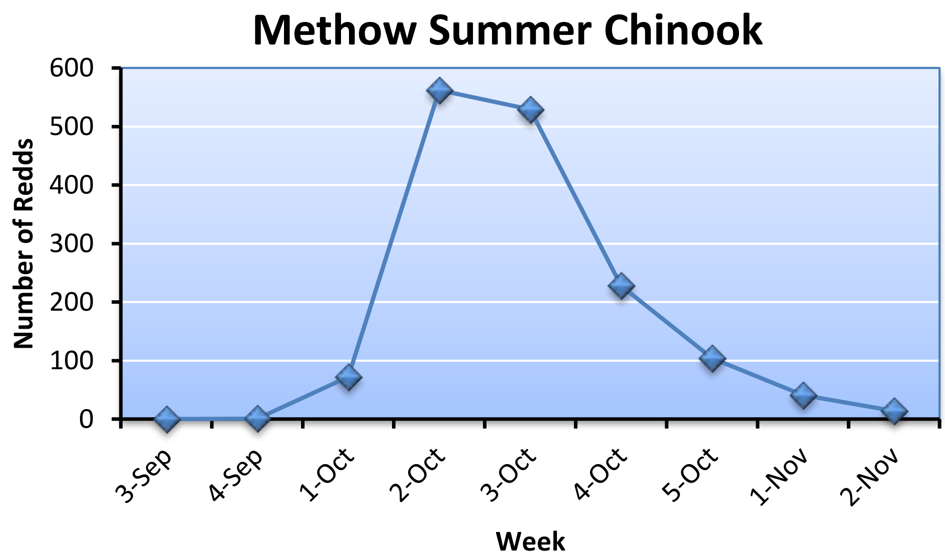


Figure 8.2. Number of new summer Chinook redds counted during different weeks in the Methow River, September through mid-November 2013.

Spawning Escapement

Spawning escapement for Methow summer Chinook was calculated as the total number of redds times the fish per redd ratio estimated from fish sampled at Wells Dam. The estimated fish per redd ratio for Methow summer Chinook in 2013 was 2.31. Multiplying this ratio by the number of redds counted in the Methow River resulted in a total spawning escapement of 3,583 summer Chinook (Table 8.15).

Table 8.15. Spawning escapements for summer Chinook in the Methow River for return years 1989-2013.

Return year	Fish/Redd	Redds	Total spawning escapement
1989*	3.30	149	492
1990*	3.40	418	1,421
1991*	3.70	153	566
1992*	4.30	107	460
1993*	3.30	154	508
1994*	3.50	310	1,085
1995*	3.40	357	1,214
1996*	3.40	181	615
1997*	3.40	205	697
1998	3.00	225	675
1999	2.20	448	986
2000	2.40	500	1,200
2001	4.10	675	2,768
2002	2.30	2,013	4,630
2003	2.42	1,624	3,930

Return year	Fish/Redd	Redds	Total spawning escapement
2004	2.25	973	2,189
2005	2.93	874	2,561
2006	2.02	1,353	2,733
2007	2.20	620	1,364
2008	3.25	599	1,947
2009	2.54	692	1,758
2010	2.81	887	2,492
2011	3.10	941	2,917
2012	3.07	960	2,947
2013	2.31	1,551	3,583
Average	***2.98***	***679***	***1,830***

* Spawning escapement was calculated using the "Modified Meekin Method" (i.e., 3.1 x jack multiplier).

8.5 Carcass Surveys

Surveys for Methow summer Chinook carcasses were conducted during late September to mid-November 2013 in the Methow River (see Appendix L for more details).

Number sampled

A total of 1,170 summer Chinook carcasses were sampled during September through mid-November in the Methow River (Table 8.16). This was higher than the overall average of 513 carcasses sampled since 1991.

Table 8.16. Numbers of summer Chinook carcasses sampled within each survey reach on the Methow River, 1991-2013. Reach codes are described in Table 2.11.

Survey year	Number of summer Chinook carcasses							
	M-1	**M-2**	**M-3**	**M-4**	**M-5**	**M-6**	**M-7**	**Total**
1991	0	12	8	4	2	0	0	**26**
1992	8	8	19	0	17	1	0	**53**
1993	19	25	14	2	5	0	0	**65**
1994[a]	43	33	20	5	13	0	0	**114**
1995	14	33	58	7	7	0	0	**119**
1996	6	30	46	5	2	0	0	**89**
1997	6	12	38	2	19	1	0	**78**
1998	90	84	99	17	30	0	0	**320**
1999	47	144	232	32	37	12	2	**506**
2000	62	118	105	9	99	5	0	**398**
2001	392	275	88	14	76	11	1	**857**
2002	551	318	518	164	219	34	10	**1,814**
2003	115	268	317	115	128	5	0	**948**
2004	40	173	187	82	92	2	1	**577**
2005	154	173	182	42	112	3	0	**666**

Survey year	Number of summer Chinook carcasses							
	M-1	M-2	M-3	M-4	M-5	M-6	M-7	Total
2006	121	148	110	56	144	3	1	**583**
2007	142	132	108	27	53	0	0	**462**
2008	64	128	197	33	57	3	0	**482**
2009	144	158	159	36	94	0	0	**591**
2010	105	180	184	38	63	5	1	**576**
2011	56	134	201	78	83	5	1	**558**
2012	127	154	169	75	82	14	7	**628**
2013	296	287	385	90	100	7	5	**1,170**
Average	***113***	***132***	***150***	***41***	***67***	***5***	***1***	***508***

[a] An additional 113 carcasses were sampled, but reach was not identified.

Carcass Distribution and Origin

Summer Chinook carcasses were not evenly distributed among reaches within the Methow River in 2013 (Table 8.15; Figure 8.3). Most of the carcasses in the Methow River were found downstream from Twisp (Reaches 1-3).

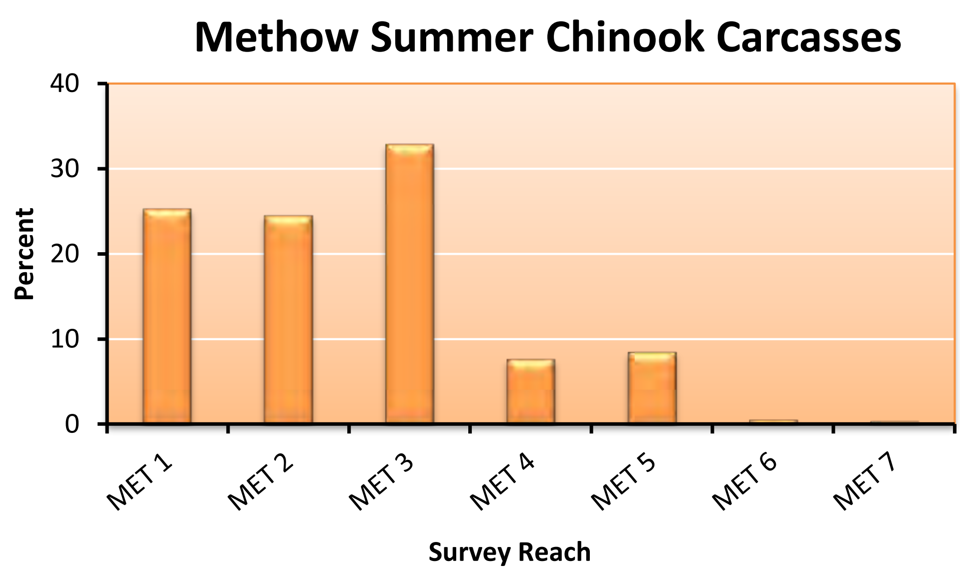


Figure 8.3. Percent of summer Chinook carcasses sampled within different reaches on the Methow River during September through mid-November, 2013. Reach codes are described in Table 2.11.

Numbers of wild and hatchery-origin summer Chinook carcasses sampled in 2013 will be available after analysis of CWTs and scales. Based on the available data (1991-2012), hatchery and wild summer Chinook carcasses were not distributed equally among the reaches in the Methow River (Table 8.17). A larger percentage of hatchery carcasses occurred in the lower reaches, while a larger percentage of wild summer Chinook carcasses occurred in upstream reaches (Figure 8.4).

Table 8.17. Numbers of wild and hatchery summer Chinook carcasses sampled within different reaches on the Methow River, 1991-2012.

Survey year	Origin	Survey reach							Total
		M-1	M-2	M-3	M-4	M-5	M-6	M-7	
1991	Wild	0	12	8	4	2	0	0	**26**
	Hatchery	0	0	0	0	0	0	0	**0**
1992	Wild	8	8	19	0	17	1	0	**53**
	Hatchery	0	0	0	0	0	0	0	**0**
1993	Wild	11	18	9	0	3	0	0	**41**
	Hatchery	8	7	5	2	2	0	0	**24**
1994	Wild	23	18	9	5	10	0	0	**65**
	Hatchery	20	15	11	0	3	0	0	**49**
1995	Wild	7	9	33	7	6	0	0	**62**
	Hatchery	7	24	25	0	1	0	0	**57**
1996	Wild	1	23	35	4	2	0	0	**65**
	Hatchery	5	7	11	1	0	0	0	**24**
1997	Wild	5	8	31	1	17	0	0	**62**
	Hatchery	1	4	7	1	2	1	0	**16**
1998	Wild	42	48	71	11	25	0	0	**197**
	Hatchery	48	36	28	6	5	0	0	**123**
1999	Wild	32	87	130	15	24	4	2	**294**
	Hatchery	15	57	102	17	13	8	0	**212**
2000	Wild	25	85	85	8	83	3	0	**289**
	Hatchery	37	33	20	1	16	2	0	**109**
2001	Wild	62	118	56	10	70	11	1	**328**
	Hatchery	330	157	32	4	6	0	0	**529**
2002	Wild	138	177	380	140	197	34	9	**1,075**
	Hatchery	413	141	138	24	22	0	1	**739**
2003	Wild	33	146	188	76	92	3	0	**538**
	Hatchery	82	122	129	39	36	2	0	**410**
2004	Wild	16	120	155	65	78	1	0	**435**
	Hatchery	24	53	32	17	14	1	1	**142**
2005	Wild	62	99	133	33	107	3	0	**437**
	Hatchery	92	74	49	9	5	0	0	**229**
2006	Wild	52	82	67	44	109	2	1	**357**
	Hatchery	69	66	43	12	35	1	0	**226**
2007	Wild	35	58	59	16	40	0	0	**208**
	Hatchery	107	74	49	11	13	0	0	**254**
2008	Wild	13	62	146	27	52	2	0	**302**
	Hatchery	51	66	51	6	5	1	0	**180**
2009	Wild	45	87	103	27	84	0	0	**346**

Survey year	Origin	Survey reach							Total
		M-1	M-2	M-3	M-4	M-5	M-6	M-7	
	Hatchery	99	71	56	9	10	0	0	**245**
2010	Wild	33	79	101	24	53	5	1	**296**
	Hatchery	72	101	83	14	10	0	0	**280**
2011	Wild	21	56	87	54	56	5	1	**280**
	Hatchery	35	78	114	24	27	0	0	**278**
2012	Wild	54	53	96	58	74	13	7	**355**
	Hatchery	73	101	73	17	8	1	0	**273**
Average	***Wild***	***33***	***66***	***91***	***29***	***55***	***4***	***1***	***6,111***
	Hatchery	***72***	***59***	***48***	***10***	***11***	***1***	***0***	***4,399***

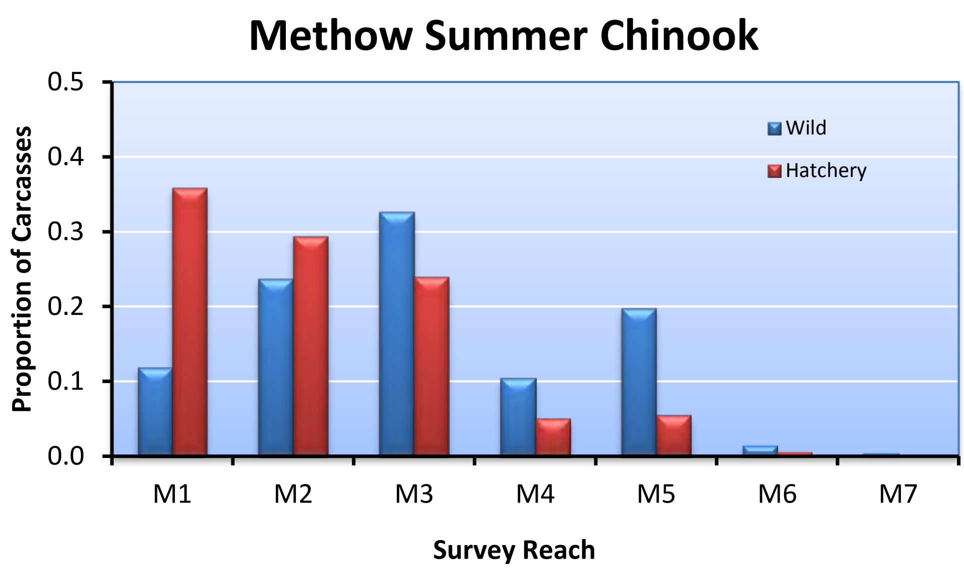


Figure 8.4. Distribution of wild and hatchery produced carcasses in different reaches on the Methow River, 1993-2012. Reach codes are described in Table 2.11.

Sampling Rate

Overall, 33% of the total spawning escapement of summer Chinook in the Methow River basin was sampled in 2013 (Table 8.18). Sampling rates among survey reaches varied from 20 to 53%.

Table 8.18. Number of redds and carcasses, total spawning escapement, and sampling rates for summer Chinook in the Methow River basin, 2013. Reach codes are described in Table 2.11.

Survey reach	Total number of redds	Total number of carcasses	Total spawning escapement	Sampling rate
Methow 1 (M1)	438	296	1,012	0.29
Methow 2 (M2)	331	287	765	0.38
Methow 3 (M3)	510	385	1,178	0.33

Survey reach	Total number of redds	Total number of carcasses	Total spawning escapement	Sampling rate
Methow 4 (M4)	73	90	169	0.53
Methow 5 (M5)	182	100	420	0.24
Methow 6 (M6)	6	7	14	0.51
Methow 7 (M7)	11	5	25	0.20
Total	***1,551***	***1,170***	***3,583***	***0.33***

Length Data

Mean lengths (POH, cm) of male and female summer Chinook carcasses sampled during surveys on the Methow River in 2013 are provided in Table 8.19. The average size of males and females sampled in the Methow River were 61 cm and 69 cm, respectively.

Table 8.19. Mean lengths (postorbital-to-hypural length; cm) and standard deviations (in parentheses) of male and female summer Chinook carcasses sampled in different reaches on the Methow River, 2013. Reach codes are described in Table 2.11.

Stream/watershed	Mean length (cm)	
	Male	Female
Methow 1 (M1)	58.7 (10.5)	69.0 (5.0)
Methow 2 (M2)	60.0 (10.2)	68.9 (5.1)
Methow 3 (M3)	63.7 (10.4)	69.0 (5.1)
Methow 4 (M4)	61.3 (9.9)	69.9 (3.9)
Methow 5 (M5)	63.4 (9.8)	69.9 (4.3)
Methow 6 (M6)	70.8 (6.1)	69.0 (5.7)
Methow 7 (M7)	57.0 (0.0)	68.0 (4.2)
Total	***61.0 (10.4)***	***69.1 (4.9)***

8.6 Life History Monitoring

Life history characteristics of Methow summer Chinook were assessed by examining carcasses on spawning grounds and fish collected or examined at broodstock collection sites, and by reviewing tagging data and fisheries statistics.

Migration Timing

Migration timing of hatchery and wild Methow/Okanogan summer Chinook was determined from broodstock data collected at Wells Dam. Counting of summer/fall Chinook at Wells Dam occurs from 29 June to 15 November. Broodstock collection at the Dam occurs from early July (week 27) to mid-September (week 37) (Table 2.1). Based on broodstock sampling in 2013, both wild and hatchery summer Chinook arrived at Wells Dam about the same time (Table 8.20). This was true throughout most of the migration period. This pattern was also observed when data were pooled for the 2007-2013 survey period.

Table 8.20. The week that 10%, 50% (median), and 90% of the wild and hatchery summer Chinook salmon passed Wells Dam, 2007-2013. The average week is also provided. Migration timing is based on collection of summer Chinook broodstock at Wells Dam.

Survey year	Origin	Methow/Okanogan Summer Chinook Migration Time (week)				Sample size
		10 Percentile	50 Percentile	90 Percentile	Mean	
2007	Wild	27	30	34	30	485
	Hatchery	27	30	33	30	433
2008	Wild	28	30	34	30	542
	Hatchery	28	30	36	31	884
2009	Wild	27	29	34	30	585
	Hatchery	27	29	33	29	708
2010	Wild	27	29	33	29	377
	Hatchery	27	29	32	29	801
2011	Wild	30	32	36	32	516
	Hatchery	30	32	35	33	1,223
2012	Wild	28	30	34	31	192
	Hatchery	28	31	34	31	591
2013	Wild	27	30	33	30	229
	Hatchery	27	30	33	30	282
Average	***Wild***	***27***	***30***	***34***	***30***	***2,926***
	Hatchery	***28***	***31***	***35***	***31***	***4,922***

Age at Maturity

Because hatchery summer Chinook are released after one year of rearing and natural-origin summer Chinook migrate primarily as age-0 fish, total ages will differ between hatchery and natural-origin Chinook (see Hillman et al. 2011). Therefore, in this section, we evaluated age at maturity by comparing differences in salt (ocean) ages between the two groups.

Most of the wild and hatchery summer Chinook sampled during the period 1993-2012 in the Methow River were salt age-3 fish (Table 8.21; Figure 8.5). A higher percentage of salt age-4 wild Chinook returned to the basin than did salt age-4 hatchery Chinook. In contrast, a higher proportion of salt age-1 and 2 hatchery fish returned than did salt age-1 and 2 wild fish. Thus, a higher percentage of wild fish returned at an older age than did hatchery fish.

Table 8.21. Proportions of wild and hatchery summer Chinook of different salt (ocean) ages sampled on spawning grounds in the Methow River, 1993-2012.

Sample year	Origin	Salt age						Sample size
		1	2	3	4	5	6	
1993	Wild	0.05	0.08	0.76	0.11	0.00	0.00	38
	Hatchery	0.00	1.00	0.00	0.00	0.00	0.00	20
1994	Wild	0.03	0.26	0.51	0.20	0.00	0.00	101
	Hatchery	0.00	0.07	0.93	0.00	0.00	0.00	111

Sample year	Origin	Salt age						Sample size
		1	2	3	4	5	6	
1995	Wild	0.00	0.09	0.70	0.20	0.00	0.00	54
	Hatchery	0.02	0.04	0.44	0.51	0.00	0.00	55
1996	Wild	0.04	0.30	0.54	0.13	0.00	0.00	56
	Hatchery	0.00	0.05	0.50	0.41	0.05	0.00	22
1997	Wild	0.00	0.22	0.51	0.27	0.00	0.00	55
	Hatchery	0.13	0.06	0.56	0.25	0.00	0.00	16
1998	Wild	0.09	0.38	0.45	0.09	0.00	0.00	188
	Hatchery	0.02	0.52	0.41	0.04	0.00	0.00	123
1999	Wild	0.01	0.51	0.43	0.05	0.00	0.00	252
	Hatchery	0.00	0.07	0.90	0.03	0.00	0.00	210
2000	Wild	0.01	0.09	0.75	0.16	0.00	0.00	257
	Hatchery	0.10	0.16	0.62	0.11	0.00	0.00	97
2001	Wild	0.02	0.20	0.72	0.07	0.00	0.00	292
	Hatchery	0.10	0.60	0.26	0.04	0.00	0.00	526
2002	Wild	0.01	0.17	0.61	0.21	0.00	0.00	1,003
	Hatchery	0.01	0.41	0.57	0.01	0.00	0.00	734
2003	Wild	0.01	0.11	0.50	0.37	0.00	0.00	478
	Hatchery	0.02	0.03	0.90	0.04	0.00	0.00	399
2004	Wild	0.00	0.09	0.35	0.56	0.00	0.00	394
	Hatchery	0.07	0.28	0.30	0.35	0.00	0.00	141
2005	Wild	0.11	0.74	0.14	0.01	0.00	0.00	410
	Hatchery	0.06	0.26	0.65	0.02	0.00	0.00	220
2006	Wild	0.00	0.02	0.33	0.64	0.00	0.00	356
	Hatchery	0.01	0.19	0.50	0.30	0.00	0.00	164
2007	Wild	0.03	0.09	0.24	0.59	0.05	0.00	208
	Hatchery	0.07	0.09	0.75	0.09	0.01	0.00	213
2008	Wild	0.01	0.14	0.71	0.13	0.01	0.00	298
	Hatchery	0.10	0.45	0.30	0.15	0.00	0.00	138
2009	Wild	0.00	0.11	0.41	0.48	0.00	0.00	317
	Hatchery	0.17	0.26	0.53	0.04	0.00	0.00	242
2010	Wild	0.01	0.16	0.59	0.24	0.00	0.00	269
	Hatchery	0.01	0.69	0.29	0.02	0.00	0.00	247
2011	Wild	0.02	0.09	0.60	0.30	0.00	0.00	255
	Hatchery	0.16	0.10	0.74	0.01	0.00	0.00	261
2012	Wild	0.03	0.24	0.53	0.21	0.0	0.0	315
	Hatchery	0.09	0.71	0.16	0.04	0.0	0.0	243
Average	***Wild***	***0.02***	***0.20***	***0.52***	***0.25***	***0.00***	***0.00***	***280***
	Hatchery	***0.06***	***0.30***	***0.52***	***0.12***	***0.00***	***0.00***	***209***

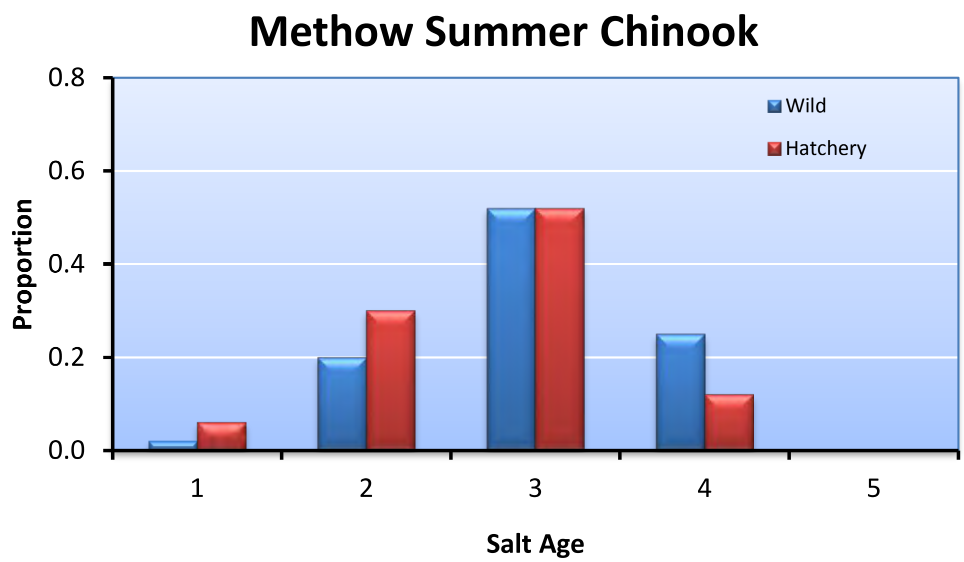


Figure 8.5. Proportions of wild and hatchery summer Chinook of different salt (ocean) ages sampled at broodstock collection sites and on spawning grounds in the Methow River for the combined years 1993-2012.

Size at Maturity

On average, hatchery summer Chinook were about 5 cm smaller than wild summer Chinook sampled in the Methow River basin (Table 8.22). This is likely because a higher percentage of wild fish returned as salt age-4 fish than did hatchery fish. Future analyses will compare sizes of hatchery and wild fish of the same age groups and sex.

Table 8.22. Mean lengths (POH; cm) and variability statistics for wild and hatchery summer Chinook sampled in the Methow River basin, 1993-2012; SD = 1 standard deviation.

Survey year	Origin	Sample size	Summer Chinook length (POH; cm)			
			Mean	SD	Minimum	Maximum
1993[a]	Wild	41	74	9	51	89
	Hatchery	24	62	8	36	80
1994[a]	Wild	112	69	8	35	87
	Hatchery	114	67	5	43	77
1995	Wild	62	74	6	52	88
	Hatchery	56	73	7	46	85
1996	Wild	64	70	11	34	91
	Hatchery	23	72	7	58	85
1997	Wild	62	76	9	35	90
	Hatchery	16	68	15	33	87
1998	Wild	196	67	10	38	97
	Hatchery	123	63	10	37	87

Survey year	Origin	Sample size	Summer Chinook length (POH; cm)			
			Mean	SD	Minimum	Maximum
1999	Wild	292	66	8	43	99
	Hatchery	212	66	7	26	89
2000	Wild	288	74	8	37	89
	Hatchery	109	68	12	24	87
2001	Wild	328	67	10	29	86
	Hatchery	529	63	10	31	87
2002	Wild	1,075	70	8	37	94
	Hatchery	739	67	9	33	87
2003	Wild	538	71	8	35	88
	Hatchery	410	69	8	35	89
2004	Wild	435	73	7	38	89
	Hatchery	142	65	12	34	85
2005	Wild	437	69	8	45	86
	Hatchery	229	64	9	36	79
2006	Wild	438	73	7	35	92
	Hatchery	149	69	8	38	91
2007	Wild	249	72	11	33	89
	Hatchery	219	69	9	22	84
2008	Wild	384	69	8	30	90
	Hatchery	210	63	15	23	86
2009	Wild	363	71	9	32	88
	Hatchery	228	63	12	30	83
2010	Wild	296	69	8	33	90
	Hatchery	280	62	9	39	81
2011	Wild	280	70	9	31	89
	Hatchery	278	64	11	26	82
2012	Wild	355	68	8	36	85
	Hatchery	273	59	9	21	81
Pooled	***Wild***	***6,295***	***71***	***9***	***29***	***99***
	Hatchery	***4,363***	***66***	***10***	***21***	***91***

[a] These years include sizes reported in annual reports. The data contained in the WDFW database do not include all these data.

Contribution to Fisheries

Most of the harvest on hatchery-origin Methow summer Chinook occurred in the Ocean (Table 8.23). Ocean harvest has made up 13% to 99% of all hatchery-origin Methow summer Chinook harvested. Brood years 1989, 1998, and 2006 provided the largest harvests, while brood years 1996 and 1999 provided the lowest.

Table 8.23. Estimated number and percent (in parentheses) of hatchery-origin Methow summer Chinook captured in different fisheries, brood years 1989-2007.

Brood year	Ocean fisheries	Columbia River Fisheries			Total
		Tribal	Commercial (Zones 1-5)	Recreational (sport)	
1989	1,041 (52)	884 (44)	0 (0)	66 (3)	1,991
1990	53 (56)	41 (44)	0 (0)	0 (0)	94
1991	10 (17)	49 (83)	0 (0)	0 (0)	59
1992	17 (55)	14 (45)	0 (0)	0 (0)	31
1993	14 (58)	8 (33)	2 (8)	0 (0)	24
1994	153 (81)	34 (18)	1 (1)	1 (1)	189
1995	77 (99)	0 (0)	1 (1)	0 (0)	78
1996	12 (92)	1 (8)	0 (0)	0 (0)	13
1997	214 (88)	7 (3)	0 (0)	21 (9)	242
1998	1,739 (83)	101 (5)	14 (1)	234 (11)	2,088
1999	2 (13)	13 (87)	0 (0)	0 (0)	15
2000	357 (71)	88 (17)	27 (5)	33 (7)	505
2001	319 (52)	97 (16)	43 (7)	160 (26)	619
2002	271 (48)	96 (17)	61 (11)	137 (24)	565
2003	58 (58)	17 (17)	7 (7)	18 (18)	100
2004	132 (49)	55 (20)	16 (6)	68 (25)	271
2005	295 (54)	137 (25)	50 (9)	66 (12)	548
2006	1,110 (48)	811 (35)	100 (4)	314 (13)	2,335
2007	201 (62)	54 (17)	16 (5)	54 (17)	325
Average	***320 (60)***	***132 (28)***	***18 (3)***	***62 (9)***	***531***

Straying

Stray rates were determined by examining CWTs recovered on spawning grounds within and outside the Methow River basin. Targets for strays based on return year (recovery year) and brood year should be less than 5%.

Few hatchery-origin Methow summer Chinook have strayed into basins outside the Methow (Table 8.24). Although hatchery-origin Methow summer Chinook have strayed into the Wenatchee River basin, Okanogan River basin, Entiat River basin, Chelan tailrace, and Hanford Reach, they have made up less than 1% of the spawning escapement within those areas.

Table 8.24. Number and percent of spawning escapements within other non-target basins that consisted of hatchery-origin Methow summer Chinook, return years 1994-2010. For example, for return year 2002, 0.4% of the summer Chinook escapement in the Okanogan River basin consisted of hatchery-origin Methow summer Chinook. Percent strays should be less than 5%.

Return year	Wenatchee		Okanogan		Chelan		Entiat		Hanford Reach	
	Number	%	Number	%	Number	%	Number	%	Number	%
1994	0	0.0	72	1.8	-	-	-	-	-	-
1995	0	0.0	9	0.3	-	-	-	-	-	-
1996	0	0.0	0	0.0	-	-	-	-	-	-
1997	0	0.0	0	0.0	-	-	-	-	-	-
1998	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
1999	0	0.0	6	0.2	0	0.0	0	0.0	7	0.0
2000	0	0.0	3	0.1	0	0.0	0	0.0	0	0.0
2001	0	0.0	0	0.0	0	0.0	0	0.0	7	0.0
2002	0	0.0	54	0.4	0	0.0	0	0.0	0	0.0
2003	0	0.0	1	0.0	6	1.4	0	0.0	0	0.0
2004	0	0.0	7	0.1	3	0.7	0	0.0	0	0.0
2005	0	0.0	24	0.3	0	0.0	0	0.0	0	0.0
2006	0	0.0	12	0.1	0	0.0	0	0.0	0	0.0
2007	0	0.0	17	0.4	2	1.1	1	0.4	0	0.0
2008	0	0.0	12	0.2	0	0.0	0	0.0	0	0.0
2009	0	0.0	14	0.2	0	0.0	0	0.0	0	0.0
2010	6	0.1	44	0.7	22	2.0	0	0.0	0	0.0
Total	***6***	***0.0***	***275***	***0.3***	***33***	***0.5***	***1***	***0.0***	***14***	***0.0***

Based on brood year analyses, on average, about 4.8% of the returns have strayed into non-target spawning areas, falling within the acceptable level of less than 5% (Table 8.25). Depending on brood year, percent strays into non-target spawning areas have ranged from 0-11.9%. Few (<2% on average) have strayed into non-target hatchery programs.

Table 8.25. Number and percent of hatchery-origin Methow summer Chinook that homed to target spawning areas and the target hatchery program, and number and percent that strayed to non-target spawning areas and non-target hatchery programs, by brood years 1989-2007. Percent stays should be less than 5%.

Brood year	Homing				Straying			
	Target stream		Target hatchery		Non-target streams		Non-target hatcheries	
	Number	%	Number	%	Number	%	Number	%
1989	773	55.7	459	33.0	81	5.8	76	5.5
1990	199	70.6	81	28.7	0	0.0	2	0.7
1991	82	65.6	43	34.4	0	0.0	0	0.0
1992	68	63.0	40	37.0	0	0.0	0	0.0
1993	25	65.8	10	26.3	3	7.9	0	0.0

Brood year	Homing				Straying			
	Target stream		Target hatchery		Non-target streams		Non-target hatcheries	
	Number	%	Number	%	Number	%	Number	%
1994	419	79.7	94	17.9	13	2.5	0	0.0
1995	126	81.8	28	18.2	0	0.0	0	0.0
1996	57	93.4	4	6.6	0	0.0	0	0.0
1997	379	93.8	7	1.7	18	4.5	0	0.0
1998	1,653	94.7	32	1.8	60	3.4	0	0.0
1999	18	100.0	0	0.0	0	0.0	0	0.0
2000	239	93.0	4	1.6	14	5.4	0	0.0
2001	272	88.3	6	1.9	29	9.4	1	0.3
2002	315	95.2	4	1.2	12	3.6	0	0.0
2003	131	99.2	1	0.8	0	0.0	0	0.0
2004	194	85.5	6	2.6	27	11.9	0	0.0
2005	373	90.5	13	3.2	23	5.6	3	0.7
2006	1,314	91.4	15	1.0	109	7.6	0	0.0
2007	116	98.3	2	1.7	0	0.0	0	0.0
Total	***6,753***	***83.6***	***849***	***10.5***	***389***	***4.8***	***82***	***1.0***

Genetics

Genetic studies were conducted to investigate relationships among temporally replicated collections of summer Chinook from the Wenatchee River, Methow River, and Okanogan River in the upper Columbia River basin (Kassler et al. 2011; the entire report is appended as Appendix K). Samples from the Eastbank Hatchery – Wenatchee stock, Eastbank Hatchery – Methow/Okanogan (MEOK) stock, and Wells Hatchery were also included in the analysis. Samples of natural and hatchery-origin summer Chinook were analyzed and compared to determine if the supplementation program has affected the genetic structure of these populations. The study also calculated the effective number of breeders for collection locations of natural and hatchery-origin summer Chinook from 1993 and 2008.

In general, population differentiation was not observed among the temporally replicated collection locations. A single collection from the Okanogan River (1993) was the only collection showing statistically significant differences. The effective number of breeders was not statistically different from the early collection in 1993 in comparison to the late collection in 2008. Overall, these analyses revealed a lack of differentiation among the temporal replicates from the same locations and among the collection from different locations, suggesting the populations have been homogenized or that there has been substantial gene flow among populations. Additional comparisons among summer-run and fall-run Chinook populations in the upper Columbia River were conducted to determine if there was any differentiation between Chinook with different run timing. These analyses revealed pairwise F_{ST} values that were less than 0.01 for the collections of summer Chinook to collections of fall Chinook from Hanford Reach, lower Yakima River, Priest Rapids, and Umatilla. Collections of fall Chinook from Crab

Creek, Lyons Ferry Hatchery, Marion Drain, and Snake River had pairwise F_{ST} values that were higher in comparison to the collections of summer Chinook. The consensus clustering analysis did not provide good statistical support to the groupings, but did show relationships among collections based on geographic proximity. Overall the summer and fall run Chinook that have historically been spawned together were not differentiated while fall Chinook from greater geographic distances were differentiated.

Proportion of Natural Influence

Another method for assessing the genetic risk of a supplementation program is to determine the influence of the hatchery and natural environments on the adaptation of the composite population. This is estimated by the proportion of natural-origin fish in the hatchery broodstock (pNOB) and the proportion of hatchery-origin fish in the natural spawning escapement (pHOS). The ratio pNOB/(pHOS+pNOB) is the Proportion of Natural Influence (PNI). The larger the ratio (PNI), the greater the strength of selection in the natural environment relative to that of the hatchery environment. In order for the natural environment to dominate selection, PNI should be greater than 0.50, and important integrated populations should have a PNI of at least 0.67 (HSRG/WDFW/NWIFC 2004).

For brood years 1993-2003, the PNI was generally less than 0.67 (Table 8.26). However, since brood year 2003, the PNI has generally been greater than 0.67.

Table 8.26. Proportionate natural influence (PNI) of the Methow summer Chinook supplementation program for brood years 1989-2012. PNI was calculated as the proportion of naturally produced Chinook in the hatchery broodstock (pNOB) divided by the proportion of hatchery Chinook on the spawning grounds (pHOS) plus pNOB. NOS = number of natural-origin Chinook on the spawning grounds; HOS = number of hatchery-origin Chinook on the spawning grounds; NOB = number of natural-origin Chinook collected for broodstock; and HOB = number of hatchery-origin Chinook included in hatchery broodstock.

Brood year	Spawners			Broodstock			PNI
	NOS	HOS	pHOS	NOB	HOB	pNOB	
1989	492	0	0.00	1,297	312	0.81	1.00
1990	1,421	0	0.00	828	206	0.80	1.00
1991	566	0	0.00	924	314	0.75	1.00
1992	460	0	0.00	297	406	0.42	1.00
1993	309	199	0.39	681	388	0.64	0.62
1994	573	512	0.47	341	244	0.58	0.55
1995	563	651	0.54	173	240	0.42	0.44
1996	424	191	0.31	287	155	0.65	0.68
1997	512	185	0.27	197	265	0.43	0.61
1998	432	243	0.36	153	211	0.42	0.54
1999	537	449	0.46	224	289	0.44	0.49
2000	838	362	0.30	164	337	0.33	0.52
2001	1,052	1,716	0.62	12	345	0.03	0.05
2002	2,505	2,125	0.46	247	241	0.51	0.53
2003	2,224	1,706	0.43	381	101	0.79	0.65

Brood year	Spawners			Broodstock			PNI
	NOS	HOS	pHOS	NOB	HOB	pNOB	
2004	1,609	580	0.26	506	16	0.97	0.79
2005	1,672	889	0.35	391	9	0.98	0.74
2006	2,039	694	0.25	500	10	0.98	0.80
2007	764	600	0.44	456	17	0.96	0.69
2008	1,293	654	0.34	359	86	0.81	0.70
2009	1,093	665	0.38	503	4	0.99	0.72
2010	1,326	1,166	0.47	484	8	0.98	0.68
2011	1,503	1,414	0.48	467	26	0.95	0.66
2012	1,593	1,354	0.46	98	1	0.99	0.68
Average	***1,075***	***681***	***0.34***	***415***	***176***	***0.69***	***0.67***

Natural and Hatchery Replacement Rates

Natural replacement rates (NRR) were calculated as the ratio of natural-origin recruits (NOR) to the parent spawning population (spawning escapement). Natural-origin recruits are naturally produced (wild) fish that survive to contribute to harvest (directly or indirectly), to broodstock, and to spawning grounds. We do not account for fish that died in route to the spawning grounds (migration mortality) or died just before spawning (pre-spawn mortality) (see Appendix B in Hillman et al. 2012). We calculated NORs with and without harvest. NORs without harvest include all returning fish that either returned to the basin or were collected as wild broodstock. NORs with harvest include all fish harvested and are based on a brood year harvest rates from the hatchery program. For brood years 1989-2006, NRR for summer Chinook in the Methow averaged 1.15 (range, 0.10-4.90) if harvested fish were not include in the estimate and 2.27 (range, 0.18-10.79) if harvested fish were included in the estimate (Table 8.27). NRRs for more recent brood years will be calculated as soon as all tag recoveries and sampling rates have been loaded into the database.

Hatchery replacement rates (HRR) are the hatchery adult-to-adult returns and were calculated as the ratio of hatchery-origin recruits (HOR) to the parent broodstock collected. These rates should be greater than the NRRs and greater than or equal to 5.30 (the calculated target value in Murdoch and Peven 2005). HRRs exceeded NRRs in 11 out of the 18 years of data, regardless if harvest was or was not included in the estimate (Table 8.27). Hatchery replacement rates for Methow summer Chinook have exceeded the estimated target value of 5.30 in three of the 18 years of data, regardless if harvest was or was not included in the estimate.

Table 8.27. Broodstock collected, spawning escapements, natural and hatchery-origin recruits (NOR and HOR), and natural and hatchery replacement rates (NRR and HRR; with and without harvest) for wild summer Chinook in the Methow River basin, brood years 1989-2006.

Brood year	Broodstock Collected	Spawning Escapement	Harvest not included				Harvest included			
			HOR	NOR	HRR	NRR	HOR	NOR	HRR	NRR
1989	202	492	1,389	631	6.88	1.28	3,380	1,550	16.73	3.15
1990	202	1,421	282	979	1.40	0.69	376	1,311	1.86	0.92

Brood year	Broodstock Collected	Spawning Escapement	Harvest not included				Harvest included			
			HOR	NOR	HRR	NRR	HOR	NOR	HRR	NRR
1991	266	566	125	288	0.47	0.51	184	427	0.69	0.75
1992	214	460	108	614	0.50	1.33	139	792	0.65	1.72
1993	234	508	38	431	0.16	0.85	62	703	0.26	1.38
1994	260	1,085	526	545	2.02	0.50	715	743	2.75	0.68
1995	242	1,214	154	1,201	0.64	0.99	232	1,809	0.96	1.49
1996	220	615	61	445	0.28	0.72	74	541	0.34	0.88
1997	209	697	404	1,494	1.93	2.14	646	2,383	3.09	3.42
1998	235	675	1,745	3,308	7.43	4.90	3,833	7,286	16.31	10.79
1999	222	986	18	2,863	0.08	2.90	33	5,253	0.15	5.33
2000	222	1,200	257	808	1.16	0.67	762	2,405	3.43	2.00
2001	223	2,768	308	2,877	1.38	1.04	927	8,718	4.16	3.15
2002	222	4,630	331	1,072	1.49	0.23	896	2,921	4.04	0.63
2003	224	3,930	132	397	0.59	0.10	232	698	1.04	0.18
2004	223	2,189	227	1,646	1.02	0.75	498	3,618	2.23	1.65
2005	225	2,561	412	1,159	1.83	0.45	960	2,708	4.27	1.06
2006	236	2,733	1,438	1,714	6.09	0.63	3,773	4,499	15.99	1.65
Average	***227***	***1,596***	***442***	***1,248***	***1.96***	***1.15***	***985***	***2,687***	***4.39***	***2.27***

Smolt-to-Adult Survivals

Smolt-to-adult survival ratios (SARs) were calculated as the number of hatchery adult recaptures divided by the number of tagged hatchery smolts released. SARs were based on CWT returns. For the available brood years, SARs have ranged from 0.00008 to 0.01876 for hatchery summer Chinook in the Methow River basin (Table 8.28).

Table 8.28. Smolt-to-adult ratios (SARs) for Methow summer Chinook, brood years 1989-2007.

Brood year	Number of tagged smolts released[a]	Estimated adult captures[b]	SAR
1989	358,237	2,869	0.00801
1990	371,483	359	0.00097
1991	377,097	129	0.00034
1992	392,636	138	0.00035
1993	200,345	62	0.00031
1994	400,488	710	0.00177
1995	344,974	229	0.00066
1996	289,880	73	0.00025
1997	380,430	642	0.00169
1998	202,559	3,799	0.01876
1999	422,473	33	0.00008

Brood year	Number of tagged smolts released[a]	Estimated adult captures[b]	SAR
2000	334,337	761	0.00228
2001	246,159	923	0.00375
2002	310,846	893	0.00287
2003	353,495	232	0.00066
2004	394,490	495	0.00125
2005	262,496	958	0.00365
2006	417,795	3,765	0.00901
2007	426,188	442	0.00104
Average	***341,390***	***922***	***0.00304***

[a] Includes all tag codes and CWT released fish (CWT + Ad Clip fish and CWT-only fish).

[b] Includes estimated recoveries (spawning ground, hatcheries, harvest, etc.) and observed recoveries if estimated recoveries were unavailable.

8.7 ESA/HCP Compliance

Broodstock Collection

Summer Chinook adults collected at Wells Dam are used for both the Methow and Okanogan supplementation programs. Per the 2011 broodstock collection protocol, 216 natural-origin (adipose fin present) adults were targeted for collection between 1 July and 15 September at the West Ladder of Wells Dam (an additional 311 NOR's were targeted by the CCT purse seine as an evaluation of collection methodology for a combined Methow/Okanogan broodstock total of 527 adults). Actual collections occurred between 2 July and 10 September and totaled 528 summer Chinook (including 103 from CCT purse seine efforts). ESA Permit 1347 provides authorization to collect Methow and Okanogan summer Chinook at Wells Dam three days per week and up to 16 hours per day from July through November. During 2011, broodstock collection activities were accomplished within the allowable trapping days authorized under ESA Permit 1347.

Collection of Methow and Okanogan summer Chinook broodstock at Wells Dam occurred concurrently with collection of summer steelhead for the Wells steelhead program authorized under ESA Section 10 Permit 1395. Encounters with steelhead and spring Chinook during Methow and Okanogan summer Chinook broodstock collections did not result in takes that were outside those authorized in Permit 1347 and in Permit 1395 for the Wells Steelhead program. Steelhead encountered during summer Chinook collections that were not required for steelhead broodstock were passed at the trap site and were not physically handled. Any spring Chinook encountered during summer Chinook broodstock activities were also passed without handling.

Hatchery Rearing and Release

The 2011 brood Methow/Okanogan summer Chinook reared throughout their juvenile life-stages at Eastbank Fish Hatchery and the Carlton Acclimation pond without incident (see Section 8.2). The 2011 brood smolt release totaled 436,092 summer Chinook, representing 109% of the production objective and was compliant with the 10% overage allowable in ESA Section 10 Permit 1347.

Hatchery Effluent Monitoring

Per ESA Permits 1196, 1347, 1395, 18118, 18119, and 18121, permit holders shall monitor and report hatchery effluents in compliance with applicable National Pollution Discharge Elimination Systems (NPDES) (EPA 1999) permit limitations. There was one NPDES violation reported at PUD Hatchery facilities during the period 1 January 2013 through 31 December 2013. NPDES monitoring and reporting for Chelan PUD Hatchery Programs during 2013 are provided in Appendix F.

Spawning Surveys

Summer Chinook spawning ground surveys conducted in the Methow River basin during 2013 were consistent with ESA Section 10 Permit No. 1347. Because of the difficulty of quantifying the level of take associated with spawning ground surveys, the Permit does not specify a take level associated with these activities, even though it does authorize implementation of spawning ground surveys. Therefore, no take levels are reported. However, to minimize potential effects to established redds, wading was restricted to the extent practical, and extreme caution was used to avoid established redds when wading was required.

SECTION 9: OKANOGAN/SIMILKAMEEN SUMMER CHINOOK

The Colville Tribes began monitoring the Okanogan/Similkameen summer Chinook program in 2013. Their monitoring results will be published in annual reports to Bonneville Power Administration (BPA). The purpose of retaining this section is to provide readers with monitoring data collected with Chelan PUD funding through brood year 2012. Thus, this section tracks the status and life histories of summer Chinook up to and including brood year 2012. Results from monitoring brood year 2013 and beyond will be included in annual reports to BPA.

9.1 Broodstock Sampling

Summer Chinook broodstock for the Okanogan/Similkameen and Methow programs was typically collected at the East and West Ladders of Wells Dam. In 2012, broodstock was also collected at the mouth of the Okanogan River via purse seine. Refer to Section 8.1 for information on the origin, age and length, sex ratios, and fecundity of summer Chinook broodstock collected at Wells Dam prior to 2013.

9.2 Hatchery Rearing

Rearing History

Number of eggs taken

Based on the unfertilized egg-to-release survival standard of 81%, a total of 711,111 eggs were required to meet the program release goal of 576,000 smolts through the 2011 brood year. An evaluation of the program in 2012 determined that 205,134 eggs were needed to meet the revised release goal of 166,569 smolts. This revised goal began with brood year 2012. From 1989 through 2012, the egg take goal was reached in 13 of those years (Table 9.1).

Table 9.1. Numbers of eggs taken from summer Chinook broodstock collected at Wells Dam for the Okanogan program, 1989-2012.

Return year	Number of eggs taken
1989	724,200
1990	696,144
1991	879,892
1992	729,389
1993	797,234
1994	893,086
1995	736,500
1996	672,000
1997	601,744
1998	584,018
1999	725,589
2000	645,403
2001	418,907

Return year	Number of eggs taken
2002	718,599
2003	710,521
2004	805,814
2005	452,928
2006	757,350
2007	824,703
2008	662,668
2009	840,902
2010	726,979
2011	683,419
2012	201,295
Average	***687,054***

Number of acclimation days

Summer Chinook were released volitionally from Similkameen Pond as yearling smolts. Transfer dates, release dates, and the number of acclimation days for Okanogan summer Chinook are shown in Table 9.2.

Table 9.2. Number of days Okanogan summer Chinook broods were acclimated at Similkameen and Bonaparte ponds, brood years 1989-2011.

Brood year	Release year	Rearing facility	Transfer date	Release date	Number of days
1989	1991	Similkameen	29-Oct	7-May	190
1990	1992	Similkameen	5-Nov	25-Apr	171
1991	1993	Similkameen	1-Nov	9-Apr	159
1992	1994	Similkameen	2-Nov	1-Apr	150
			26-Feb	1-Apr	34
1993	1995	Similkameen	24-Oct	1-Apr	159
			24-Feb	1-Apr	36
1994	1996	Similkameen	30-Oct	6-Apr	158
			14-Mar	6-Apr	23
1995	1997	Similkameen	1-Oct	1-Apr	182
1996	1998	Similkameen	10-Oct	15-Mar	156
1997	1999	Similkameen	7-Oct	19-Apr	194
1998	2000	Similkameen	5-Oct	19-Apr	196
1999	2001	Similkameen	5-Oct	18-Apr	195
2000	2002	Similkameen	10-Oct	8-Apr	180
2001	2003	Similkameen	1-Oct	29-Apr	210

Brood year	Release year	Rearing facility	Transfer date	Release date	Number of days
2002	2004	Similkameen	9-Nov	23-Apr	165
2003	2005	Similkameen	19-Oct	28-Apr	191
2004	2006	Similkameen	26-Oct	23-Apr	179
2005	2007	Bonaparte	6-Nov	11-Apr	156
		Similkameen	25-Oct	18-Apr – 9-May	179-200
2006	2008	Similkameen	15-17-Oct	16-Apr – 7-May	182-205
2007	2009	Bonaparte	3-4-Nov	10-22-Apr	157-170
		Similkameen	20-24-Oct	14-Apr – 9-May	172-201
2008	2010	Bonaparte	2-4-Nov	19-Apr – 5-May	167-185
		Similkameen	26-28-Oct	19-Apr – 14-May	176-201
2009	2011	Bonaparte	8-9-Nov	12-Apr	155-156
		Similkameen	25-27-Oct	13-Apr – 5-May	169-193
2010	2012	Bonaparte	No program	No program	No program
		Similkameen	25-27 Oct	16-Apr – 7-May	173-196
2011	2013	Bonaparte	No program	No program	No program
		Similkameen	23-26 Oct	16-Apr – 8-May	175-197

Release Information

Numbers released

The 2011 Okanogan summer Chinook program achieved 107.3% of the 576,000 target goal with about 627,978 fish being released volitionally into the Similkameen River (Table 9.3).

Table 9.3. Numbers of Okanogan summer Chinook smolts released from the Similkameen and Bonaparte ponds, brood years 1989-2011; NA = not available. The release target for Okanogan summer Chinook is 576,000 smolts.

Brood year	Release year	Rearing facility	CWT mark rate	Number of smolts released
1989	1991	Similkameen	0.5732	352,600
1990	1992	Similkameen	0.6800	540,000
1991	1993	Similkameen	0.5335	675,500
1992	1994	Similkameen	0.9819	548,182
1993	1995	Similkameen	0.6470	586,000
1994	1996	Similkameen	0.4176	536,299
1995	1997	Similkameen	0.9785	587,000
1996	1998	Similkameen	0.9769	507,913
1997	1999	Similkameen	0.9711	589,591
1998	2000	Similkameen	0.9825	293,191

Brood year	Release year	Rearing facility	CWT mark rate	Number of smolts released
1999	2001	Similkameen	0.9689	630,463
2000	2002	Similkameen	0.9928	532,453
2001	2003	Similkameen	0.9877	26,642
2002	2004	Similkameen	0.9204	388,589
2003	2005	Similkameen	0.9929	579,019
2004	2006	Similkameen	0.9425	703,359
2005	2007	Bonaparte	0	0 (assumed)
		Similkameen	0.9862	275,919
2006	2008	Bonaparte	NA	NA
		Similkameen	0.9878	604,035
2007	2009	Bonaparte	0.9920	102,099
		Similkameen	0.9914	513,039
2008	2010	Bonaparte	0.9947	175,729
		Similkameen	0.9947	343,628
2009	2011	Bonaparte	0.9981	151,382
		Similkameen	0.9953	524,521
2010	2012	Bonaparte	No program	No program
		Similkameen	0.9886	617,950
2011	2013	Bonaparte	No program	No program
		Similkameen	0.9956	627,978
Average		***Bonaparte***	***0.7462***	***143,070***
		Similkameen	***0.8907***	***503,647***

Numbers tagged

The 2011 brood Okanogan summer Chinook from the Similkameen facility was 99.6% CWT and adipose fin-clipped (Table 9.3). Table 9.4 summarizes the number of hatchery summer Chinook that have been PIT-tagged and released into the Okanogan River basin. No fish from the 2012 brood year were PIT tagged.

Table 9.4. Summary of PIT-tagging activities for Okanogan hatchery summer Chinook, brood years 2008-2011.

Brood year	Release year	Number of fish tagged	Number of tagged fish that died	Number of tags shed	Number of tagged fish released
2008	2010	5,700 (high density)	1,169	0	4,531
		5,700 (low density)	1,407	0	4,293
2009	2011	5,100	11	0	5,089
2010	2012	0	0	0	0
2011	2013	5,100	64	0	5,036

Fish size and condition at release

Size at release of the Similkameen population was 75.0% and 61.5% of the target fork length and weight, respectively. The target CV for fork length was exceeded by 5.6% (Table 9.5). There was no Bonaparte program for the 2013 release year.

Table 9.5. Mean lengths (FL, mm), weight (g and fish/pound), and coefficient of variation (CV) of Okanogan summer Chinook smolts released from the hatchery, brood years 1989-2011. Size targets are provided in the last row of the table.

Brood year	Release year	Fork length (mm)		Mean weight	
		Mean	CV	Grams (g)	Fish/pound
1989	1991	-	-	41.3	11
1990	1992	143	9.5	37.8	12
1991	1993	125	15.5	22.4	20
1992	1994	120	15.4	20.7	22
1993	1995	132	-	23.2	20
1994	1996	136	16.0	29.6	15
1995	1997	137	8.2	32.8	14
1996	1998	127	12.8	26.2	17
1997	1999	144	9.9	36.0	13
1998	2000	148	5.9	41.0	11
1999	2001	141	15.7	35.4	13
2000	2002	121	13.4	20.4	22
2001	2003	132	8.2	25.7	18
2002	2004	119	13.4	20.8	22
2003	2005	133	10.6	28.9	16
2004	2006	132	9.9	29.8	15
2005	2007	132	9.6	25.9	18
2006	2008	120	12.3	20.9	22
2007	2009	124	12.6	21.9	21
2008	2010	140	12.3	35.1	13
2009	2011	132	11.6	24.7	18
2010	2012	125	10.1	23.2	20
2011	2013	132	9.5	27.9	16
Average		***132***	***11.5***	***28.3***	***17***
Targets		***176***	***9.0***	***45.4***	***10***

Survival Estimates

Overall survival of Okanogan summer Chinook from green (unfertilized) egg to release was above the standard set for the program (Table 9.6). High survival can be attributed to exceeding the survival standards set for the program at all stages, with the exception of unfertilized egg-eyed egg falling just short of its target survival. Currently, it is unknown if gamete viability is sex biased or is uniform between sexes and more influenced by between-year environmental variations.

Table 9.6. Hatchery life-stage survival rates (%) for Okanogan summer Chinook, brood years 1989-2011. Survival standards or targets are provided in the last row of the table.

Brood year	Rearing facility	Collection to spawning		Unfertilized egg-eyed	Eyed egg-ponding	30 d after ponding	100 d after ponding	Ponding to release	Transport to release	Unfertilized egg-release
		Female	Male							
1989[a]	Similkameen	89.8	99.5	89.9	96.7	99.7	99.4	73.3	57.4	48.7
1990[a]	Similkameen	93.9	99.0	84.9	97.1	81.2	80.6	97.7	98.6	77.6
1991[a]	Similkameen	93.1	95.5	88.2	97.1	99.4	99.1	98.4	97.1	76.8
1992[a]	Similkameen	96.9	99.0	87.0	98.0	99.9	99.9	91.7	92.6	75.2
1993[a]	Similkameen	82.2	99.4	85.4	97.6	99.8	99.5	92.0	90.2	73.5
1994	Similkameen	96.1	90.0	86.6	100.0	98.1	97.4	73.1	89.8	60.1
1995	Similkameen	91.9	96.2	98.2	84.1	96.5	96.2	92.7	98.2	79.7
1996	Similkameen	95.4	98.1	83.2	100.0	97.7	96.9	86.5	92.5	75.6
1997	Similkameen	91.9	94.6	86.1	98.4	98.7	98.3	98.8	99.4	98.0
1998	Similkameen	84.0	96.2	54.1	98.0	99.4	98.9	96.6	99.6	50.2
1999	Similkameen	98.8	98.7	92.9	96.9	98.0	97.6	96.9	99.0	86.9
2000	Similkameen	90.5	96.9	89.2	98.5	98.2	98.0	93.6	97.2	82.5
2001	Similkameen	96.2	92.3	89.1	97.6	99.7	99.5	7.4	11.9	6.4
2002	Similkameen	97.1	98.1	89.8	98.0	99.7	99.5	51.6	52.2	54.1
2003	Similkameen	96.7	97.5	86.8	97.6	99.3	98.5	98.0	98.8	81.5
2004	Similkameen	93.6	98.2	84.0	97.6	99.6	99.3	97.8	98.8	80.2
	Bonaparte	93.6	98.2	84.0	97.6	99.6	99.3	97.9	98.9	80.3
2005	Similkameen	97.0	89.6	88.0	99.5	99.5	99.0	93.5	94.6	81.8
	Bonaparte	97.0	89.6	88.0	99.5	99.5	99.0	0.0	0.0	0.0
2006	Similkameen	92.9	89.5	86.3	98.3	99.6	99.3	94.1	95.5	79.8
2007	Similkameen	92.6	99.6	80.8	99.1	99.5	99.1	97.0	98.1	77.7
	Bonaparte	92.6	99.6	80.8	99.1	99.5	99.1	95.6	96.7	76.6
2008	Similkameen	97.9	99.6	91.2	96.8	99.7	99.3	89.8	90.5	79.3
	Bonaparte	97.9	99.6	91.2	96.8	99.7	99.3	86.9	87.8	76.7
2009[b]	Similkameen	93.6	93.5	91.0	98.2	99.7	99.5	97.8	98.6	87.4
	Bonaparte	93.6	93.5	91.0	98.2	99.7	99.5	74.8	75.3	66.8
2010	Similkameen	96.5	100.0	91.2	99.9	97.4	97.1	93.3	96.3	85.0
	Bonaparte	NA	NA	NA	NA	NA	NA	NA	NA	NA
2011	Similkameen	100.0	90.2	95.9	98.3	99.8	99.1	97.8	98.8	92.2
	Bonaparte	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mean	***Similkameen***	***93.9***	***96.1***	***86.9***	***97.5***	***98.3***	***97.9***	***87.4***	***88.9***	***73.5***
	Bonaparte	***94.9***	***96.1***	***87.0***	***98.2***	***99.6***	***99.2***	***71.0***	***71.7***	***60.1***
Standard		***90.0***	***85.0***	***92.0***	***98.0***	***97.0***	***93.0***	***90.0***	***95.0***	***81.0***

[a] Survival rates were calculated from the aggregate population collected at Wells Fish Hatchery volunteer channel and left- and right-ladder traps at Wells Dam.

[b] Survival rates were calculated from aggregate collections at Wells east fish ladder for the Methow and Okanogan/Similkameen programs. About 59% of the total fish collected were used to estimate survival rates.

9.3 Disease Monitoring

Rearing of the 2011 brood Okanogan summer Chinook was similar to previous years with fish being held on well water before being transferred for final acclimation on the Similkameen. The Similkameen group was transferred in late October. Fish acclimating at the Similkameen facility were diagnosed with bacterial cold water disease and external fungus in November and were treated. No additional disease-related problems were noted before the fish were released.

Results of adult broodstock bacterial kidney disease (BKD) monitoring for Methow/Okanogan summer Chinook are shown in Table 8.12 in Section 8.3.

9.4 Spawning Surveys

Surveys for Okanogan/Similkameen summer Chinook redds were conducted from late September to mid-November in the Okanogan and Similkameen rivers. Total redd counts (not peak counts) were conducted in the rivers.

Redd Counts

During the survey period 1989 through 2012, the number of summer Chinook redds in the Okanogan River basin averaged 1,819 and ranged from 110 to 6,025 (Table 9.7).

Table 9.7. Total number of redds counted in the Okanogan River basin, 1989-2012.

Survey year	Number of summer Chinook redds		
	Okanogan River	Similkameen River	Total count
1989	151	370	521
1990	99	147	246
1991	64	91	155
1992	53	57	110
1993	162	288	450
1994	375*	777	1,152
1995	267*	616	883
1996	116	419	535
1997	158	486	644
1998	88	276	364
1999	369	1,275	1,644
2000	549	993	1,542
2001	1,108	1,540	2,648
2002	2,667	3,358	6,025
2003	1,035	378	1,413
2004	1,327	1,660	2,987
2005	1,611	1,423	3,034
2006	2,592	1,666	4,258
2007	1,301	707	2,008
2008	1,146	1,000	2,146

Survey year	Number of summer Chinook redds		
	Okanogan River	Similkameen River	Total count
2009	1,672	1,298	2,970
2010	1,011	1,107	2,118
2011	1,714	1,409	3,123
2012	1,613	1,066	2,679
Average	***937***	***934***	***1,819***

* Reach-expanded aerial counts.

Spawning Escapement

Spawning escapement for Okanogan/Similkameen summer Chinook was calculated as the total number of redds times the fish per redd ratio estimated from fish sampled at Wells Dam. During the survey period 1989 through 2012, the summer Chinook spawning escapement within the Okanogan River basin averaged 4,987 and ranged from 473 to 13,857 (Table 9.8).

Table 9.8. Spawning escapements for summer Chinook in the Okanogan and Similkameen rivers for return years 1989-2012.

Return year	Fish/Redd	Spawning escapement		
		Okanogan	Similkameen	Total
1989*	3.30	498	1,221	1,719
1990*	3.40	337	500	837
1991*	3.70	237	337	574
1992*	4.30	228	245	473
1993*	3.30	535	950	1,485
1994*	3.50	1,313	2,720	4,033
1995*	3.40	908	2,094	3,002
1996*	3.40	394	1,425	1,819
1997*	3.40	537	1,652	2,189
1998	3.00	264	828	1,092
1999	2.20	812	2,805	3,617
2000	2.40	1,318	2,383	3,701
2001	4.10	4,543	6,314	10,857
2002	2.30	6,134	7,723	13,857
2003	2.42	2,505	915	3,420
2004	2.25	2,986	3,735	6,721
2005	2.93	4,720	4,169	8,889
2006	2.02	5,236	3,365	8,601
2007	2.20	2,862	1,555	4,417
2008	3.25	3,725	3,250	6,975
2009	2.54	4,247	3,297	7,544
2010	2.81	2,841	3,111	5,952

Return year	Fish/Redd	Spawning escapement		
		Okanogan	Similkameen	Total
2011	3.10	5,313	4,368	9,681
2012	3.07	4,952	3,273	8,225
Average	*3.01*	*2,394*	*2,593*	*4,987*

* Spawning escapement was calculated using the "Modified Meekin Method" (i.e., 3.1 x jack multiplier).

9.5 Carcass Surveys

Surveys for summer Chinook carcasses were conducted during late September to mid-November in the Okanogan and Similkameen rivers.

Number sampled

During the survey period 1993 through 2012, the number of summer Chinook carcasses sampled in the Okanogan River basin averaged 1,205 and ranged from 115 to 2,460 (Table 9.9). In all years, most were sampled in the upper Okanogan River and lower Similkameen River (Table 9.9).

Table 9.9. Numbers of summer Chinook carcasses sampled within each survey reach in the Okanogan River basin, 1993-2012. Reach codes are described in Table 2.11.

Survey year	Number of summer Chinook carcasses								
	Okanogan						Similkameen		Total
	O-1	O-2	O-3	O-4	O-5	O-6	S-1	S-2	
1993[a]	0	2	3	0	23	13	73	1	115
1994[b]	0	4	4	0	27	5	318	60	418
1995	0	0	2	0	30	0	239	15	286
1996	0	0	0	2	5	2	226	0	235
1997	0	0	2	0	9	3	225	1	240
1998	0	1	8	1	7	7	340	4	368
1999	0	0	3	2	23	53	766	48	895
2000	0	2	20	15	47	16	727	41	868
2001	0	26	75	10	127	112	1,141	105	1,596
2002	10	32	83	35	204	572	1,265	259	2,460
2003[c]	0	0	28	0	17	243	596	381	1,265
2004	0	4	31	24	146	283	1,392	298	2,178
2005	0	8	93	37	371	434	731	276	1,950
2006	4	3	31	16	120	291	508	106	1,079
2007	2	0	55	1	453	519	658	29	1,717
2008	4	10	40	36	248	665	859	157	2,019
2009	2	7	31	32	348	500	703	150	1,773
2010	3	10	30	42	241	352	627	148	1,453
2011	0	0	55	14	361	478	753	114	1,775

Survey year	Number of summer Chinook carcasses								
	Okanogan						Similkameen		Total
	O-1	O-2	O-3	O-4	O-5	O-6	S-1	S-2	
2012	1	0	56	15	256	537	495	54	1,414
Average	***1***	***5***	***33***	***14***	***153***	***254***	***632***	***112***	***1,205***

[a] 25 additional carcasses were sampled on the Similkameen and 46 on the Okanogan without any reach designation.
[b] One additional carcasses was sampled on the Similkameen without any reach designation.
[c] 793 carcasses were sampled on the Similkameen before initiation of spawning (pre-spawn mortality) and an additional 40 carcasses were sampled on the Okanogan. The cause of the high mortality (*Ichthyophthirius multifilis* and *Flavobacterium columnarae*) was exacerbated by high river temperatures.

Carcass Distribution and Origin

Based on the available data (1991-2012), most fish, regardless of origin, were found in Reach 1 on the Similkameen River (Driscoll Channel to Oroville Bridge) (Table 9.10). However, a slightly larger percentage of hatchery fish were found in reaches on the Similkameen River than were wild fish (Figure 9.1). In contrast, a larger percentage of wild fish were found in reaches on the Okanogan River.

Table 9.10. Numbers of wild and hatchery summer Chinook carcasses sampled within different reaches in the Okanogan River basin, 1993-2012.

Survey year	Origin	Survey reach								Total
		O-1	O-2	O-3	O-4	O-5	O-6	S-1	S-2	
1993	Wild	0	0	3	0	13	4	48	1	69
	Hatchery	0	2	0	0	10	9	25	0	46
1994	Wild	0	0	1	0	7	1	113	22	144
	Hatchery	0	4	3	0	20	4	205	38	274
1995	Wild	0	0	1	0	10	0	66	4	81
	Hatchery	0	0	1	0	20	0	173	11	205
1996	Wild	0	0	0	1	3	1	53	0	58
	Hatchery	0	0	0	1	2	1	173	0	177
1997	Wild	0	0	1	0	0	3	83	0	87
	Hatchery	0	0	1	0	9	0	142	1	153
1998	Wild	0	1	3	1	6	5	162	4	182
	Hatchery	0	0	5	0	1	2	178	0	186
1999	Wild	0	0	0	0	9	23	293	9	334
	Hatchery	0	0	3	2	14	30	473	39	561
2000	Wild	0	0	8	8	24	11	189	4	244
	Hatchery	0	2	12	7	23	5	538	37	624
2001	Wild	0	10	23	5	67	42	390	54	591
	Hatchery	0	16	52	5	60	70	751	51	1,005
2002	Wild	6	14	20	10	81	212	340	72	755
	Hatchery	4	18	63	25	123	360	925	187	1,705
2003	Wild	0	0	13	0	12	152	231	124	532
	Hatchery	0	0	15	0	5	91	365	257	733

Survey year	Origin	Survey reach								Total
		O-1	O-2	O-3	O-4	O-5	O-6	S-1	S-2	
2004	Wild	0	2	19	19	108	225	1,125	260	1,758
	Hatchery	0	2	12	5	38	58	267	38	420
2005	Wild	0	5	51	21	256	364	531	176	1,404
	Hatchery	0	3	42	16	115	70	200	100	546
2006	Wild	2	2	22	10	105	247	370	73	831
	Hatchery	2	1	9	6	15	44	138	33	248
2007	Wild	1	0	30	1	284	322	405	20	1,063
	Hatchery	1	0	25	0	169	197	253	9	654
2008	Wild	2	1	14	11	107	324	347	41	847
	Hatchery	2	9	26	25	141	341	512	116	1,172
2009	Wild	2	3	13	14	189	347	330	75	973
	Hatchery	0	4	18	18	159	153	373	75	800
2010	Wild	1	5	19	18	154	180	329	69	775
	Hatchery	2	5	11	24	87	172	296	79	676
2011	Wild	0	0	21	4	201	362	216	19	823
	Hatchery	0	0	34	10	160	116	537	95	952
2012	Wild	0	0	18	9	133	427	206	23	816
	Hatchery	1	0	38	6	123	110	288	31	597
Average	***Wild***	***1***	***2***	***14***	***7***	***88***	***163***	***291***	***53***	***618***
	Hatchery	***1***	***3***	***19***	***8***	***65***	***92***	***341***	***60***	***587***

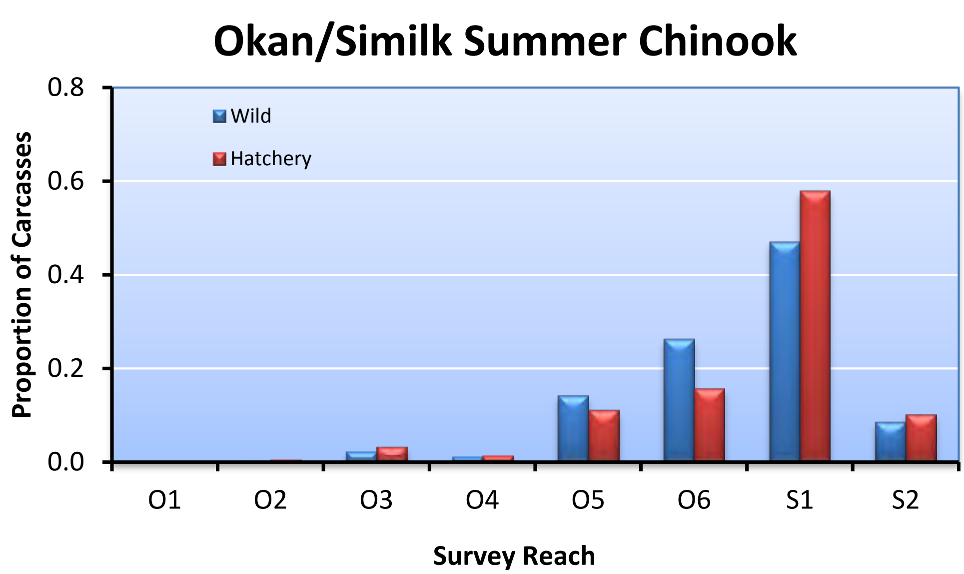


Figure 9.1. Distribution of wild and hatchery produced carcasses in different reaches in the Okanogan River basin, 1993-2012. Reach codes are described in Table 2.11.

9.6 Life History Monitoring

Life history characteristics of Okanogan/Similkameen summer Chinook were assessed by examining carcasses on spawning grounds and fish collected or examined at broodstock collection sites, and by reviewing tagging data and fisheries statistics.

Migration Timing

Migration timing for Okanogan/Similkameen summer Chinook is described in Section 8.6.

Age at Maturity

Because hatchery summer Chinook are released after one year of rearing and natural-origin summer Chinook migrate primarily as age-0 fish, total ages will differ between hatchery and natural-origin Chinook (see Hillman et al. 2011). Therefore, in this section, we evaluated age at maturity by comparing differences in salt (ocean) ages between the two groups.

Most of the wild and hatchery summer Chinook sampled during the period 1993-2012 in the Okanogan River basin were salt age-3 fish (Table 9.11; Figure 9.2). A higher percentage of salt age-4 wild Chinook returned to the basin than did salt age-4 hatchery Chinook. In contrast, a higher proportion of salt age-1 and 2 hatchery fish returned than did salt age-1 and 2 wild fish. Thus, a higher percentage of wild fish returned at an older age than did hatchery fish.

Table 9.11. Proportions of wild and hatchery summer Chinook of different salt (ocean) ages sampled on spawning grounds in the Okanogan River basin, 1993-2012.

Sample year	Origin	Salt age					Sample size
		1	2	3	4	5	
1993	Wild	0.00	0.21	0.70	0.10	0.00	63
	Hatchery	0.00	0.98	0.02	0.00	0.00	44
1994	Wild	0.02	0.13	0.54	0.31	0.00	134
	Hatchery	0.02	0.09	0.89	0.00	0.00	290
1995	Wild	0.00	0.19	0.59	0.22	0.00	68
	Hatchery	0.01	0.15	0.36	0.49	0.00	200
1996	Wild	0.03	0.28	0.61	0.08	0.00	36
	Hatchery	0.02	0.22	0.56	0.20	0.01	174
1997	Wild	0.04	0.27	0.53	0.15	0.00	73
	Hatchery	0.00	0.02	0.87	0.11	0.00	148
1998	Wild	0.02	0.35	0.52	0.11	0.00	151
	Hatchery	0.05	0.50	0.23	0.22	0.00	185
1999	Wild	0.00	0.20	0.64	0.16	0.00	268
	Hatchery	0.00	0.12	0.85	0.02	0.00	552
2000	Wild	0.03	0.15	0.62	0.20	0.00	216
	Hatchery	0.12	0.02	0.76	0.10	0.00	545
2001	Wild	0.02	0.18	0.76	0.04	0.00	531
	Hatchery	0.05	0.88	0.02	0.05	0.00	1,005
2002	Wild	0.02	0.15	0.62	0.21	0.00	692

Sample year	Origin	Salt age					Sample size
		1	2	3	4	5	
	Hatchery	0.01	0.19	0.80	0.01	0.00	1,681
2003	Wild	0.03	0.18	0.63	0.17	0.00	477
	Hatchery	0.03	0.06	0.79	0.12	0.00	653
2004	Wild	0.01	0.17	0.26	0.55	0.00	1,528
	Hatchery	0.01	0.32	0.45	0.23	0.00	382
2005	Wild	0.00	0.12	0.79	0.08	0.01	1,281
	Hatchery	0.02	0.06	0.77	0.15	0.00	530
2006	Wild	0.00	0.02	0.53	0.45	0.00	830
	Hatchery	0.05	0.18	0.24	0.53	0.00	139
2007	Wild	0.02	0.07	0.12	0.78	0.02	1,061
	Hatchery	0.22	0.30	0.42	0.05	0.01	559
2008	Wild	0.01	0.32	0.63	0.04	0.01	846
	Hatchery	0.02	0.60	0.36	0.02	0.00	1,108
2009	Wild	0.01	0.03	0.81	0.15	0.00	926
	Hatchery	0.05	0.05	0.86	0.03	0.00	783
2010	Wild	0.00	0.16	0.45	0.39	0.00	708
	Hatchery	0.02	0.65	0.27	0.06	0.00	619
2011	Wild	0.01	0.07	0.82	0.10	0.00	787
	Hatchery[a]	0.16	0.08	0.76	0.00	0.00	873
2012	Wild	0.02	0.23	0.41	0.34	0.00	750
	Hatchery	0.05	0.55	0.35	0.05	0.00	532
Average	***Wild***	***0.01***	***0.17***	***0.58***	***0.23***	***0.00***	***571***
	Hatchery	***0.05***	***0.30***	***0.53***	***0.12***	***0.00***	***550***

[a] There was one salt age-6 hatchery fish that was not included in this table.

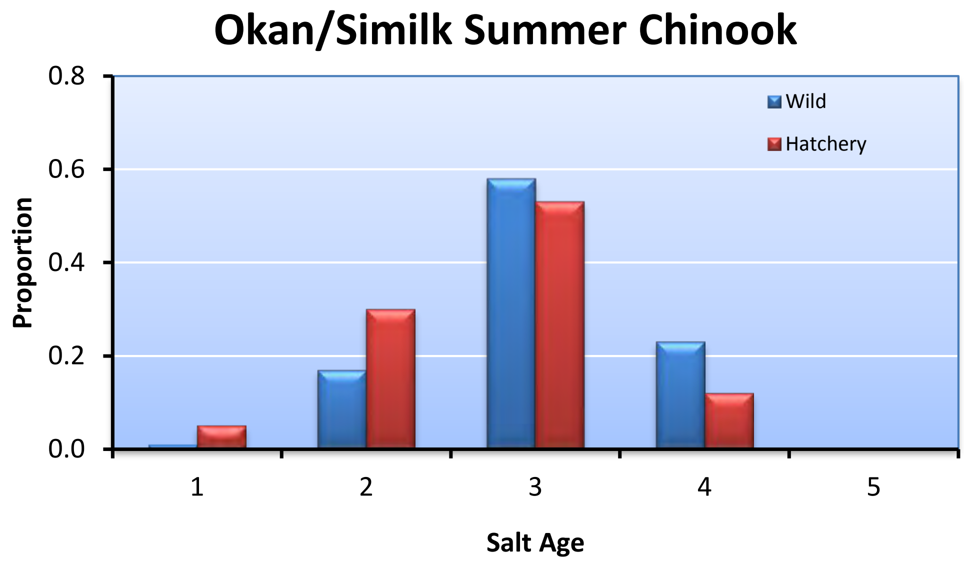


Figure 9.2. Proportions of wild and hatchery summer Chinook of different salt (ocean) ages sampled at broodstock collection sites and on spawning grounds in the Okanogan River basin for the combined years 1993-2012.

Size at Maturity

For the period 1993 through 2012, on average, hatchery summer Chinook were about 2 cm smaller than wild summer Chinook sampled in the Okanogan River basin (Table 9.12). This is likely because a higher percentage of wild fish returned as salt age-4 fish than did hatchery fish.

Table 9.12. Mean lengths (POH; cm) and variability statistics for wild and hatchery summer Chinook sampled in the Okanogan River basin, 1993-2012; SD = 1 standard deviation.

Sample year	Origin	Sample size	Summer Chinook length (POH; cm)			
			Mean	SD	Minimum	Maximum
1993[a]	Wild	69	73	7	52	90
	Hatchery	59	62	6	47	75
1994	Wild	136	71	7	40	86
	Hatchery	268	69	8	30	84
1995	Wild	81	75	6	54	87
	Hatchery	201	73	8	39	87
1996	Wild	22	68	14	22	85
	Hatchery	26	75	8	60	88
1997	Wild	87	70	7	44	84
	Hatchery	148	74	6	48	88
1998	Wild	182	70	8	45	94
	Hatchery	186	65	12	30	87
1999	Wild	333	73	7	56	91
	Hatchery	559	71	7	23	84

Sample year	Origin	Sample size	Summer Chinook length (POH; cm)			
			Mean	SD	Minimum	Maximum
2000	Wild	241	70	10	32	86
	Hatchery	624	69	12	24	92
2001	Wild	578	67	9	26	86
	Hatchery	997	61	8	32	90
2002	Wild	755	69	9	28	91
	Hatchery	1705	70	8	33	87
2003	Wild	532	68	9	30	93
	Hatchery	733	69	10	26	90
2004	Wild	1756	71	10	33	94
	Hatchery	417	66	9	41	92
2005	Wild	1403	66	7	41	99
	Hatchery	546	68	8	31	85
2006	Wild	831	72	6	31	91
	Hatchery	248	71	9	33	87
2007	Wild	1063	75	9	27	99
	Hatchery	654	64	13	30	87
2008	Wild	847	65	9	29	86
	Hatchery	1172	65	8	32	89
2009	Wild	973	70	7	28	89
	Hatchery	799	70	9	35	86
2010	Wild	775	71	9	43	90
	Hatchery	676	64	10	22	87
2011	Wild	823	68	7	29	89
	Hatchery	952	66	11	26	86
2012	Wild	816	67	10	27	93
	Hatchery	597	63	9	23	86
Pooled	***Wild***	***12,303***	***70***	***8***	***22***	***99***
	Hatchery	***11,567***	***68***	***9***	***22***	***92***

[a] This year includes sizes reported in the annual report. The data contained in the WDFW database do not include all these data.

Contribution to Fisheries

Most of the harvest on hatchery-origin Okanogan/Similkameen summer Chinook occurred in the Ocean (Table 9.13). Ocean harvest has made up 37-100% of all hatchery-origin Okanogan/Similkameen summer Chinook harvested. Brood years 1997, 1998, 2000, 2004, and 2006 provided the largest harvests, while brood year 1996 provided the lowest.

Table 9.13. Estimated number and percent (in parentheses) of hatchery-origin Okanogan/Similkameen summer Chinook captured in different fisheries, brood years 1989-2007.

Brood year	Ocean fisheries	Columbia River Fisheries			Total
		Tribal	Commercial (Zones 1-5)	Recreational (sport)	
1989	2,371 (80)	553 (19)	0 (0)	42 (1)	2,966
1990	355 (89)	34 (8)	0 (0)	12 (3)	401
1991	220 (86)	37 (14)	0 (0)	0 (0)	257
1992	422 (91)	28 (6)	2 (0)	10 (2)	462
1993	24 (80)	6 (20)	0 (0)	0 (0)	30
1994	374 (92)	23 (6)	2 (0)	7 (2)	406
1995	650 (93)	9 (1)	12 (2)	25 (4)	696
1996	5 (100)	0 (0)	0 (0)	0 (0)	5
1997	6,521 (92)	136 (2)	36 (1)	416 (6)	7,109
1998	4,364 (89)	251 (5)	45 (1)	219 (4)	4,879
1999	1,353 (68)	224 (11)	31 (2)	384 (19)	1,992
2000	3,141 (69)	533 (12)	222 (5)	665 (15)	4,561
2001	184 (58)	81 (25)	31 (10)	23 (7)	319
2002	702 (56)	200 (16)	90 (7)	258 (21)	1,250
2003	697 (37)	568 (31)	130 (7)	466 (25)	1,861
2004	3,093 (38)	2,162 (27)	694 (9)	2,165 (27)	8,114
2005	468 (46)	306 (30)	79 (8)	167 (16)	1,020
2006	3,164 (38)	3,352 (40)	469 (6)	1,419 (17)	8,404
2007	1,551 (45)	920 (27)	65 (2)	881 (26)	3,417
Average	***1,561 (62)***	***496 (20)***	***100 (4)***	***377 (15)***	***2,534***

Straying

Stray rates were determined by examining CWTs recovered on spawning grounds within and outside the Okanogan River basin. Targets for strays based on return year (recovery year) and brood year should be less than 5%.

Few hatchery-origin Okanogan summer Chinook have strayed into basins outside the Okanogan (Table 9.14). Although hatchery-origin Okanogan summer Chinook have strayed into other spawning areas, they usually made up less than 5% of the spawning escapement within those areas. The Chelan tailrace has received the largest number of Okanogan strays.

Table 9.14. Number and percent of spawning escapements within other non-target basins that consisted of hatchery-origin Okanogan summer Chinook, return years 1994-2010. For example, for return year 2002, 1% of the summer Chinook spawning escapement in the Entiat Basin consisted of hatchery-origin Okanogan summer Chinook. Percent strays should be less than 5%.

Return year	Wenatchee		Methow		Chelan		Entiat		Hanford Reach	
	Number	%	Number	%	Number	%	Number	%	Number	%
1994	0	0.0	0	0.0	-	-	-	-	-	-
1995	0	0.0	0	0.0	-	-	-	-	-	-
1996	0	0.0	0	0.0	-	-	-	-	-	-
1997	0	0.0	0	0.0	-	-	-	-	-	-
1998	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
1999	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
2000	0	0.0	6	0.5	30	4.5	0	0.0	3	0.0
2001	12	0.1	0	0.0	10	1.0	0	0.0	0	0.0
2002	0	0.0	3	0.1	4	0.7	5	1.0	0	0.0
2003	0	0.0	8	0.2	22	5.3	14	2.0	0	0.0
2004	0	0.0	0	0.0	5	1.2	0	0.0	0	0.0
2005	5	0.1	27	1.1	36	6.9	7	1.9	8	0.0
2006	0	0.0	5	0.2	4	1.0	2	0.3	0	0.0
2007	0	0.0	3	0.2	4	2.1	0	0.0	0	0.0
2008	0	0.0	9	0.5	46	9.3	4	1.3	0	0.0
2009	15	0.2	3	0.2	11	1.8	18	7.2	0	0.0
2010	6	0.1	0	0.0	33	3.0	0	0.0	0	0.0
Total	***38***	***0.0***	***64***	***0.2***	***205***	***3.1***	***50***	***1.1***	***11***	***0.0***

On average, about 1% of the returns have strayed into non-target spawning areas, falling within the acceptable level of less than 5% (Table 9.15). Depending on brood year, percent strays into non-target spawning areas have ranged from 0-4.2%. Few (<1% on average) have strayed into non-target hatchery programs.

Table 9.15. Number and percent of hatchery-origin Okanogan summer Chinook that homed to target spawning areas and the target hatchery, and number and percent that strayed to non-target spawning areas and non-target hatchery programs, by brood years 1989-2007. Percent stays should be less than 5%.

Brood year	Homing				Straying			
	Target stream		Target hatchery		Non-target streams		Non-target hatcheries	
	Number	%	Number	%	Number	%	Number	%
1989	3,132	69.7	1328	29.6	2	0.0	31	0.7
1990	729	71.4	291	28.5	0	0.0	1	0.1
1991	1,125	71.3	453	28.7	0	0.0	0	0.0
1992	1,264	68.5	572	31.0	8	0.4	1	0.1
1993	54	62.1	32	36.8	0	0.0	1	1.1

Brood year	Homing				Straying			
	Target stream		Target hatchery		Non-target streams		Non-target hatcheries	
	Number	%	Number	%	Number	%	Number	%
1994	924	80.8	203	17.7	16	1.4	1	0.1
1995	1,883	85.4	271	12.3	52	2.4	0	0.0
1996	27	100.0	0	0.0	0	0.0	0	0.0
1997	11,659	97.1	309	2.6	35	0.3	2	0.0
1998	2,784	95.4	102	3.5	31	1.1	2	0.1
1999	828	96.7	18	2.1	10	1.2	0	0.0
2000	2,091	93.8	29	1.3	94	4.2	15	0.7
2001	105	98.1	2	1.9	0	0.0	0	0.0
2002	702	96.2	17	2.3	11	1.5	0	0.0
2003	1,580	96.2	47	2.9	16	1.0	0	0.0
2004	4,947	94.4	206	3.9	85	1.6	2	0.0
2005	606	93.2	22	3.4	22	3.4	0	0.0
2006	5,210	97.6	60	1.1	68	1.3	0	0.0
2007	1,330	97.9	19	1.4	10	0.7	0	0.0
Total	***40,980***	***90.1***	***3,981***	***8.8***	***460***	***1.0***	***56***	***0.1***

Genetics

Genetic studies were conducted to investigate relationships among temporally replicated collections of summer Chinook from the Wenatchee River, Methow River, and Okanogan River in the upper Columbia River basin (Kassler et al. 2011; the entire report is appended as Appendix K). Samples from the Eastbank Hatchery – Wenatchee stock, Eastbank Hatchery – Methow/Okanogan (MEOK) stock, and Wells Hatchery were also included in the analysis. Samples of natural and hatchery-origin summer Chinook were analyzed and compared to determine if the supplementation program has affected the genetic structure of these populations. The study also calculated the effective number of breeders for collection locations of natural and hatchery-origin summer Chinook from 1993 and 2008.

In general, population differentiation was not observed among the temporally replicated collection locations. A single collection from the Okanogan River (1993) was the only collection showing statistically significant differences. The effective number of breeders was not statistically different from the early collection in 1993 in comparison to the late collection in 2008. Overall, these analyses revealed a lack of differentiation among the temporal replicates from the same locations and among the collection from different locations, suggesting the populations have been homogenized or that there has been substantial gene flow among populations. Additional comparisons among summer-run and fall-run Chinook populations in the upper Columbia River were conducted to determine if there was any differentiation between Chinook with different run timing. These analyses revealed pairwise F_{ST} values that were less than 0.01 for the collections of summer Chinook to collections of fall Chinook from Hanford Reach, lower Yakima River, Priest Rapids, and Umatilla. Collections of fall Chinook from Crab

Creek, Lyons Ferry Hatchery, Marion Drain, and Snake River had pairwise F_{ST} values that were higher in comparison to the collections of summer Chinook. The consensus clustering analysis did not provide good statistical support to the groupings, but did show relationships among collections based on geographic proximity. Overall the summer and fall run Chinook that have historically been spawned together were not differentiated while fall Chinook from greater geographic distances were differentiated.

Proportion of Natural Influence

Another method for assessing the genetic risk of a supplementation program is to determine the influence of the hatchery and natural environments on the adaptation of the composite population. This is estimated by the proportion of natural-origin fish in the hatchery broodstock (pNOB) and the proportion of hatchery-origin fish in the natural spawning escapement (pHOS). The ratio pNOB/(pHOS+pNOB) is the Proportion of Natural Influence (PNI). The larger the ratio (PNI), the greater the strength of selection in the natural environment relative to that of the hatchery environment. In order for the natural environment to dominate selection, PNI should be greater than 0.50, and important integrated populations should have a PNI of at least 0.67 (HSRG/WDFW/NWIFC 2004).

For brood years 1993-2003, the PNI was less than 0.67 (Table 9.16). However, since brood year 2003, the PNI has generally been greater than 0.67, save 2008 and 2011.

Table 9.16. Proportionate natural influence (PNI) of the Okanogan/Similkameen summer Chinook supplementation program for brood years 1989-2011. PNI was calculated as the proportion of naturally produced Chinook in the hatchery broodstock (pNOB) divided by the proportion of hatchery Chinook on the spawning grounds (pHOS) plus pNOB. NOS = number of natural-origin Chinook on the spawning grounds; HOS = number of hatchery-origin Chinook on the spawning grounds; NOB = number of natural-origin Chinook collected for broodstock; and HOB = number of hatchery-origin Chinook included in hatchery broodstock.

Brood year	Spawners			Broodstock			PNI
	NOS	HOS	pHOS	NOB	HOB	pNOB	
1989	1,719	0	0.00	1,297	312	0.81	1.00
1990	837	0	0.00	828	206	0.80	1.00
1991	574	0	0.00	924	314	0.75	1.00
1992	473	0	0.00	297	406	0.42	1.00
1993	915	570	0.38	681	388	0.64	0.63
1994	1,323	2,710	0.67	341	244	0.58	0.46
1995	979	2,023	0.67	173	240	0.42	0.39
1996	568	1,251	0.69	287	155	0.65	0.49
1997	862	1,327	0.61	197	265	0.43	0.41
1998	600	492	0.45	153	211	0.42	0.48
1999	1,274	2,343	0.65	224	289	0.44	0.40
2000	1,174	2,527	0.68	164	337	0.33	0.33
2001	4,306	6,551	0.60	12	345	0.03	0.05
2002	4,346	9,511	0.69	247	241	0.51	0.43
2003	1,933	1,487	0.43	381	101	0.79	0.65

Brood year	Spawners			Broodstock			PNI
	NOS	HOS	pHOS	NOB	HOB	pNOB	
2004	5,309	1,412	0.21	506	16	0.97	0.82
2005	6,441	2,448	0.28	391	9	0.98	0.78
2006	5,507	3,094	0.36	500	10	0.98	0.73
2007	2,983	1,434	0.32	456	17	0.96	0.75
2008	2,998	3,977	0.57	359	86	0.81	0.59
2009	4,204	3,340	0.44	503	4	0.99	0.69
2010	3,189	2,763	0.46	484	8	0.98	0.68
2011	4,642	5,039	0.52	467	26	0.95	0.65
Average	***2,485***	***2,361***	***0.42***	***429***	***184***	***0.68***	***0.63***

Natural and Hatchery Replacement Rates

Natural replacement rates (NRR) were calculated as the ratio of natural-origin recruits (NOR) to the parent spawning population (spawning escapement). Natural-origin recruits are naturally produced (wild) fish that survive to contribute to harvest (directly or indirectly), to broodstock, and to spawning grounds. We do not account for fish that died in route to the spawning grounds (migration mortality) or died just before spawning (pre-spawn mortality) (see Appendix B in Hillman et al. 2012). We calculated NORs with and without harvest. NORs without harvest include all returning fish that either returned to the basin or were collected as wild broodstock. NORs with harvest include all fish harvested and are based on a brood year harvest rates from the hatchery program. For brood years 1989-2006, NRR for summer Chinook in the Okanogan averaged 1.03 (range, 0.16-3.82) if harvested fish were not include in the estimate and 2.20 (range, 0.31-10.23) if harvested fish were included in the estimate (Table 9.17). NRRs for more recent brood years will be calculated as soon as all tag recoveries and sampling rates have been loaded into the database.

Hatchery replacement rates (HRR) are the hatchery adult-to-adult returns and were calculated as the ratio of hatchery-origin recruits (HOR) to the parent broodstock collected. These rates should be greater than the NRRs and greater than or equal to 5.30 (the calculated target value in Murdoch and Peven 2005). HRRs exceeded NRRs in 15 of the 18 years of data, regardless if harvest was or was not included in the estimate (Table 9.17). Hatchery replacement rates for Okanogan summer Chinook have exceeded the estimated target value of 5.30 in eight or 11 of the 17 years of data depending on if harvest was or was not included in the estimate.

Table 9.17. Broodstock collected, spawning escapements, natural and hatchery-origin recruits (NOR and HOR), and natural and hatchery replacement rates (NRR and HRR; with and without harvest) for wild summer Chinook in the Okanogan River basin, brood years 1989-2006.

Brood year	Broodstock Collected	Spawning Escapement	Harvest not included				Harvest included			
			HOR	NOR	HRR	NRR	HOR	NOR	HRR	NRR
1989	304	1,719	4,493	2,145	14.78	1.25	7,459	3,575	24.54	2.08
1990	288	837	1,021	1,476	3.55	1.76	1,422	2,061	4.94	2.46
1991	364	574	1,578	629	4.34	1.10	1,835	728	5.04	1.27
1992	304	473	1,845	752	6.07	1.59	2,307	942	7.59	1.99

Brood year	Broodstock Collected	Spawning Escapement	Harvest not included				Harvest included			
			HOR	NOR	HRR	NRR	HOR	NOR	HRR	NRR
1993	328	1,485	87	1,003	0.27	0.68	117	1,348	0.36	0.91
1994	302	4,033	1,144	2,168	3.79	0.54	1,550	2,946	5.13	0.73
1995	385	3,002	2,204	959	5.72	0.32	2,902	1,267	7.54	0.42
1996	330	1,819	27	466	0.08	0.26	32	555	0.10	0.31
1997	313	2,189	12,005	4,363	38.35	1.99	19,114	6,959	61.07	3.18
1998	352	1,092	2,919	4,166	8.29	3.82	7,798	11,169	22.15	10.23
1999	333	3,617	856	6,641	2.57	1.84	2,848	22,211	8.55	6.14
2000	334	3,701	2,229	1,716	6.67	0.46	6,790	5,248	20.33	1.42
2001	335	10,857	107	8,946	0.32	0.82	426	35,784	1.27	3.30
2002	333	13,857	730	6,061	2.19	0.44	1,980	16,470	5.95	1.19
2003	337	3,420	1,643	562	4.88	0.16	3,504	1,201	10.40	0.35
2004	335	6,721	5,240	3,112	15.64	0.46	13,354	7,959	39.86	1.18
2005	338	8,889	650	6,173	1.92	0.69	1,670	15,951	4.94	1.79
2006	355	8,601	5,338	2,422	15.04	0.28	13,742	6,242	38.71	0.73
Average	***332***	***4,271***	***2,451***	***2,987***	***7.47***	***1.03***	***4,936***	***7,923***	***14.92***	***2.20***

Smolt-to-Adult Survivals

Smolt-to-adult survival ratios (SARs) were calculated as the number of hatchery adult recaptures divided by the number of tagged hatchery smolts released. SARs were based on CWT returns. For the available brood years, SARs have ranged from 0.00006 to 0.03249 for hatchery summer Chinook in the Okanogan River basin (Table 9.18).

Table 9.18. Smolt-to-adult ratios (SARs) for Okanogan/Similkameen summer Chinook, brood years 1989-2007.

Brood year	Number of tagged smolts released[a]	Estimated adult captures[b]	SAR
1989	202,125	4,293	0.02124
1990	367,207	972	0.00265
1991	360,380	975	0.00271
1992	537,190	2,282	0.00425
1993	379,139	117	0.00031
1994	217,818	1,528	0.00702
1995	574,197	2,851	0.00497
1996	487,776	31	0.00006
1997	572,531	18,600	0.03249
1998	287,948	7,687	0.02670
1999	610,868	2,776	0.00454
2000	528,639	6,762	0.01279

Brood year	Number of tagged smolts released[a]	Estimated adult captures[b]	SAR
2001	26,315	424	0.01611
2002	245,997	1,975	0.00803
2003	574,908	3,489	0.00607
2004	676,222	12,896	0.01907
2005	273,512	1,660	0.00607
2006	597,276	13,623	0.02281
2007	610,379	4,758	0.00780
Average	***427,917***	***4,616***	***0.01083***

[a] Includes all tag codes and CWT released fish (CWT + Ad Clip fish and CWT-only fish).

[b] Includes estimated recoveries (spawning ground, hatcheries, harvest, etc.) and observed recoveries if estimated recoveries were unavailable.

9.7 ESA/HCP Compliance

Broodstock Collection

Because summer Chinook adults collected at Wells Dam are used for both the Methow and Okanogan supplementation programs, please refer to Section 8.7 for information on ESA compliance during broodstock collection.

Hatchery Rearing and Release

The 2011 brood Okanogan/Similkameen summer Chinook reared throughout their juvenile life-stages at Eastbank Fish Hatchery and Similkameen pond. No significant fish health issues occurred during rearing/acclimation of the 2011 brood. The 2011 brood smolt release from the Similkameen pond totaled 627,975 summer Chinook, representing 109% of the production objective for the Okanogan/Similkameen program and was incompliance with the 10% overage in production allowable in ESA Section 10 Permit 1347.

Hatchery Effluent Monitoring

Per ESA Permits 1196, 1347, 1395, 18118, 18120, and 18121, permit holders shall monitor and report hatchery effluents in compliance with applicable National Pollution Discharge Elimination Systems (NPDES) (EPA 1999) permit limitations. There was one NPDES violation reported at PUD Hatchery facilities during the period 1 January 2013 through 31 December 2013. NPDES monitoring and reporting for Chelan PUD Hatchery Programs during 2013 are provided in Appendix F.

SECTION 10: CHELAN FALLS SUMMER CHINOOK

10.1 Broodstock Sampling

Broodstock for the Chelan Falls program (formerly the Turtle Rock program) are collected as part of the Wells summer Chinook volunteer program. Refer to Snow et al. (2012) for information related to adults collected for these programs.

10.2 Hatchery Rearing

Rearing History

Number of eggs taken

Broodstock for the Chelan Falls summer Chinook program are collected at Wells Dam and consist of volunteers to the hatchery. In recent years some naturally produced fish have been incorporated into the brood. Green eggs are transferred from Wells Fish Hatchery to Eastbank Fish Hatchery for rearing.

Disease

Significant health concerns were encountered during rearing of Chelan Falls summer Chinook in 2013. Specifically, after transfer from Eastbank Fish Hatchery to the Chelan Falls acclimation facility in November there was an increase in mortality. Diagnosis showed initial transfer trauma, followed by fungus, bacterial cold water disease, erythrocytic inclusion body syndrome, and bacterial gill disease. Fish showed little response to treatment efforts. No additional disease-related problems were noted before the fish were released.

Number of acclimation days

Rearing of the 2011-brood Chelan Falls summer Chinook was similar to previous years with fish being held on well water. However, this was the second year that the whole program was transferred to the Chelan Falls acclimation ponds for final overwinter acclimation. Transfer occurred on 5-7 November 2012. Fish were force released on 11 April 2013 after 155-157 days of acclimation on Chelan River water.

Release Information

Numbers released

The subyearling Turtle Rock summer Chinook program was discontinued in 2010; however, releases of subyearling Chinook in past years are shown in Tables 10.1 and 10.2. Production from the subyearling programs was converted to the yearling program.

The 2011 yearling summer Chinook program achieved 97% of the 600,000 target goal with about 582,460 fish being released from the Chelan River Acclimation Ponds (Table 10.3). Releases of 2012 yearling Chinook will be reported in the 2014 report.

Table 10.1. Numbers of Turtle Rock summer Chinook subyearlings released from the hatchery, brood years 1995-2009. The release target for Turtle Rock summer Chinook subyearlings was 810,000 fish.

Brood year	Release year	CWT mark rate	Number of subyearlings released
1995	1996	0.1873	1,074,600
1996	1997	0.9653	385,215
1997	1998	0.9780	508,060
1998	1999	0.6453	301,777
1999	2000	0.9748	369,026
2000	2001	0.3678	604,892
2001	2002	0.9871	214,059
2002	2003	0.3070	656,399
2003	2004	0.4138	491,480
2004	2005	0.4591	411,707
2005	2006	0.4337	490,074
2006	2007	0.3388	538,392
2007	2008	0.4385	439,806
2008	2009	0.6355	309,003
2009	2010	NA	713,130
Average		***0.6111***	***500,508***

Table 10.2. Numbers of Turtle Rock summer Chinook accelerated subyearlings released from the hatchery, brood years 1995-2008. The release target for Turtle Rock summer Chinook accelerated subyearlings was 810,000 fish.

Brood year	Release year	CWT mark rate	Number of subyearlings released
1995	1996	0.9834	169,000
1996	1997	0.4163	477,300
1997	1998	0.3767	521,480
1998	1999	0.6033	307,571
1999	2000	0.9556	347,946
2000	2001	0.4331	449,329
2001	2002	0.4086	480,584
2002	2003	0.5492	364,461
2003	2004	0.6414	289,696
2004	2005	0.5471	364,453
2005	2006	0.9783	457,340
2006	2007	0.5510	342,273
2007	2008	0.4745	392,024
2008	2009	0.5295	372,320
Average		***0.6034***	***381,127***

Table 10.3. Numbers of Turtle Rock summer Chinook yearling smolts released from the hatchery, brood years 1995-2011. The release target for Turtle Rock summer Chinook was 200,000 smolts for the period before brood year 2010. The current release target is 600,000 smolts.

Brood year	Release year	Acclimation facility	CWT mark rate	Number of smolts released
1995	1997	Turtle Rock	0.9688	150,000
1996	1998	Turtle Rock	0.9582	202,727
1997	1999	Turtle Rock	0.9800	202,989
1998	2000	Turtle Rock	0.9337	217,797
1999	2001	Turtle Rock	0.9824	285,707
2000	2002	Turtle Rock	0.9948	165,935
2001	2003	Turtle Rock	0.9824	203,279
2002	2004	Turtle Rock	0.9799	195,851
2003	2005	Turtle Rock	0.9258	215,366
2004	2006	Turtle Rock	0.9578	206,734
2005	2007	Turtle Rock	0.9810	204,644
2006	2008	Chelan	0.9752	99,271
		Turtle Rock	0.9752	43,943
2007	2009	Chelan	0.9426	112,604
		Turtle Rock	0.9426	61,003
2008	2010	Chelan	0.9818	200,999
		Turtle Rock	0.9818	252,762
2009	2011	Chelan[a]	-	190,449
		Turtle Rock	0.9721	250,667
2010	2012	Chelan	0.9702	563,824
2011	2013	Chelan	0.9859	582,460
Average (1995-2009)		***Chelan***	***0.9665***	***137,625***
		Turtle Rock	***0.9745***	***233,429***
Average (2010-present)		***Chelan***	***0.9781***	***573,142***

[a] No CWT mark rate was provided because of the early release of this group.

Numbers tagged

The 2011 yearling Chinook were 99.2% CWT and adipose fin-clipped.

In 2014, a total of 10,000 summer Chinook from the 2012 brood were PIT tagged at the Chelan River Hatchery during 10-19 March. Fish were tagged in four groups of 2,500 per group. Two groups made up a “small-fish” group that averaged 123-129 mm and 21-25 g at time of tagging, and the other two made up a “big-fish” group that averaged 133-138 mm and 25-29 g at time of tagging. Fish were not fed during tagging or for two days before and after tagging. A total of 9,943 PIT-tagged summer Chinook were released into the Chelan River in April. A total of 57 fish died and no fish shed their tags during the period between tagging and release.

Table 10.4 summarizes the number of yearling summer Chinook that have been PIT-tagged and released from the Turtle Rock/Chelan Program.

Table 10.4. Summary of PIT-tagging activities for Turtle Rock/Chelan yearling summer Chinook, brood years 2007-2011.

Brood year	Release year	Raceway/Program	Number of fish tagged	Number of tagged fish that died	Number of tags shed	Number of tagged fish released
2007	2009	Circular Reuse	10,104	128	1	9,975
		Standard	10,102	162	3	9,937
2008	2010	Circular Reuse	11,102	15	0	11,087
		Standard	11,100	18	2	11,080
2009	2011	Turtle Rock	5,051	106	0	4,945
		Chelan Net Pens	5,050	2	0	5,048
2010	2012	Chelan Net Pens	4,200	10	0	4,190
2011	2013	Chelan Net Pens	4,101	26	0	4,075
2012	2014	Chelan (Small Fish)	5,000	17	0	4,983
		Chelan (Big Fish)	5,000	40	0	4,960

Fish size and condition at release

Although the subyearling summer Chinook program was discontinued, sizes of subyearlings released from Turtle Rock Hatchery before 2010 are shown in Tables 10.5 and 10.6.

Table 10.5. Mean lengths (FL, mm), weight (g and fish/pound), and coefficient of variation (CV) of Turtle Rock summer Chinook subyearlings released from the hatchery, brood years 1995-2009. Size targets are provided in the last row of the table.

Brood year	Release year	Fork length (mm)		Mean weight	
		Mean	CV	Grams (g)	Fish/pound
1995	1996	102	6.3	12.6	36
1996	1997	87	8.0	7.4	62
1997	1998	98	6.2	10.2	45
1998	1999	96	6.3	10.7	43
1999	2000	90	9.0	9.8	46
2000	2001	100	7.1	11.3	40
2001	2002	104	7.2	13.4	34
2002	2003	97	7.3	11.8	39
2003	2004	101	8.0	12.0	43
2004	2005	100	7.8	11.4	40
2005	2006	100	6.5	12.5	36
2006	2007	95	7.2	9.5	48
2007	2008	79	7.4	5.6	81

Brood year	Release year	Fork length (mm)		Mean weight	
		Mean	CV	Grams (g)	Fish/pound
2008	2009	86	7.9	7.9	57
2009[a]	2010	89	7.1	7.0	65
Average		***95***	***7.3***	***10.2***	***48***
Targets		***112***	***9.0***	***11.4***	***40***

[a] Pre-release growth sample was conducted using pond mortalities.

Table 10.6. Mean lengths (FL, mm), weight (g and fish/pound), and coefficient of variation (CV) of Turtle Rock summer Chinook accelerated subyearlings released from the hatchery, brood years 1995-2008. Size targets are provided in the last row of the table.

Brood year	Release year	Fork length (mm)		Mean weight	
		Mean	CV	Grams (g)	Fish/pound
1995	1996	129	7.1	27.3	17
1996	1997	107	6.5	15.6	29
1997	1998	117	6.0	18.9	24
1998	1999	119	8.0	18.9	24
1999	2000	114	6.7	19.0	24
2000	2001	111	7.0	16.8	27
2001	2002	117	8.4	19.5	23
2002	2003	116	11.3	21.2	21
2003	2004	113	14.9	17.0	30
2004	2005	117	11.3	20.1	23
2005	2006	119	9.1	22.2	21
2006	2007	118	8.3	19.1	24
2007	2008	95	7.7	10.0	45
2008[a]	2009	97	8.6	10.6	43
Average		***114***	***8.6***	***18.3***	***27***
Targets		***112***	***9.0***	***11.4***	***40***

[a] The 2008 brood year was the last year of the accelerated subyearling program.

Size at release of the 2011 yearling summer Chinook was 84.1% and 93.8% of the target fork length and weight, respectively, for the Chelan Falls group. This group also exceeded the target CV for length. (Table 10.7).

Table 10.7. Mean lengths (FL, mm), weight (g and fish/pound), and coefficient of variation (CV) of Turtle Rock/Chelan summer Chinook yearling releases, brood years 1995-2011. Size targets are provided in the last row of the table.

Brood year	Release year	Acclimation facility	Fork length (mm)		Mean weight	
			Mean	CV	Grams (g)	Fish/pound
1995	1997	Turtle Rock	-	-	-	-
1996	1998	Turtle Rock	166	14.2	60.9	7
1997	1999	Turtle Rock	198	4.6	91.3	5
1998	2000	Turtle Rock	161	11.9	53.9	8
1999	2001	Turtle Rock	164	18.6	59.0	8
2000	2002	Turtle Rock	170	15.3	59.0	8
2001	2003	Turtle Rock	154	22.3	48.6	9
2002	2004	Turtle Rock	157	16.7	44.0	12
2003	2005	Turtle Rock	173	13.8	54.7	8
2004	2006	Turtle Rock	176	20.6	45.3	7
2005	2007	Turtle Rock	158	11.0	43.5	10
2006	2008	Chelan	172	14.5	58.4	8
		Turtle Rock	157	25.8	54.1	8
2007	2009	Chelan	153	18.8	45.7	10
		Turtle Rock	167	14.6	49.3	9
2008	2010	Chelan	146	22.9	40.6	11
		Turtle Rock	172	15.9	58.5	8
2009	2011	Chelan	158	15.1	46.6	10
		Turtle Rock	174	17.5	59.3	8
2010	2012	Chelan	132	27.4	33.2	14
2011	2013	Chelan	148	18.6	42.6	11
Average			***163***	***17.0***	***52.4***	***9***
Targets			***176***	***9.0***	***45.4***	***10***

Survival Estimates

Normal subyearling releases

Overall survival of the normal subyearling Turtle Rock summer Chinook program from green egg to release was below the standard set for the program (Table 10.8). Lower than expected survival at ponding and post-ponding reduced the overall program performance. This program was discontinued in 2010.

Table 10.8. Hatchery life-stage survival rates (%) for Turtle Rock subyearling (zero program) summer Chinook, brood years 2004-2009. Survival standards or targets are provided in the last row of the table.

Brood year	Collection to spawning		Unfertilized egg-eyed	Eyed egg-ponding	30 d after ponding	100 d after ponding	Ponding to release	Transport to release	Unfertilized egg-release
	Female	Male							
2004	NA	NA	93.5	74.4	93.9	91.4	90.8	99.7	63.1
2005	NA	NA	94.4	87.9	85	84.8	84.2	99.4	69.8
2006	NA	NA	97.8	87.9	85.0	84.8	84.2	99.4	72.4
2007	NA	NA	92.7	84.9	88.5	86.7	84.8	99.6	66.7
2008	NA	NA	78.8	95.0	80.7	79.3	79.9	99.8	59.8
2009	NA	NA	95.0	89.4	89.5	89.2	79.7	89.5	67.7
Average	***NA***	***NA***	***92.0***	***86.6***	***87.1***	***86.0***	***83.9***	***97.9***	***66.6***
Standard	***90.0***	***85.0***	***92.0***	***98.0***	***97.0***	***93.0***	***90.0***	***95.0***	***81.0***

Accelerated subyearling releases

Overall survival of the accelerated subyearling Turtle Rock summer Chinook program from green egg to release was below the standard set for the program (Table 10.9). Lower than expected survival in post-ponding reduced the overall program performance. This program was discontinued in 2010.

Table 10.9. Hatchery life-stage survival rates (%) for Turtle Rock subyearling (accelerated program) summer Chinook, brood years 2004-2009. Survival standards or targets are provided in the last row of the table.

Brood year	Collection to spawning		Unfertilized egg-eyed	Eyed egg-ponding	30 d after ponding	100 d after ponding	Ponding to release	Transport to release	Unfertilized egg-release
	Female	Male							
2004	NA	NA	92.5	98.3	93.4	92.4	90.0	97.8	81.8
2005	NA	NA	93.8	94.6	83.7	83.4	81.7	98.8	72.5
2006	NA	NA	86.1	94.6	83.7	83.4	81.7	98.8	66.5
2007	NA	NA	93.4	95.4	78.4	77.5	76.3	98.9	67.9
2008[a]	NA	NA	93.4	95.0	79.8	78.8	78.2	99.3	67.1
Average	***NA***	***NA***	***91.8***	***95.6***	***83.8***	***83.1***	***81.6***	***98.7***	***71.2***
Standard	***90.0***	***85.0***	***92.0***	***98.0***	***97.0***	***93.0***	***90.0***	***95.0***	***81.0***

[a] The 2008 brood year was the last year of the accelerated subyearling program.

Yearling releases

Overall survival of the yearling Chelan Falls summer Chinook program from green egg to release was below the standard set for the program (Table 10.10). Lower than expected survivals in the transport to release life stages contributed to the decreased program performance.

Table 10.10. Hatchery life-stage survival rates (%) for Turtle Rock yearling summer Chinook, brood years 2004-2011. Survival standards or targets are provided in the last row of the table.

Brood year	Collection to spawning		Un-fertilized egg-eyed	Eyed egg-ponding	30 d after ponding	100 d after ponding	Ponding to release	Transport to release	Un-fertilized egg-release
	Female	Male							
2004	NA	NA	92.9	97.7	96.8	96.4	95.5	99.6	86.7
2005	NA	NA	89.1	97.5	98.1	97.8	96.6	99.1	83.9
2006	NA	NA	86.2	78.8	97.6	97.1	95.2	98.7	64.8
2007 (Turtle Rock)	NA	NA	80.3	97.6	98.8	98.2	95.4	99.1	74.8
2007 (Chelan Falls)	NA	NA	80.3	97.6	98.8	98.2	94.9	97.1	74.4
2008 (Turtle Rock)	NA	NA	93.5	98.0	99.4	97.2	95.9	98.8	87.8
2008 (Chelan Falls)	NA	NA	93.5	98.0	97.6	98.7	96.4	99.3	88.2
2009 (Turtle Rock)	NA	NA	90.8	96.8	99.7	99.0	97.2	98.1	85.5
2009 (Chelan Falls)	NA	NA	90.9	96.9	99.8	99.0	96.7	97.7	85.2
2010 (Chelan Falls)	NA	NA	94.8	97.7	99.4	95.2	92.4	97.6	85.5
2011 (Chelan Falls)	NA	NA	90.0	99.4	91.7	98.2	83.4	85.2	74.6
Average (Chelan)	***NA***	***NA***	***89.3***	***96.0***	***98.0***	***97.7***	***94.5***	***97.3***	***81.0***
Standard	***90.0***	***85.0***	***92.0***	***98.0***	***97.0***	***93.0***	***90.0***	***95.0***	***81.0***

10.3 Life History Monitoring

Life history characteristics of Chelan Falls and Turtle Rock summer Chinook were assessed by examining carcasses on spawning grounds and by reviewing tagging data and fisheries statistics.

Contribution to Fisheries

Normal subyearling releases

Most of the harvest on Turtle Rock summer Chinook (normal subyearling releases) occurred in the Ocean (10-100% of the fish harvested; Table 10.11). Brood years 1995 and 2006 provided the largest total harvests, while brood year 1997 and 1998 provided the lowest. This program was discontinued in 2010.

Table 10.11. Estimated number and percent (in parentheses) of Turtle Rock summer Chinook (normal subyearling releases) captured in different fisheries, brood years 1995-2007.

Brood year	Ocean fisheries	Columbia River Fisheries			Total
		Tribal	Commercial (Zones 1-5)	Recreational (sport)	
1995	682 (84)	106 (13)	11 (1)	16 (2)	815
1996	72 (80)	0 (0)	5 (6)	13 (14)	90
1997	10 (100)	0 (0)	0 (0)	0 (0)	10
1998	21 (100)	0 (0)	0 (0)	0 (0)	21
1999	182 (63)	26 (9)	4 (1)	75 (26)	287
2000	36 (55)	8 (12)	8 (12)	14 (21)	66
2001	164 (64)	30 (12)	20 (8)	44 (17)	258

Brood year	Ocean fisheries	Columbia River Fisheries			Total
		Tribal	Commercial (Zones 1-5)	Recreational (sport)	
2002	23 (20)	33 (29)	3 (3)	56 (49)	115
2003	9 (10)	55 (61)	2 (2)	24 (27)	90
2004	42 (37)	29 (25)	2 (2)	42 (37)	115
2005	100 (38)	95 (36)	24 (9)	44 (17)	263
2006	296 (40)	288 (39)	53 (7)	104 (14)	741
2007	105 (33)	91 (28)	21 (7)	104 (32)	321
Average	***134 (56)***	***59 (20)***	***12 (4)***	***41 (20)***	***246***

Accelerated subyearling releases

Most of the harvest on Turtle Rock summer Chinook (accelerated subyearling releases) occurred in ocean fisheries (Table 10.12). Ocean harvest has made up 27% to 100% of all Turtle Rock summer Chinook harvested (no fish from the 2003 brood year were harvested). Brood year 1999 provided the largest total harvest, while brood years 1995, 1997, 2002, and 2003 provided the lowest. This program was discontinued in 2010.

Table 10.12. Estimated number and percent (in parentheses) of Turtle Rock summer Chinook (accelerated subyearling releases) captured in different fisheries, brood years 1995-2007.

Brood year	Ocean fisheries	Columbia River Fisheries			Total
		Tribal	Commercial (Zones 1-5)	Recreational (sport)	
1995	3 (100)	0 (0)	0 (0)	0 (0)	3
1996	77 (89)	5 (6)	5 (6)	0 (0)	87
1997	3 (100)	0 (0)	0 (0)	0 (0)	3
1998	97 (95)	2 (2)	3 (3)	0 (0)	102
1999	1,015 (75)	142 (11)	12 (1)	178 (13)	1,347
2000	117 (100)	0 (0)	0 (0)	0 (0)	117
2001	205 (59)	49 (14)	13 (4)	80 (23)	347
2002	9 (100)	0 (0)	0 (0)	0 (0)	9
2003	0 (0)	0 (0)	0 (0)	0 (0)	0
2004	45 (27)	79 (48)	6 (4)	34 (21)	164
2005	62 (58)	12 (11)	26 (24)	7 (7)	107
2006	130 (43)	113 (37)	16 (5)	43 (14)	302
2007	169 (41)	168 (41)	12 (3)	59 (14)	408
Average	***149 (68)***	***44 (13)***	***7 (4)***	***13 (7)***	***230***

Yearling releases

Most of the harvest on Turtle Rock summer Chinook (yearling releases) occurred in ocean fisheries (Table 10.13). Ocean harvest has made up 39% to 95% of all Turtle Rock summer

Chinook harvested. Brood year 1998 provided the largest harvest, while brood years 1995 and 1996 provided the lowest.

Table 10.13. Estimated number and percent (in parentheses) of Turtle Rock summer Chinook (yearling releases) captured in different fisheries, brood years 1995-2007.

Brood year	Ocean fisheries	Columbia River Fisheries			Total
		Tribal	Commercial (Zones 1-5)	Recreational (sport)	
1995	452 (75)	51 (8)	32 (5)	70 (12)	605
1996	757 (95)	14 (2)	2 (0)	21 (3)	794
1997	2,789 (91)	61 (2)	27 (1)	176 (6)	3,053
1998	4,251 (90)	224 (5)	16 (0)	230 (5)	4,721
1999	1,646 (73)	233 (10)	7 (0)	383 (17)	2,269
2000	1,122 (73)	129 (8)	48 (3)	244 (16)	1,543
2001	1,921 (59)	453 (14)	178 (5)	729 (22)	3,281
2002	999 (49)	384 (19)	102 (5)	536 (27)	2,021
2003	749 (46)	449 (27)	70 (4)	378 (23)	1,646
2004	832 (39)	560 (26)	127 (6)	605 (28)	2,124
2005	499 (44)	303 (27)	123 (11)	206 (18)	1,131
2006	1,162 (39)	880 (30)	231 (8)	688 (23)	2,961
2007	746 (49)	362 (24)	66 (4)	339 (22)	1,513
Average	***1,379 (63)***	***316 (16)***	***79 (4)***	***354 (17)***	***2,128***

Straying

Normal subyearling releases

Rates of Turtle Rock summer Chinook (normal subyearling releases) straying into spawning areas in the upper basin have been low. Although Turtle Rock summer Chinook have strayed into other spawning areas, they made up less than 5% of the spawning escapement within those areas (Table 10.14). The Chelan tailrace has received the largest number of Turtle Rock strays. This program was discontinued in 2010.

Table 10.14. Number (No.) and percent of spawning escapements within other non-target basins that consisted of Turtle Rock summer Chinook (normal subyearling releases), return years 1998-2010. For example, for return year 2003, 0.6% of the summer Chinook spawning escapement in the Okanogan River basin consisted of Turtle Rock summer Chinook. Percent strays should be less than 5%.

Return year	Wenatchee		Methow		Okanogan		Chelan		Entiat		Hanford Reach	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1998	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
1999	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
2000	8	0.1	3	0.3	13	0.4	63	9.5	0	0.0	0	0.0
2001	0	0.0	5	0.2	13	0.1	0	0.0	0	0.0	0	0.0
2002	0	0.0	0	0.0	13	0.1	0	0.0	0	0.0	0	0.0

Return year	Wenatchee		Methow		Okanogan		Chelan		Entiat		Hanford Reach	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
2003	7	0.1	7	0.2	19	0.6	6	1.4	0	0.0	0	0.0
2004	5	0.0	4	0.2	13	0.2	6	1.4	0	0.0	0	0.0
2005	5	0.1	0	0.0	5	0.1	0	0.0	2	0.5	0	0.0
2006	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
2007	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
2008	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
2009	0	0.0	16	0.9	0	0.0	2	0.3	9	3.6	0	0.0
2010	0	0.0	26	1.0	0	0.0	0	0.0	14	3.2	0	0.0
Total	***25***	***0.0***	***61***	***0.2***	***76***	***0.1***	***77***	***1.2***	***25***	***0.6***	***0***	***0.0***

On average, about 27% of the brood year returns have strayed into spawning areas in the upper basin (Table 10.15). Depending on brood year, percent strays into spawning areas have ranged from 0-100%. Few (2.2% on average) have strayed into non-target hatchery programs.

Table 10.15. Number and percent of Turtle Rock summer Chinook (normal subyearling releases) that homed to the target hatchery and strayed to non-target spawning areas and non-target hatchery programs, by brood years 1995-2007.

Brood year	Homing				Straying			
	Target stream		Target hatchery		Non-target streams		Non-target hatcheries	
	Number	%	Number	%	Number	%	Number	%
1995	-	-	197	74.1	64	24.1	5	1.9
1996	-	-	54	54.5	44	44.4	1	1.0
1997	-	-	2	28.6	5	71.4	0	0.0
1998	-	-	0	0.0	24	100.0	0	0.0
1999	-	-	40	43.5	52	56.5	0	0.0
2000	-	-	5	50.0	5	50.0	0	0.0
2001	-	-	56	77.8	16	22.2	0	0.0
2002	-	-	10	100.0	0	0.0	0	0.0
2003	-	-	27	100.0	0	0.0	0	0.0
2004	-	-	71	97.3	2	2.7	0	0.0
2005	-	-	80	92.0	7	8.0	0	0.0
2006	-	-	194	72.1	72	26.8	3	1.1
2007	-	-	113	68.5	34	20.6	18	10.9
Total	***-***	***-***	***849***	***70.7***	***325***	***27.1***	***27***	***2.2***

Accelerated subyearling releases

Rates of Turtle Rock summer Chinook (accelerated subyearling releases) straying into spawning areas in the upper basin have been low. Although Turtle Rock summer Chinook have strayed into other spawning areas, they made up less than 5% of the spawning escapement within those areas (Table 10.16). The Chelan tailrace, Entiat Basin, and Methow River basin have received the largest number of Turtle Rock strays. This program was discontinued in 2010.

Table 10.16. Number (No.) and percent of spawning escapements within other non-target basins that consisted of Turtle Rock summer Chinook (accelerated subyearling releases), return years 1998-2010. For example, for return year 2001, 0.2% of the summer Chinook spawning escapement in the Methow River basin consisted of Turtle Rock summer Chinook. Percent strays should be less than 5%.

Return year	Wenatchee		Methow		Okanogan		Chelan		Entiat		Hanford Reach	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1998	3	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
1999	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
2000	7	0.1	0	0.0	0	0.0	24	3.6	0	0.0	0	0.0
2001	0	0.0	12	0.4	31	0.3	0	0.0	0	0.0	0	0.0
2002	0	0.0	5	0.1	0	0.0	0	0.0	0	0.0	0	0.0
2003	0	0.0	45	1.1	0	0.0	22	5.3	13	1.9	16	0.0
2004	0	0.0	7	0.3	0	0.0	14	3.3	0	0.0	18	0.0
2005	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
2006	0	0.0	0	0.0	0	0.0	0	0.0	2	0.3	0	0.0
2007	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
2008	0	0.0	7	0.4	0	0.0	27	5.4	0	0.0	0	0.0
2009	19	0.2	0	0.0	0	0.0	2	0.3	0	0.0	0	0.0
2010	0	0.0	19	0.8	0	0.0	0	0.0	10	2.3	0	0.0
Total	***29***	***0.0***	***95***	***0.3***	***31***	***0.0***	***89***	***1.4***	***25***	***0.6***	***34***	***0.0***

On average, about 35% of the brood year returns have strayed into spawning areas in the upper basin (Table 10.17). Depending on brood year, percent strays into spawning areas have ranged from 0-83%. Few (<2% on average) have strayed into non-target hatchery programs.

Table 10.17. Number and percent of Turtle Rock summer Chinook (accelerated subyearling releases) that homed to the target hatchery and strayed to non-target spawning areas and non-target hatchery programs, by brood years 1995-2007.

Brood year	Homing				Straying			
	Target stream		Target hatchery		Non-target streams		Non-target hatcheries	
	Number	%	Number	%	Number	%	Number	%
1995	-	-	7	70.0	3	30.0	0	0.0
1996	-	-	33	32.4	69	67.6	0	0.0
1997	-	-	6	100.0	0	0.0	0	0.0
1998	-	-	2	16.7	10	83.3	0	0.0
1999	-	-	138	54.1	117	45.9	0	0.0
2000	-	-	12	40.0	18	60.0	0	0.0
2001	-	-	57	96.6	2	3.4	0	0.0

Brood year	Homing				Straying			
	Target stream		Target hatchery		Non-target streams		Non-target hatcheries	
	Number	%	Number	%	Number	%	Number	%
2002	-	-	0	0.0	0	0.0	0	0.0
2003	-	-	3	100.0	0	0.0	0	0.0
2004	-	-	90	75.6	29	24.4	0	0.0
2005	-	-	64	75.3	19	22.4	2	2.4
2006	-	-	88	88.9	7	7.1	4	4.0
2007	-	-	133	61.9	70	32.6	12	5.6
Total	***-***	***-***	***633***	***63.6***	***344***	***34.6***	***18***	***1.8***

Yearling releases

Rates of Turtle Rock summer Chinook (yearling releases) straying into spawning areas in the upper basin have varied widely depending on spawning area. Most of these fish strayed to spawning areas within the Chelan tailrace, Entiat Basin, and Methow River basin. On average, Turtle Rock summer Chinook have made up 6-22% of the spawning escapement within those basins (Table 10.18). Relatively few, on average, have strayed to spawning areas in the Okanogan River basin, Wenatchee River basin, and the Hanford Reach (i.e., they made up less than 5% of the spawning escapement in these areas).

Table 10.18. Number (No.) and percent of spawning escapements within other non-target basins that consisted of Turtle Rock summer Chinook (yearling releases), return years 1998-2010. For example, for return year 2003, 4.3% of the summer Chinook spawning escapement in the Methow River basin consisted of Turtle Rock summer Chinook. Percent strays should be less than 5%.

Return year	Wenatchee		Methow		Okanogan		Chelan		Entiat		Hanford Reach	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1998	0	0.0	2	0.3	0	0.0	0	0.0	0	0.0	0	0.0
1999	3	0.1	2	0.2	0	0.0	0	0.0	0	0.0	0	0.0
2000	18	0.3	57	4.8	154	4.2	73	11.0	0	0.0	10	0.0
2001	109	1.0	523	18.9	319	2.9	316	32.1	0	0.0	7	0.0
2002	92	0.6	437	9.4	207	1.5	191	32.8	136	27.1	0	0.0
2003	64	0.5	170	4.3	27	0.8	165	39.4	180	26.0	9	0.0
2004	10	0.1	51	2.3	112	1.7	75	17.9	0	0.0	0	0.0
2005	5	0.1	73	2.9	75	0.8	88	19.8	42	11.4	0	0.0
2006	0	0.0	100	3.7	29	0.3	64	15.2	9	1.6	0	0.0
2007	0	0.0	65	4.8	31	0.7	40	21.2	20	8.2	19	0.1
2008	18	0.3	72	3.7	54	0.8	115	23.1	46	14.4	0	0.0
2009	8	0.1	95	5.4	28	0.4	7	1.1	18	7.2	0	0.0
2010	12	0.2	105	4.2	113	1.9	346	30.9	30	6.9	0	0.0
Total	***339***	***0.3***	***1,752***	***6.0***	***1,149***	***1.3***	***1,480***	***22.4***	***481***	***10.7***	***45***	***0.0***

On average, about 62% of the brood year returns have strayed into spawning areas in the upper basin (Table 10.19). Depending on brood year, percent strays into spawning areas have ranged from 37-86%. Few (<1% on average) have strayed into non-target hatchery programs.

Table 10.19. Number and percent of Turtle Rock summer Chinook (yearling releases) that homed to the target hatchery and strayed to non-target spawning areas and non-target hatchery programs, by brood years 1995-2007.

Brood year	Homing				Straying			
	Target stream		Target hatchery		Non-target streams		Non-target hatcheries	
	Number	%	Number	%	Number	%	Number	%
1995	-	-	180	39.3	278	60.7	0	0.0
1996	-	-	218	27.2	583	72.8	0	0.0
1997	-	-	254	14.2	1,531	85.6	3	0.2
1998	-	-	166	16.1	864	83.8	1	0.1
1999	-	-	181	42.7	243	57.3	0	0.0
2000	-	-	89	27.4	236	72.6	0	0.0
2001	-	-	389	59.8	261	40.2	0	0.0
2002	-	-	303	57.8	220	42.0	1	0.2
2003	-	-	373	62.9	219	36.9	1	0.2
2004	-	-	287	56.6	219	43.2	1	0.2
2005	-	-	202	39.9	293	57.9	11	2.2
2006	-	-	376	35.4	649	61.2	36	3.4
2007	120	28.5	212	50.4	57	13.5	32	7.6
Total	***120***	***28.5***	***3,230***	***35.5***	***5,653***	***62.2***	***86***	***0.9***

Smolt-to-Adult Survivals

Subyearling-to-adult and smolt-to-adult survival ratios (SARs) were calculated as the number of hatchery adult recaptures divided by the number of tagged hatchery subyearling or yearling Chinook released. SARs were based on CWT returns.

Normal subyearling releases

For the available brood years, SARs for normal subyearling-released Chinook have ranged from 0.000034 to 0.001870 (Table 10.20). This program was discontinued in 2010.

Table 10.20. Subyearling-to-adult ratios (SARs) for Turtle Rock normal subyearling-released summer Chinook, brood years 1995-2007.

Brood year	Number released[a]	Estimated adult captures[b]	SAR
1995	201,230	203	0.001009
1996	371,848	188	0.000506
1997	496,904	17	0.000034
1998	194,723	28	0.000144

Brood year	Number released[a]	Estimated adult captures[b]	SAR
1999	197,793	202	0.001021
2000	222,460	28	0.000126
2001	211,306	330	0.001562
2002	200,163	38	0.000190
2003	203,410	49	0.000241
2004	198,019	91	0.000460
2005	197,135	143	0.000725
2006	188,250	352	0.001870
2007	194,437	214	0.001101
Average	***236,744***	***145***	***0.000691***

[a] Includes all tag codes and CWT released fish (CWT + Ad Clip fish and CWT-only fish).

[b] Includes estimated recoveries (spawning ground, hatcheries, harvest, etc.) and observed recoveries if estimated recoveries were unavailable.

Accelerated subyearling releases

For the available brood years, SARs for accelerated subyearling-released Chinook have ranged from 0.000011 to 0.004578 (Table 10.21). This program was discontinued in 2010.

Table 10.21. Subyearling-to-adult ratios (SARs) for Turtle Rock accelerated subyearling-released summer Chinook, brood years 1995-2007.

Brood year	Number released[a]	Estimated adult captures[b]	SAR
1995	166,203	13	0.000078
1996	198,720	79	0.000398
1997	196,459	3	0.000015
1998	185,551	69	0.000372
1999	192,665	882	0.004578
2000	194,603	63	0.000324
2001	196,355	167	0.000851
2002	200,165	5	0.000025
2003	185,834	2	0.000011
2004	203,255	156	0.000768
2005	192,045	81	0.000422
2006	186,324	217	0.001165
2007	188,328	303	0.001609
Average	***191,270***	***157***	***0.000816***

[a] Includes all tag codes and CWT released fish (CWT + Ad Clip fish and CWT-only fish).

[b] Includes estimated recoveries (spawning ground, hatcheries, harvest, etc.) and observed recoveries if estimated recoveries were unavailable.

Yearling releases

For the available brood years, SARs for yearling-released Chinook have ranged from 0.007184 to 0.028136 (Table 10.22).

Table 10.22. Smolt-to-adult ratios (SARs) for Turtle Rock yearling-released summer Chinook, brood years 1995-2007.

Brood year	Number released[a]	Estimated adult captures[b]	SAR
1995	145,318	1,044	0.007184
1996	194,251	1,544	0.007948
1997	198,924	4,767	0.023964
1998	215,646	5,731	0.026576
1999	280,683	2,661	0.009480
2000	165,072	1,867	0.011310
2001	199,694	3,888	0.019470
2002	192,234	2,517	0.013093
2003	199,386	2,088	0.010472
2004	202,682	2,599	0.012823
2005	202,329	1,629	0.008051
2006	142,699	4,015	0.028136
2007	161,071	1,830	0.011361
Average	***192,307***	***2,783***	***0.014605***

[a] Includes all tag codes and CWT released fish (CWT + Ad Clip fish and CWT-only fish).

[b] Includes estimated recoveries (spawning ground, hatcheries, harvest, etc.) and observed recoveries if estimated recoveries were unavailable.

10.4 ESA/HCP Compliance

Broodstock Collection

The 2011 brood Turtle Rock summer Chinook program is supported through adult collections at the volunteer trap at Wells Fish Hatchery and in conjunction with the Wells summer Chinook collections. During 2011, broodstock collections at the volunteer trap were consistent with the 2011 Upper Columbia River Salmon and Steelhead Broodstock Objectives and site-based broodstock collection protocols as required in ESA permit 1347. The 2011 collection target totaled 1,382 summer Chinook (including 373 for the Chelan Falls program).

Hatchery Rearing and Release

Brood year 2011 releases totaled 582,460 yearling fish. These releases represented 97.1% of the Rocky Reach HCP and ESA Section 10 Permit 1347 production for the Chelan Falls yearling summer Chinook production.

Hatchery Effluent Monitoring

Per ESA Permits 1196, 1347, 1395, 18118, 18119, and 18121, permit holders shall monitor and report hatchery effluents in compliance with applicable National Pollution Discharge Elimination Systems (NPDES) (EPA 1999) permit limitations. There was one NPDES violation reported at PUD Hatchery facilities during the period 1 January through 31 December 2013. NPDES monitoring and reporting for Chelan PUD Hatchery Programs during 2013 are provided in Appendix F.

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SECTION 12: APPENDICES

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Appendix A

Abundance and Total Numbers of Chinook Salmon and Trout in the Chiwawa River basin, Washington, 2013

BioAnalysts, Inc.℠
4725 North Cloverdale Road, Ste 102
Boise Idaho 83713

January 25, 2014

TO: HCP Hatchery Committee

FROM: Tracy Hillman

Subject: Abundance and Total Numbers of Chinook Salmon and Trout in the Chiwawa River basin, Washington, 2013

The Chelan County Public Utility District (PUD) hatchery program is operated through a habitat conservation program (HCP) that was incorporated into the PUD's license in 2004. The HCP directed the signatories to develop a monitoring and evaluation plan within one year of the effective date. This resulted in the development of the Conceptual Approach to Monitoring and Evaluating the Chelan County Public Utility District Hatchery Programs (Murdoch and Peven 2005). In 2013, the Hatchery Committees updated the hatchery monitoring and evaluation plan (Hillman et al. 2013). This study will help the Hatchery Committees determine if it is meeting Objective 2 in the updated monitoring and evaluation plan.

Objective 2: *Determine if the proportion of hatchery fish on the spawning grounds affects the freshwater productivity of supplemented stocks.*

We estimated densities and total numbers of age-0 spring Chinook salmon *Oncorhynchus tshawytscha,* trout *Oncorhynchus* sp., and char *Salvelinus* sp. in the Chiwawa River basin, Washington, in August 2013. This was the 21st year of an ongoing study to assess the freshwater productivity (juveniles/redd) of Chinook salmon in the Chiwawa River basin. We used landscape classification to stratify streams in the basin that supported juvenile Chinook salmon (Hillman and Miller 2004). Classification "explained" most of the variability in fish numbers caused by geology, land type, valley bottom type, stream state condition, and habitat type. We identified ten reaches on the lower 31 miles (50 km) of the Chiwawa River and one reach in each of Phelps, Rock, Chikamin, Big Meadow, Alder, Brush, Clear, Y, and Unnamed[1] creeks (Figure 1). Each reach consisted of several combinations of state-type and habitat-type strata. We used classification to find reference areas for reaches in the Chiwawa River. We matched Reach 3 and Reach 8 of the Chiwawa River with a moderately-confined section of Nason Creek (RM 0.62-1.70) and an unconfined area of the Little Wenatchee River (RM 4.39-8.55), respectively

[1]Unnamed tributary that drains the eastside of Chiwawa Ridge. Its confluence with the Chiwawa River is about 1 mile (1.6 km) downstream from the mouth of Phelps Creek.

(Hillman and Miller 2004). Following methods described in Hillman and Miller (2004), we used underwater observations to estimate numbers of fish in 181 randomly selected sites.

During sampling in August 2013, discharge in the Chiwawa River averaged 244 cubic feet per second (cfs) and ranged from 160-399 cfs (Figure 2). Stream temperatures during the study period ranged from 10.0 to 16.0°C. Fish species observed in the Chiwawa River basin and reference areas during the 1992-2013 survey period[2] included: spring Chinook salmon, coho salmon *O. kisutch*, sockeye salmon *O. nerka* (in the Little Wenatchee River reference area), steelhead/rainbow trout *O. mykiss* (hatchery rainbow were present only in 1992 and 1993), cutthroat trout *O. clarki lewisi*, bull trout *S. confluentus*, brook trout *S. fontinalis*, mountain whitefish *Prosopium williamsoni*, dace *Rhinichthys* sp., suckers *Catostomus* sp., and sculpin *Cottus* sp. The age-0 spring Chinook that we observed in the Chiwawa River basin during the 2013 survey were produced from 808 redds counted in the fall of 2012 (Hillman et al. 2013). Assuming a mean fecundity of 4,223 eggs per female Chinook (from females collected for broodstock), and that no female produced more than one redd (Murdoch et al. 2009), we estimated that the Chiwawa River basin was seeded with 3,412,184 eggs in 2012 (Appendix A).

In 2013, riffles made up the largest fraction of habitat types in reaches of the Chiwawa River basin (53% of the total stream surface area) (Table 1). Pools (23%), glides (7%), and multiple channels (17%) constituted the remaining 47% of the stream surface area. We consistently found woody debris associated with multiple-channel habitat.

Chinook Salmon Abundance

Chinook salmon were the most abundant salmonid in the Chiwawa River basin. We estimated, based on surface area, that age-0 Chinook salmon numbered 149,563 (±10% of the estimated total) in the Chiwawa River basin in August 2013 (Table 2). Extrapolating based on volume of habitat types, age-0 Chinook numbered 153,820 (±10%) in the Chiwawa River basin. About 6% of the juvenile Chinook were in tributaries to the Chiwawa River. During the 1992-2013 surveys, numbers of age-0 Chinook ranged from 5,815 to 149,563 in the Chiwawa River basin (Figure 3; Appendix B). Most of the difference in juvenile numbers among years resulted from different seeding (stock) levels (Figure 4). Numbers of Chinook redds in the Chiwawa River basin during 1992-2013 ranged from 13 to 1,078, resulting in seeding levels of 66,248 to 4,984,672 eggs (Appendix A).

As in most years, age-0 Chinook in 2013 were distributed contagiously among reaches in the Chiwawa River (Table 2). In the Chiwawa River, densities of age-0 Chinook were highest in the upper reaches (Reaches 7-10). The highest densities in the Chiwawa River basin were in tributaries to the Chiwawa River (Table 2). Age-0 Chinook were most abundant in multiple channels and least abundant in glides and riffles. We found the majority of the Chinook associated with woody debris in multiple channels (multiple channel use index = 2.75)[3]. These

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[2] The study period 1992-2013 includes only 21 years of sampling because there was no sampling in 2000.

[3] The habitat use index was calculated as follows: Multiple channel use = ($parr_{mc}$/$parr_t$) / ($area_{mc}$/$area_t$), where $parr_{mc}$ = the number of parr counted in multiple channel habitat, $parr_t$ = the total number of parr counted within all habitat types, $area_{mc}$ = the area of multiple channel habitat within the sampling frame, and $area_t$ = the total area of the sampling frame. A multiple channel use index value of 1 would indicate that parr were uniformly distributed among

sites (multiple channels) made up 17% of the total area of the Chiwawa River basin, but they provided habitat for 48% of all the age-0 Chinook in the basin in 2013 (Appendix C). In contrast, riffles made up 53% of the total area, but provided habitat for only 13% of all age-0 Chinook in the Chiwawa River basin (riffle use index = 0.26). Pools made up 23% of the total area and provided habitat for 37% of all age-0 Chinook in the basin (pool use index = 1.58). Few Chinook used glides that lacked woody debris (glide use index = 0.28).

As noted earlier, we assumed that the Chiwawa River was seeded with 3,412,184 Chinook eggs (808 redds times 4,223 eggs/female) in fall, 2012, and that at least 149,563 of those survived to August 2013. This means that the egg-to-parr survival was at least 4.4% (95% confidence bound 3.9-4.8%). During 1992-2013, egg-to-parr survival averaged 8.4% (range 2.7-19.1%) in the Chiwawa River basin (Appendix A). This survival rate comports with those from other streams. For example, Mullan et al. (1992) estimated an egg-to-parr survival rate of 9.8% for spring Chinook salmon in Icicle Creek, a tributary of the Wenatchee River. Using a Beverton and Holt model, Hubble (1993) estimated that egg-to-parr survival of Chinook in the Chewuck River, a tributary to the Methow River, ranged between 13% and 32%, depending on percent seeding level in the basin. Kiefer and Forster (1991) estimated a mean egg-to-parr survival rate of 5.5% (range 5.1-6.7%) for naturally-spawning spring Chinook salmon in the entire upper Salmon River. They also noted that egg-to-parr survival of natural spawners and adult outplants in the headwater streams of the upper Salmon River averaged 24.4% (range 16.1-32.0%). Petrosky (1990) reported an egg-to-parr survival range of 1.2-29.0% for Chinook in the upper Salmon River, Idaho. Konopacky et al. (1986) estimated egg-to-parr survival of Chinook in Bear Valley Creek, Idaho, as 8.1-9.4%. Work by Richards and Cernera (1987) in Bear Valley Creek indicated an egg-to-parr survival of 2.1%.

Mean densities of age-0 Chinook salmon in two reaches of the Chiwawa River were generally less than those in corresponding reference areas (Figure 5). Within both the Chiwawa River and its reference areas, pools and multiple channels consistently had the highest densities of age-0 Chinook.

We estimated a total of 852 (±21% of the estimated total) age-1+ Chinook salmon in the Chiwawa River basin in August 2013 (Table 3). This was the second highest estimate since the initiation of the study. In August 1992-2013, numbers of age-1+ Chinook ranged from 5 to 967 in the Chiwawa River basin (Figure 3; Appendix B). These fish occurred throughout the Chiwawa River. We found relatively few age-1+ Chinook in tributaries. Age-1+ Chinook were most abundant in multiple channels and pools.

Juvenile Chinook Salmon Productivity (Fish/Redd)

Freshwater productivity of juvenile Chinook salmon was estimated as the number of parr (age-0 Chinook) per redd in the Chiwawa River basin. Theoretically, the relationship between number of parr and redds can be explained mathematically provided the relationship between the two parameters goes through the origin, increases monotonically at low spawning levels, and shows

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habitat types and exhibited no preference for multiple habitat types. Values of the use index greater than 1 indicate use of multiple channels to a greater extent than the average, while scores between 0 and 1 indicate below-average use of multiple channel habitat.

some level of density dependence at high spawning levels. We identified four alternative hypotheses that may explain the relationship between spawning level (redds) and numbers of age-0 Chinook:

1. The first hypothesis assumed that the number of juveniles increases constantly toward an asymptote as the number of redds increases. After the asymptote is reached, the number of juveniles neither increases nor decreases. The asymptote represents the maximum number of juveniles the system can support (i.e., carrying capacity for the system). This hypothesis was modeled with a Beverton-Holt curve that took the form:

$$\boldsymbol{J} = \frac{(\boldsymbol{\alpha R})}{(\boldsymbol{\beta} + \boldsymbol{R})}$$

   where $\boldsymbol{J}$ is the number of juvenile (age-0) Chinook, $\boldsymbol{R}$ is the number or redds, $\boldsymbol{\alpha}$ is the maximum number of juveniles produced, and $\boldsymbol{\beta}$ is the number of redds needed to produce (on average) juveniles equal to one-half the maximum number of juveniles.

2. The second hypothesis, like the first, assumed that the number of juveniles increases toward an asymptote (carrying capacity) as the number of redds increases. After the carrying capacity is reached, the number of juveniles neither increases nor decreases. The carrying capacity represents the maximum number of juveniles the system can support. This hypothesis was modeled with a smooth hockey stick function that took the form:

$$\boldsymbol{J} = \boldsymbol{J_\infty}\left(\boldsymbol{1} - \boldsymbol{e}^{-\left(\frac{\boldsymbol{\alpha}}{\boldsymbol{J_\infty}}\right)\boldsymbol{R}}\right)$$

   where $\boldsymbol{J}$ and $\boldsymbol{R}$ are as above, $\boldsymbol{\alpha}$ is the slope at the origin of the spawner-recruitment curve, and $\boldsymbol{J_\infty}$ is the carrying capacity of juveniles.

3. The third hypothesis assumed that the number of juveniles increases to a maximum and then declines as the number or redds increases. In this case, mortality rate of juveniles (or eggs) is proportional to the initial number of redds. Higher mortality rate is associated with density-dependent growth coupled with size-dependent predation. This hypothesis was modeled with a Ricker curve that took the form:

$$\boldsymbol{J} = \boldsymbol{\alpha R e^{-\beta R}}$$

   where $\boldsymbol{J}$ and $\boldsymbol{R}$ are as above, $\boldsymbol{\alpha}$ is the number of juveniles per redd at low spawning levels, and $\boldsymbol{\beta}$ describes how quickly the juveniles per redd drop as the number of redds increases.

4. The fourth hypothesis, like the first, assumed that the number of juveniles increases constantly, but unlike the first, the number of juveniles does not reach an asymptote. Rather, the number of juveniles increases indefinitely, but at a slowing rate of increase. This hypothesis was modeled with both a Cushing curve and a Gamma function. The Cushing curve took the form:

$$\boldsymbol{J} = \boldsymbol{\alpha R^{\gamma}}$$

   where $\boldsymbol{J}$ and $\boldsymbol{R}$ are as above, $\boldsymbol{\alpha}$ is the number of juveniles per redd at low spawning levels, and $\boldsymbol{\gamma}$ describes the level of density dependence at high spawning levels. The Gamma function is a three-parameter model that has the form:

$$\boldsymbol{J = \alpha R^{\gamma} e^{-\beta R}}.$$

This is an un-normalized gamma function that is similar to the Cushing curve when $\beta = 0$.

We used Akaike's Information Criterion for small sample size (AIC_c) to determine which model(s) best explained the productivity of juvenile Chinook in the Chiwawa River basin. AIC_c was estimated as:

$$\boldsymbol{AIC_c = -2log\big(\pounds(\theta|data)\big) + 2K + \left(\frac{2K(K+1)}{n-K-1}\right)}$$

where $\boldsymbol{log(\pounds(\theta|data))}$ is the maximum likelihood estimate, $\boldsymbol{K}$ is the number of estimable parameters (structural parameters plus the residual variance parameter), and $\boldsymbol{n}$ is the sample size (Burnham and Anderson 2002). We used least-squares methods to estimate $\boldsymbol{log(\pounds(\theta|data))}$, which was calculated as $\boldsymbol{log(\sigma^2)}$, where $\boldsymbol{\sigma^2}$ = residual sum of squares divided by the sample size ($\boldsymbol{\sigma^2 = RSS/n}$). AIC_c assesses model fit in relation to model complexity (number of parameters). The model with the smallest AIC_c value represents the "best approximating" model within the model set. Remaining models were ranked relative to the best model using AIC_c difference scores ($\boldsymbol{\Delta AIC_c}$), Akaike weights ($\boldsymbol{w_i}$), and evidence ratios. Models with $\boldsymbol{\Delta AIC_c}$ values less than 2 indicate that there is substantial support for these models as being the best-fitting models within the set (Burnham and Anderson 2002). Models with values greater than 2 have less support. Akaike weights are probabilities estimating the strength of the evidence supporting a particular model as being the best model within the model set. Models with small $\boldsymbol{w_i}$ values are less plausible as competing models (Burnham and Anderson 2002). If no single model could be specified as the best model, a "best subset" of competing models was identified using (1) AIC_c differences to indicate the level of empirical support each model had as being the best model, (2) evidence ratios based on Akaike weights to indicate the relative probability that any model is the best model, and (3) coefficients of determination (R^2) assessing the explanatory power of each model.

The use of AIC_c indicated that the Beverton-Holt model best approximated the information in the juveniles/redd data (Table 4; Figure 6). The estimated structural parameters for this model were:

$$Juveniles = \frac{(147{,}297 \times Redds)}{(182 + Redds)}$$

where the bootstrap estimated standard errors for the two parameters were 19,368 and 57, respectively. The adjusted $R^2 = 0.83$. The second-best model was the smooth hockey stick model, which was 1.27 AIC_c units from the best model (Table 4; Figure 6). The estimated parameters for this model were:

$$LN(Juveniles) = 11.6 + LN\left(1 - e^{-\left(\frac{730.1}{111{,}612}\right)Redds}\right)$$

where the bootstrap estimated standard errors of the two parameters were 0.1 and 147, respectively, and the $R^2 = 0.82$. The AIC_c difference scores, Akaike weights, and evidence ratios indicated that there was substantial support for both the Beverton-Holt and smooth hockey stick models (Table 4). There was less support for the remaining models (Ricker, Gamma[4], and Cushing), which were > 2 AIC_c units from the best models. This was further supported by the fact that, relative to the best models, the remaining models had evidence ratios greater than 10.

Although the Beverton-Holt, smooth hockey stick, and Ricker models have different biological assumptions, they all indicated a density-dependent relationship between spawning levels (redds) and juvenile Chinook production. This was not only evident in the best approximating models, but there was also a significant negative relationship between juveniles per redd and numbers of redds in the Chiwawa River basin (Figure 7). Although data at high seeding levels are lacking, the Beverton-Holt model would limit the capacity of juvenile Chinook to less than about 183,000 parr in the basin (bootstrap upper 95% CI of $\boldsymbol{\alpha}$ in the Beverton-Holt model). This equates to about 1,439 Chinook parr per hectare. In contrast, the smooth hockey stick model, which fit the data as well as the Beverton-Holt model, would limit the carrying capacity for juvenile Chinook to about 142,000 parr (bootstrap upper 95% CI of $\boldsymbol{J_\infty}$ in the smooth hockey stick model). This equates to about 1,116 Chinook parr per hectare. As a comparison, Thorson et al. (2013) estimated the carrying capacity for 15 populations of juvenile Chinook in the Snake River metapopulation as 5,000 juveniles per hectare. However, those authors noted that the estimate could be biased because of imperfect detectability and estimates of spawning numbers.

Steelhead/Rainbow Abundance

Based on stream surface area, we estimated a total of 21,682 (±8% of the estimated total) age-0 steelhead/rainbow (<4 in) in reaches of the Chiwawa River basin in August 2013 (Table 5). During the 1992-2013 survey period, numbers of age-0 steelhead/rainbow ranged from 1,410 to 45,727 in the Chiwawa River basin (Figure 8; Appendix B). In 1992-2013, numbers of age-0 steelhead/rainbow varied among reaches, but were typically highest in the lower reaches of the Chiwawa River. In all years they most often used riffle and multiple channel habitats in the Chiwawa River, although we also found them associated with woody debris in pool and glide habitat. In tributaries they were generally most abundant in small pools. Those that we observed in riffles selected stations in quiet water behind small and large boulders or occupied stations in quiet water along the stream margin. In pool and multiple-channel habitats, we found age-0 steelhead/rainbow using the same kinds of habitat as age-0 Chinook salmon.

We estimated that 7,253 (±8% of the estimated total) age-1+ steelhead/rainbow (4-8 in) lived in reaches of the Chiwawa River basin in August 2013 (Table 6). During the survey period 1992-2013, numbers of age-1+ steelhead/rainbow ranged from 2,533 to 22,130 (Figure 8; Appendix B). In most years we found these fish in nearly all reaches, but they were typically most numerous in lower reaches of the Chiwawa River. We observed age-1+ steelhead/rainbow mostly in pool, riffle, and multiple-channel habitats. Those that we observed in pools were usually in deeper water than age-0 steelhead/rainbow and Chinook. Like age-0 steelhead/rainbow, age-1+ steelhead/rainbow selected stations in quiet water behind boulders in riffles, but we generally did not find the two age groups together. Age-1+ steelhead/rainbow

[4] The γ parameter in the Gamma model was greater than 0, which means that this model is nearly identical to the Ricker model. The reason it did not rank higher is because it contains an extra parameter, which means that it has less bias and greater variance than the Ricker model.

appeared to use deeper and faster water than did age-0 steelhead/rainbow.

We estimated that steelhead/rainbow larger than 8 inches numbered 76 (±22% of the estimated total) in the Chiwawa River basin in August 2013 (Table 7). During the period 1992-2013, steelhead/rainbow numbers ranged from 8 to 1,869 (Appendix B). Steelhead/rainbow larger than 8 inches were most abundant in the lower Chiwawa River; however, in 1992 and 1993, they were most abundant near campgrounds in Reaches 8, 9, and 10 (these were mostly hatchery fish planted near the campgrounds). We found very few in tributaries. Most of the steelhead/rainbow larger than 8 inches used deep pools (>5 feet), and occupied stations near the bottom at the upstream end of pools.

Bull Trout Abundance

We estimated, based on surface area that at least 299 (±21% of the estimated total) juvenile (2-8 in) bull trout lived in reaches of the Chiwawa River basin in August 2013 (Table 8). We found most of these fish in the upper-most reaches of the Chiwawa River and in tributaries of the Chiwawa River. During 1992-2013, numbers of juvenile bull trout ranged from 79 to 505 (Figure 9; Appendix B). These estimates and those for adult bull trout are incomplete because we did not sample the entire range of bull trout in all tributaries. We did not extend our surveys into the headwaters of the Chiwawa River because there were no juvenile Chinook there. Areas beyond the distribution of juvenile Chinook salmon are known to support bull trout, steelhead/rainbow, and cutthroat trout (USFS 1993). In addition, our estimates of bull trout abundance were based on daytime snorkel surveys, which may underestimate the actual abundance of bull trout.[5] Several studies (e.g., Goetz 1994; Thurow and Schill 1996; Hillman and Chapman 1996; Bonar et al. 1997) have found bull trout population estimates based on nighttime snorkeling to be in some cases more accurate than daytime snorkeling, especially for juvenile bull trout. Our estimates of adult bull trout numbers may be more accurate than those for juveniles.

In all years we found most juvenile bull trout in the upstream reaches of the Chiwawa River. Of the reaches we surveyed, they were most numerous in Reaches 7-10 on the Chiwawa River. We found the majority of these fish in multiple channels, pools, and riffles, and few in glides. They consistently occupied stations close to the stream bottom over rubble and small boulder substrate or near woody debris. This is similar to the observation of Pratt (1984) in the upper Flathead River Basin in Montana. She found that juvenile bull trout lay close to instream cover and that they tended to conceal themselves. As a result, she found it difficult to accurately estimate their numbers. Although this implies that we underestimated numbers of juvenile bull trout in the Chiwawa River, the relative distribution of juvenile bull trout is valid if we assume that we saw the same fraction of juveniles in all reaches (i.e., detection probability was the same across survey sites).

We estimated a total of 820 (±12% of the estimated total) adult (>8 in) bull trout in reaches of the Chiwawa River basin in August 2013 (Table 9). In previous years, numbers ranged from 76 to 900 (Figure 9; Appendix B). As with juvenile bull trout, we found most of the adult bull trout

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[5] Because there are no estimates for probability of detecting bull trout with daytime underwater observation methods in the Chiwawa River basin, we could not adjust bull trout numbers based on detectability. Therefore, the numbers reported in this report likely underestimate the "true" number of bull trout in the survey area.

upstream from Reach 6; although they were found in all reaches on the Chiwawa River. We found few adult bull trout in tributaries of the Chiwawa River. Adult bull trout primarily used pools and multiple channel habitat, although most of the smaller adults (<10 in) used riffles. In all years we found few adult bull trout near campgrounds.

Abundance of Other Salmonids

In August 2013, we estimated that at least 199 brook trout, an exotic species closely related to the bull trout, occurred in the Chiwawa River, Chikamin Creek, Big Meadow Creek, Minnow Creek, and in the Little Wenatchee River survey areas. Brook trout occurred in the lower seven reaches on the Chiwawa River. In both the Chiwawa and Little Wenatchee rivers, brook trout usually used multiple channels. Few appeared to be bull trout/brook trout hybrids. In Chikamin, Minnow, and Big Meadow creeks, brook trout were most abundant in pools. Brook trout lengths ranged from 2-10 inches.

At least 358 westslope cutthroat trout occurred in the Chiwawa River, Rock Creek, Phelps Creek, and Little Wenatchee River survey areas in August 2013. These fish most often occurred in pools and multiple channel habitats. They ranged in size from 2-18 inches. Juvenile coho salmon were observed in Nason Creek and the Chiwawa River.

We observed both juvenile and adult mountain whitefish in the Chiwawa River, Rock Creek, Nason Creek, and the Little Wenatchee River survey areas. In sum, at least 8,324 adult and 2,253 juvenile whitefish lived in these streams in August 2013. We found few whitefish in most tributaries to the Chiwawa River.

Conclusion

This was the 21st year of a study to monitor trends in juvenile spring Chinook production in the Chiwawa River basin. As shown in Figure 3, numbers of juvenile Chinook salmon in the Chiwawa River basin have fluctuated widely over the 21-year period. Numbers of juveniles in 2001, 2002, and 2009-2013 were some of the highest recorded, while numbers in the mid-1990s were some of the lowest. Interestingly, the highest spawning escapements (highest redd numbers) resulted in the lowest egg-parr survival rates (Appendix A). This is supported by the fact that the best approximating models clearly demonstrated a density-dependent relationship between seeding levels and juvenile production. Indeed, there was a significant negative relationship between parr per redd and numbers of redds in the Chiwawa River basin. This is an important observation because some of the hypotheses in the revised monitoring and evaluation plan (Hillman et al. 2013) are only valid when the supplemented population is below its carrying capacity.

The proportion of hatchery-origin spawners (pHOS) within the Chiwawa River basin during the survey period has ranged from 0 to 100%. Thus, some of the variation in juvenile productivity may be related to pHOS. Although there appeared to be a negative relationship between juvenile productivity (parr/redd) and pHOS, the correlation was not significant (Figure 10). In addition, there was no relationship between juvenile productivity and pHOS after the effects of spawning escapement were removed from the analysis (Figure 10). This suggests that spawning escapement has a larger effect on juvenile productivity than does the presence of hatchery spawners.

The presence of density dependence in the early life stages of spring Chinook is not surprising. Rarely does density dependence appear in numbers of adult spring Chinook or on their spawning grounds. The Chiwawa River basin appears to have plenty of spawning habitat, as indicated by the large numbers of spawners and redds widely distributed throughout the basin during high spawning escapements. However, those large spawning escapements did not translate into large numbers of juveniles or smolts. Thus, density-dependent regulation appears to occur sometime during the early life stages of the fish, likely at the fry stage. It is possible that physical habitat (space) during higher flows when fry are emerging may limit juvenile Chinook production in the basin. Low nutrient levels and its effects on food webs may also be a limiting factor in the basin. If spawning escapements remain relatively high, marine-derived nutrients should increase in the basin, resulting in more food for juvenile Chinook salmon.

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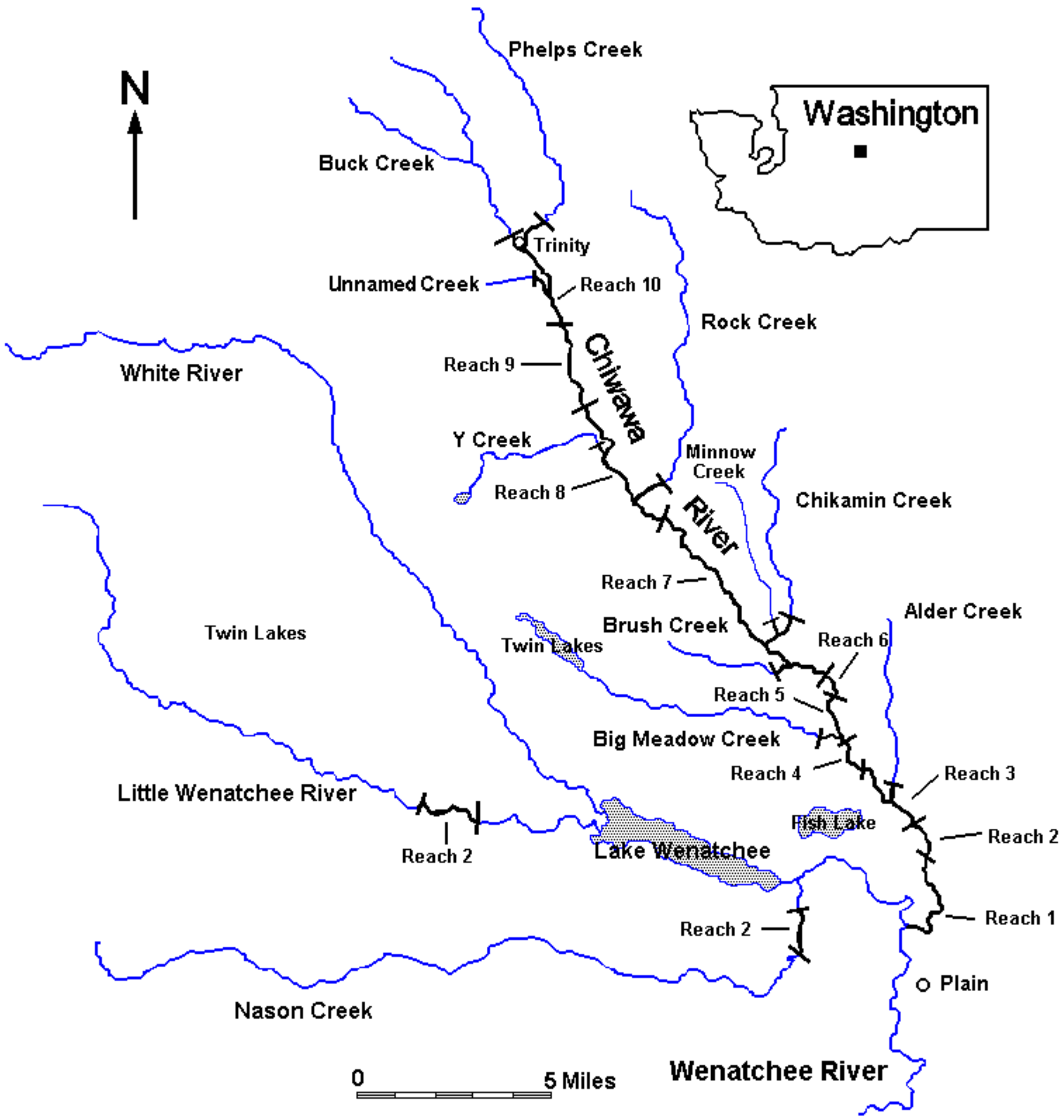

Figure 1. Location of study reaches on the Chiwawa River, and Chikamin, Rock, Big Meadow, Unnamed, Alder, Brush and Phelps creeks, Chelan County, Washington. Reach 2 on Nason Creek and Reach 2 on the Little Wenatchee River were matched with Reaches 3 and 8 on the Chiwawa River, respectively.

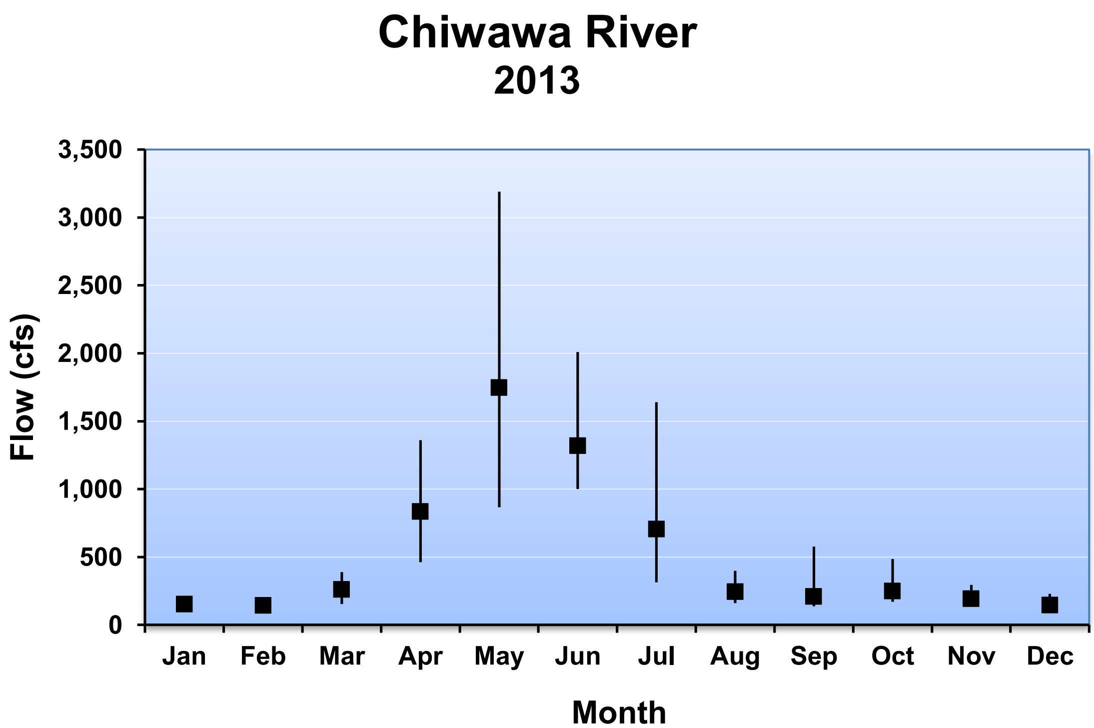

Figure 2. Mean, minimum, and maximum monthly flows in the Chiwawa River for 2013.

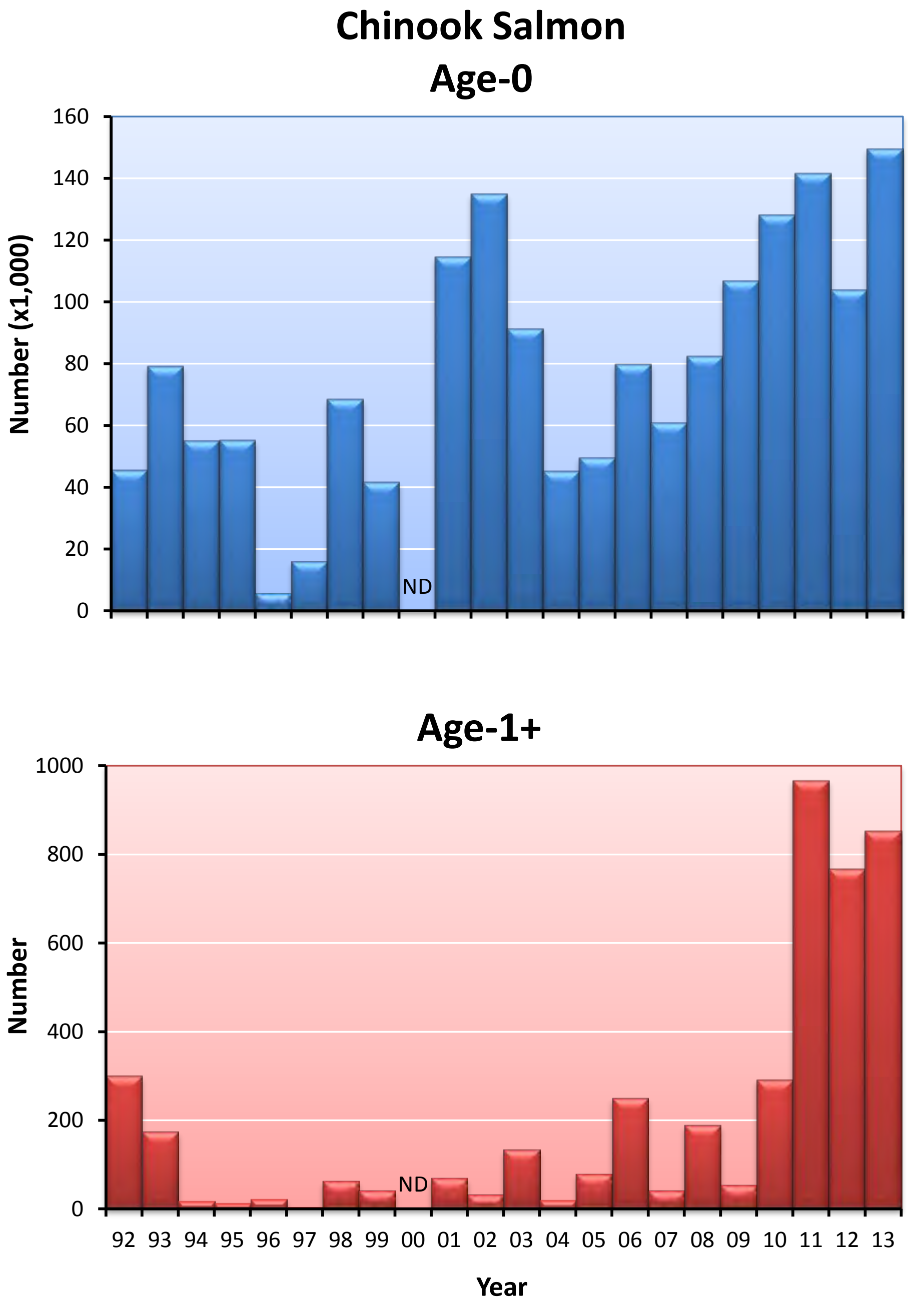

Figure 3. Numbers of age-0 and age-1+ Chinook salmon within the Chiwawa River basin in August 1992-2013; ND = no data.

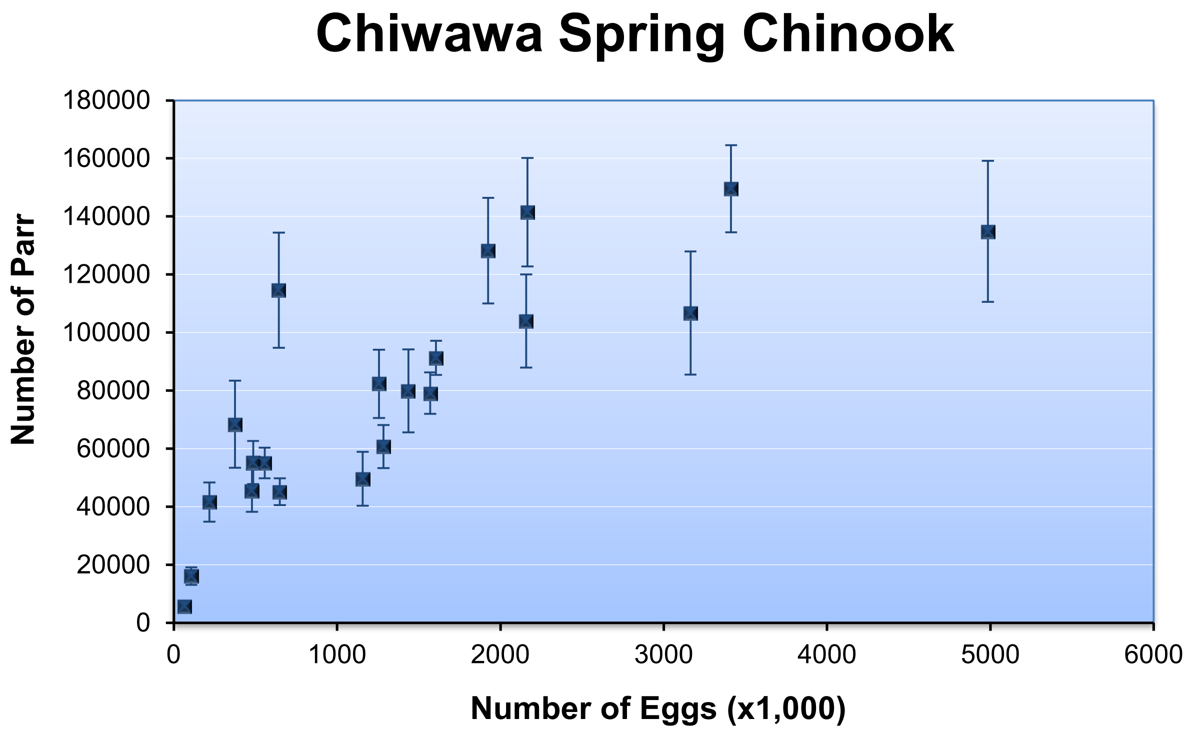

Figure 4. Relationship between total numbers of age-0 Chinook salmon (based on fish/ha) and numbers of eggs in the Chiwawa River basin. Vertical bars indicate 95% confidence bounds.

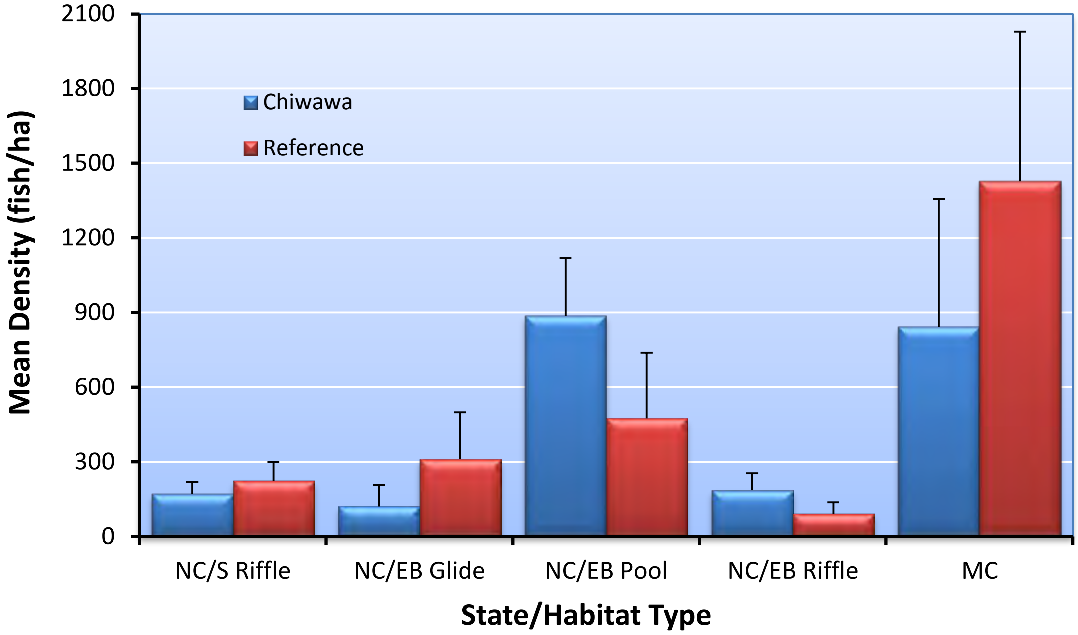

Figure 5. Comparison of the 20-year means (95% CI) of age-0 Chinook salmon densities (fish/ha) within state/habitat types in Reaches 3 and 8 of the Chiwawa River and their matched reference areas on Nason Creek and the Little Wenatchee River. There was no sampling in 2000 and no sampling in reference areas in 1992.

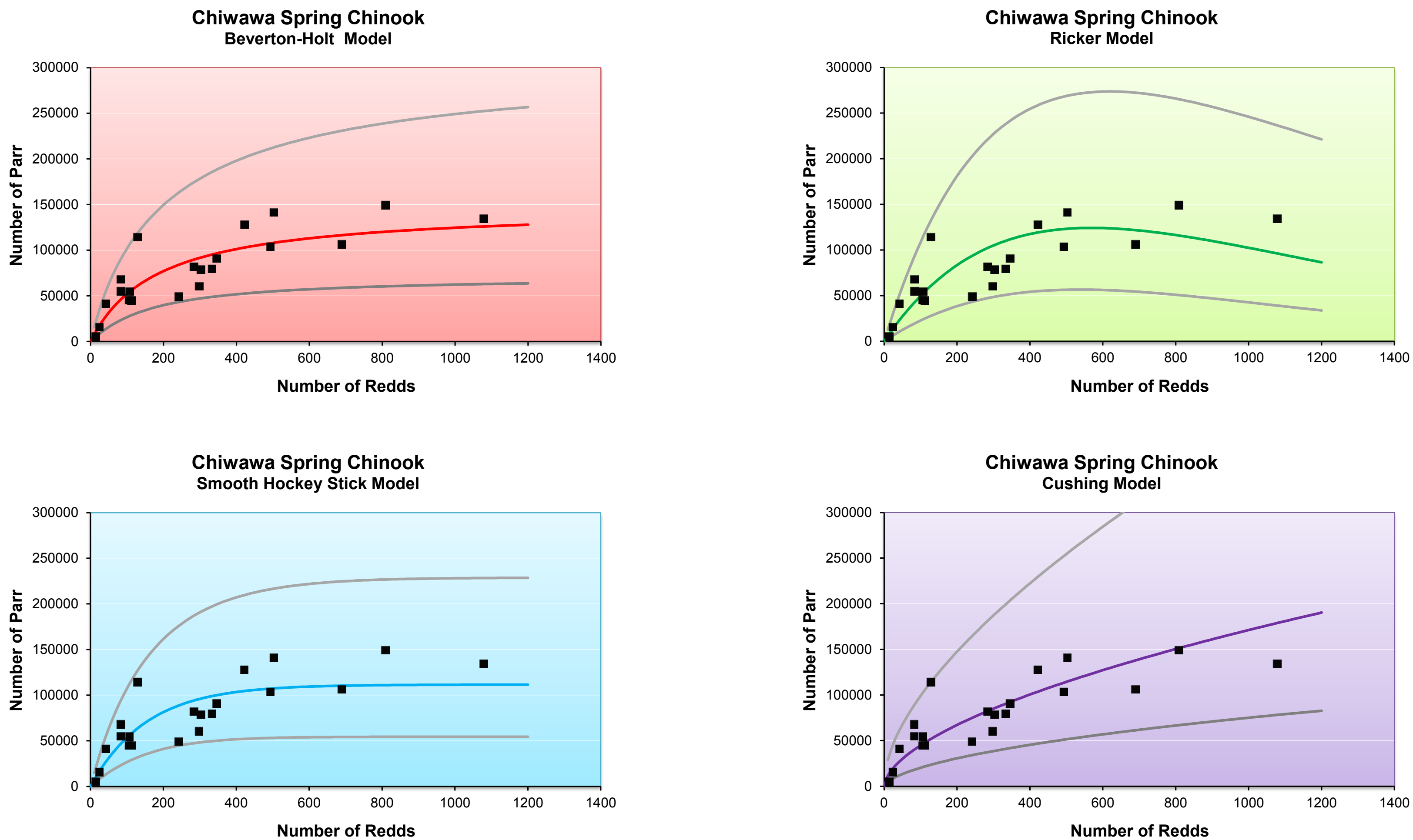

Figure 6. Relationship between numbers of juvenile (age-0) Chinook and redds in the Chiwawa River basin, 1992-2013 (no sampling occurred in 2000). Figures show the fit of the Beverton-Holt model, smooth hockey stick, Ricker model, and the Cushing model to the data. Gray lines indicate the upper and lower 95% C.B.

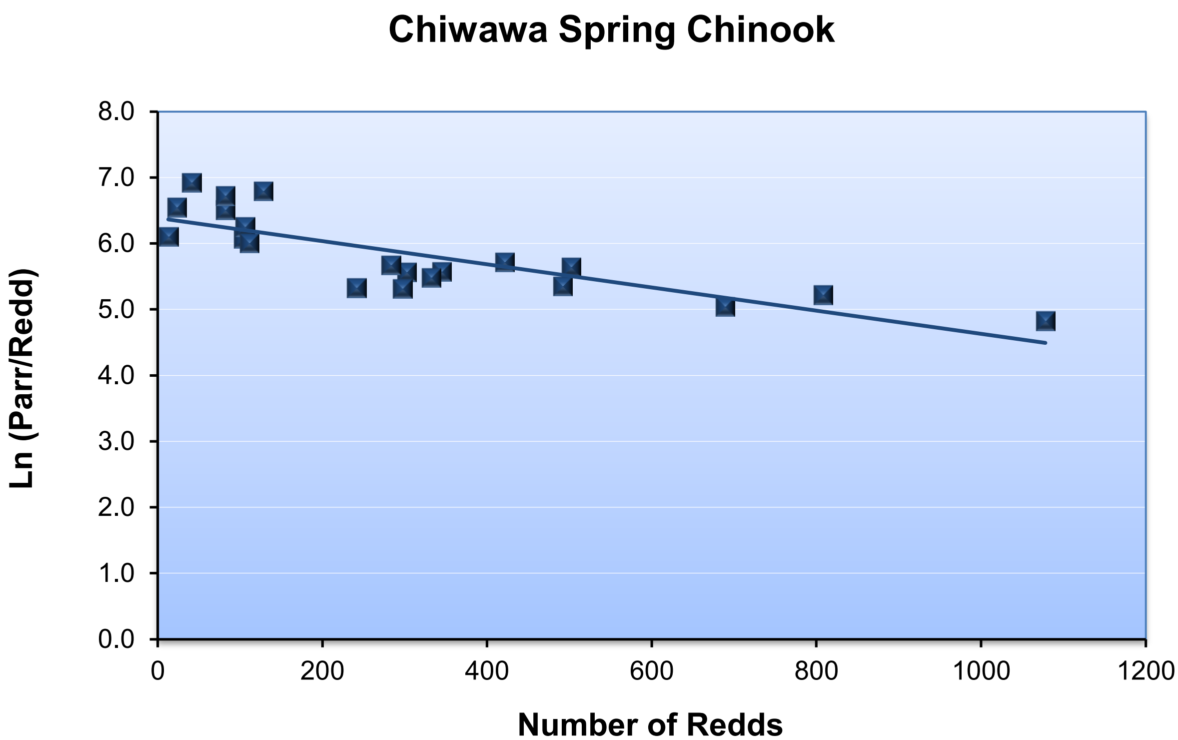

Figure 7. Relationship between natural log parr/redd and numbers of redds in the Chiwawa River basin, 1992-2013. No sampling was conducted in 2000. Estimates for 1992-2013 included the Chiwawa River and its tributaries; the 1992 estimate included only the Chiwawa River. The linear relationship LN(P/R) = 6.14 – 0.002(Redds) was significant with P = 0.0000; R^2 = 0.664.

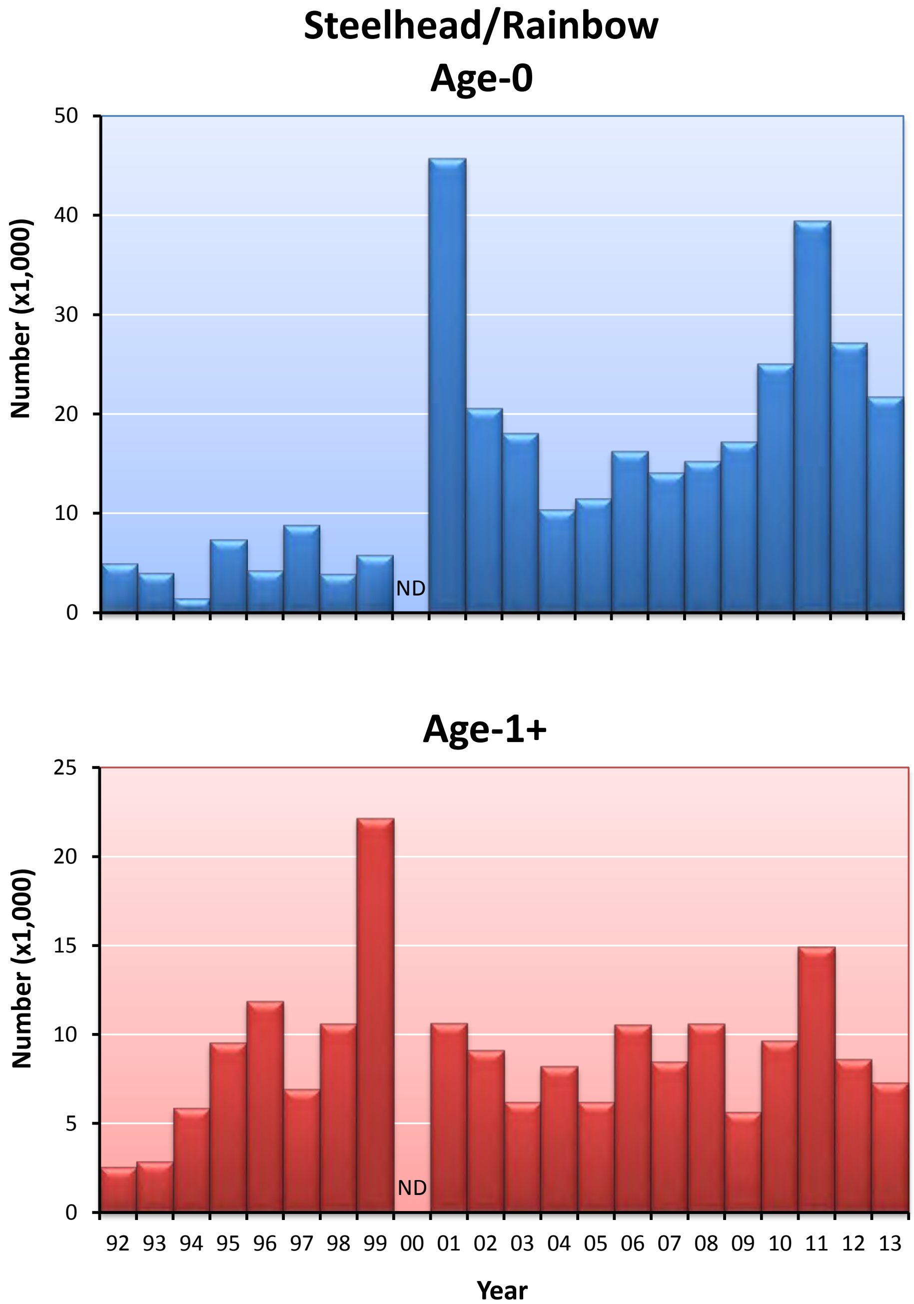

Figure 8. Numbers of age-0 (<4 in) and age-1+ (4-8 in) steelhead/rainbow within the Chiwawa River basin in August 1992-2013; ND = no data.

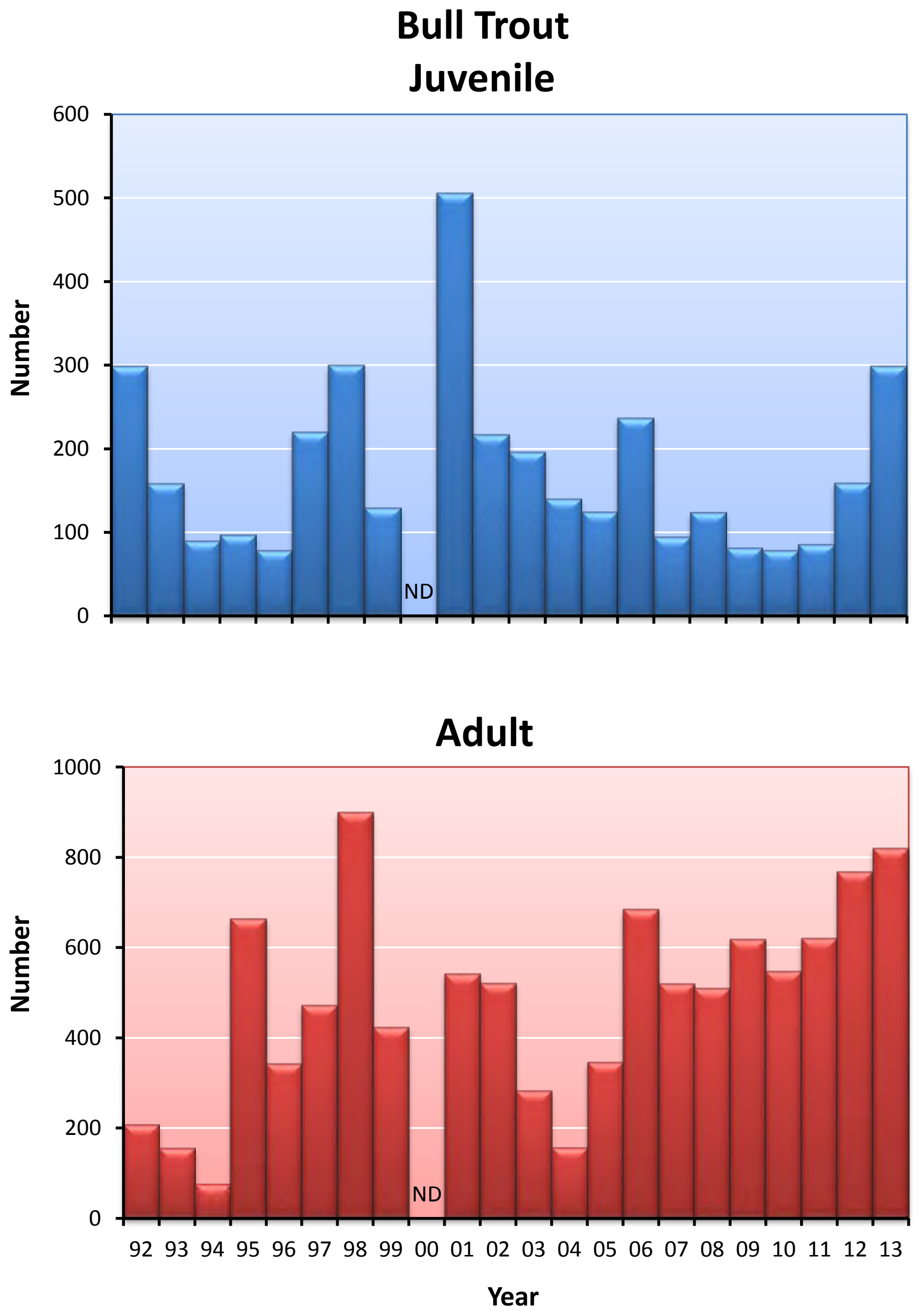

Figure 9. Numbers of juvenile (2-8 inches) and adult (>8 inches) bull trout within the Chiwawa River basin in August 1992-2013; ND = no data.

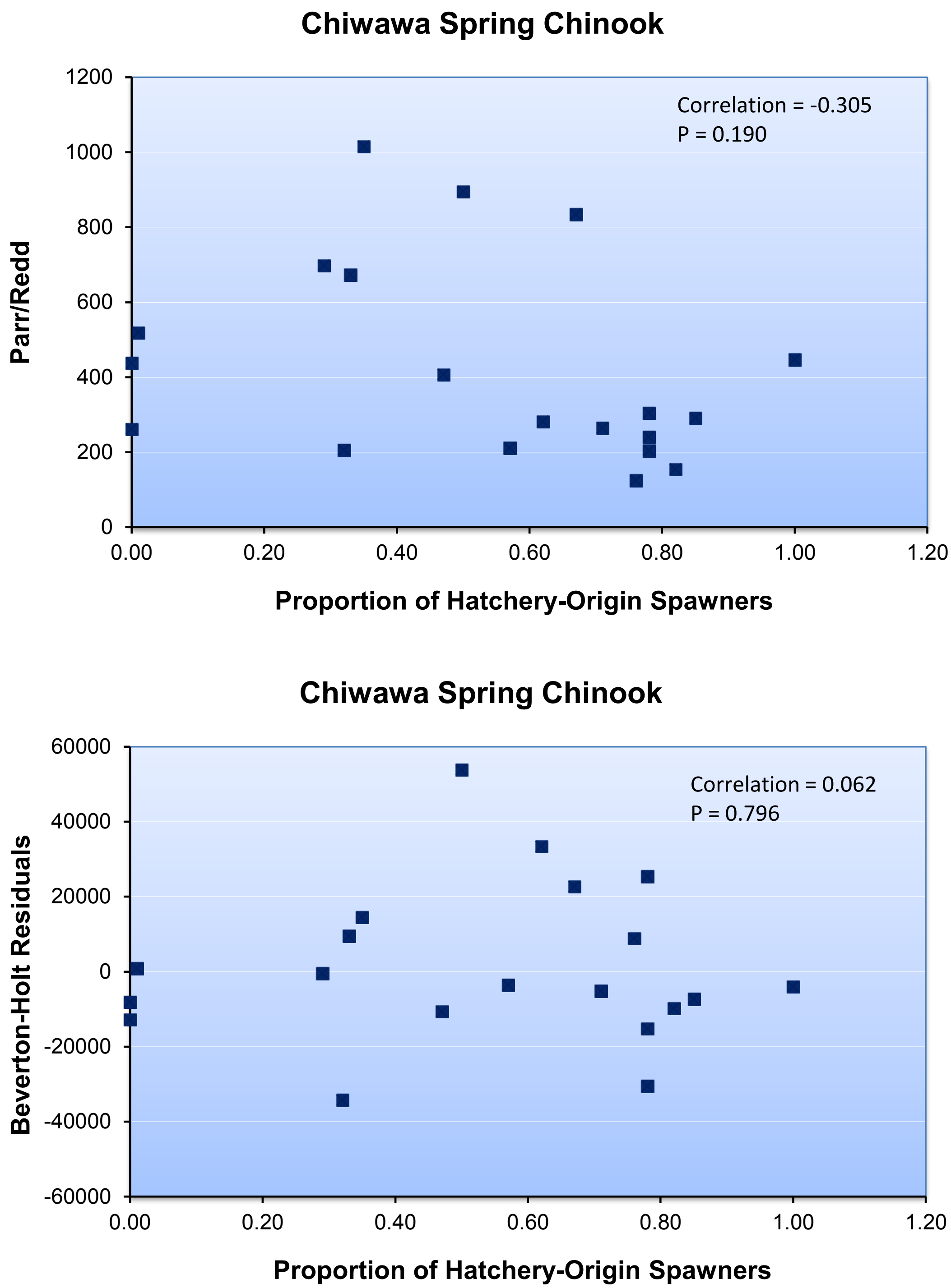

Figure 10. Relationship between juvenile productivity (parr/redd) and the proportion of hatchery-origin spawners (pHOS) (top figure) and the relationship between the residuals from the Beverton-Holt stock/recruitment relationship and pHOS (bottom figure).

Table 1. Description, location (river mile), and area (hectares) of land-class strata (reaches) used by age-0 Chinook salmon in the Chiwawa River basin, 2013. Reaches were classified according to geologic district, landtype association, valley-bottom type, stream state-type, and habitat type within the Cascade Ecoregion; MCV = moderately confined valley, CC = confined canyon, UCV = unconfined valley, NC = natural channel, EB = eroded banks, S = straight, G = glide, P = pool, R = riffle, and MC = multiple channel. See Hillman and Miller (2004) for definitions of stream state codes.

Reach	RM	Gradient	Geologic district	Landtype association	Valley bottom type	Stream state type	Habitat type	Area (ha)	
								Total	Sample
Chiwawa River									
1	0.00-3.77	0.007	Glacial Drift over Chumstick Formation	Glacial Valley	MCV Alluvial	NC/EB	G	0.57	0.57
						NC/EB	P	1.34	0.96
						NC/EB	R	17.25	1.74
2	3.77-5.51	0.010	Glacial Drift over Chumstick Formation	Glacial Canyon	CC Fluvial	NC/EB	G	0.26	0.26
						NC/EB	P	0.69	0.26
						NC/EB	R	7.07	0.68
3	5.51-7.88	0.009	Glacial Drift over Chumstick Formation	Glacial Valley	MCV Alluvial	NC/S	R	5.68	0.77
						NC/EB	G	0.13	0.13
						NC/EB	R	4.46	0.52
						MC	MC	0.39	0.39
4	7.88-8.90	0.007	Glacial Drift over Chumstick Formation	Glacial Canyon	CC Fluvial	NC/EB	P	0.38	0.27
						NC/EB	R	2.72	0.45
						MC	MC	0.45	0.45
5	8.90-10.83	0.011	Glacial Drift over Chumstick Formation	Glacial Valley	MCV Alluvial	NC/EB	P	0.13	0.13
						NC/EB	R	9.64	0.89
6	10.83-11.80	0.008	Glacial Drift over Chumstick Formation	Glacial Canyon	CC Fluvial	NC/EB	P	0.37	0.37
						NC/EB	R	3.95	1.02
						MC	MC	0.34	0.34
7	11.80-20.03	0.001	Glacial Drift over Chumstick Formation	Glacial Valley	UCV Alluvial	NC	G	2.04	0.60
						NC	P	6.32	0.55
						NC	R	1.30	0.11
						NC/EB	G	2.40	1.38
						NC/EB	P	6.34	1.48
						NC/EB	R	4.74	0.56
						MC	MC	4.63	1.94
8	20.03-25.42	0.003	Glacial Drift over Swakane Gneiss	Glacial Valley	UCV Alluvial	NC/EB	G	2.70	1.19
						NC/EB	P	7.50	1.69
						NC/EB	R	5.79	1.04
						EB	P	0.22	0.22
						EB	R	0.40	0.40
						MC	MC	6.88	2.83
9	25.42-28.81	0.007	Glacial Drift over Swakane Gneiss	Glacial Valley	MCV Alluvial	NC	P	4.52	0.70
						NC	R	2.45	0.65
						MC	MC	3.34	0.93
10	28.81-31.11	0.011	Pre-upper Jurassic Gneiss	Glacial Valley	MCV Alluvial	NC	P	0.39	0.33
						NC	R	1.48	0.73
						MC	MC	5.83	0.47

Table 1. Concluded.

Reach	RM	Gradient	Geologic district	Landtype association	Valley bottom type	Stream state type	Habitat type	Area (ha)	
								Total	Sampled
Phelps Creek									
1	0.00-0.35	0.043	Pre-upper Jurassic Gneiss	Glacial Valley	MCV Alluvial	NC	R	0.02	0.02
						NC	MC	0.03	0.03
Chikamin Creek[1]									
1	0.00-0.94	0.013	Glacial Drift over Chumstick Formation	Glacial Valley	UCV Alluvial	NC	G	0.02	0.02
						NC	P	0.20	0.06
						NC	R	0.41	0.14
						MC	MC	0.25	0.25
Rock Creek									
1	0.00-0.73	0.020	Glacial Drift over Swakane Gneiss	Glacial Valley	UCV Alluvial	NC	P	0.18	0.04
						NC	R	0.52	0.21
						MC	MC	0.16	0.16
Unnamed Creek									
1	0.00-0.05		Pre-upper Jurassic Gneiss	Glacial Valley	MCV Alluvial	NC	P	0.00	0.00
						NC	R	0.00	0.00
Big Meadow Creek									
1	0.00-0.35	0.025	Glacial Drift over Chumstick Formation	Glacial Valley	MCV Alluvial	NC	G	0.01	0.01
						NC	P	0.12	0.01
						NC	R	0.12	0.03
						NC	MC	0.05	0.05
Alder Creek									
1	0.00-0.01		Glacial Drift over Chumstick Formation	Glacial Valley	MCV Alluvial	NC	P	0.002	0.002
						NC	R	0.005	0.005
Brush Creek									
1	0.00-0.01		Glacial Drift over Chumstick Formation	Glacial Valley	UCV Alluvial	NC	P	0.001	0.001
						NC	R	0.006	0.006
Clear Creek									
1	0.00-0.05		Glacial Drift over Chumstick Formation	Glacial Valley	UCV Alluvial	NC	P	0.002	0.002
						NC	R	0.004	0.004
Y Creek									
1	0.00-0.05		Glacial Drift over Swakane Gneiss	Glacial Valley	UCV Alluvial	NC	P	0.000	0.000
						NC	R	0.000	0.000

[1] Includes the lower 0.2 miles of Minnow Creek.

Table 2. Estimated mean densities (fish/hectare and fish/m^3), total numbers, 95% confidence bounds on total numbers, and error of the estimated total number of age-0 Chinook salmon in reaches in the Chiwawa River basin, Washington, August 2013.

Reach	Mean density		Surface area (ha)			Volume (m^3)		
	Fish/ha	Fish/m^3	Total No.	95% C.B.	± Error	Total No.	95% C.B.	± Error
Chiwawa River								
1	329.8	0.099	6,319	±1,641	0.26	6,336	±1,637	0.26
2	356.9	0.090	2,862	±317	0.11	2,735	±457	0.17
3	205.1	0.056	2,186	±70	0.03	2,224	±60	0.03
4	963.9	0.214	3,422	±193	0.06	3,617	±54	0.01
5	324.7	0.077	3,172	±27	0.01	3,077	±88	0.03
6	552.1	0.154	2,573	±65	0.03	2,576	±67	0.03
7	1,757.6	0.286	48,808	±7,507	0.15	46,227	±8,369	0.18
8	1,343.8	0.245	31,567	±10,915	0.35	32,330	±10,934	0.34
9	1,850.6	0.308	19,080	±4,818	0.25	18,377	±5,946	0.32
10	2,661.8	0.810	20,496	±4,647	0.23	24,841	±3,468	0.14
Phelps Creek								
1	2,400.0	1.613	120	±0	0.00	120	±0	0.00
Chikamin Creek[1]								
1	3,751.1	2.449	3,301	±630	0.19	3,813	±660	0.17
Rock Creek								
1	3,737.2	1.788	3,214	±818	0.25	3,613	±796	0.22
Unnamed Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Big Meadow Creek								
1	7,976.2	5.045	2,345	±205	0.09	3,836	±245	0.06
Alder Creek								
1	4,428.6	4.627	31	±0	0.00	31	±0	0.00
Brush Creek								
1	3,000.0	6.177	21	±0	0.00	21	±0	0.00
Clear Creek								
1	7,666.7	6.133	46	±0	0.00	46	±0	0.00
Y Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Grand Total	**1,175.9**	**0.258**	**149,563**	**±14,975**	**0.10**	**153,820**	**±15,525**	**0.10**

[1] Includes lower 0.2 miles of Minnow Creek.

Table 3. Estimated mean densities (fish/hectare and fish/m^3), total numbers, 95% confidence bounds on total numbers, and error of the estimated total number of age-1+ Chinook salmon in reaches in the Chiwawa River basin, Washington, August 2013.

Reach	Mean density		Surface area (ha)			Volume (m^3)		
	Fish/ha	Fish/m^3	Total No.	95% C.B.	± Error	Total No.	95% C.B.	± Error
Chiwawa River								
1	1.7	0.001	32	±14	0.44	32	±37	1.16
2	8.0	0.002	64	±40	0.63	54	±45	0.83
3	0.6	0.000	6	±0	0.00	8	±0	0.00
4	10.1	0.002	36	±5	0.14	36	±7	0.19
5	0.6	0.000	6	±0	0.00	4	±0	0.00
6	1.5	0.000	7	±0	0.00	7	±0	0.00
7	9.2	0.002	255	±103	0.40	258	±282	1.09
8	7.7	0.001	180	±89	0.49	159	±155	0.97
9	14.1	0.003	145	±99	0.68	149	±132	0.89
10	13.6	0.004	105	±33	0.31	129	±36	0.28
Phelps Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Chikamin Creek[1]								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Rock Creek								
1	9.3	0.004	8	±0	0.00	8	±0	0.00
Unnamed Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Big Meadow Creek								
1	27.2	0.011	8	±0	0.00	8	±0	0.00
Alder Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Brush Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Clear Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Y Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Grand Total	**6.7**	**0.001**	**852**	**±177**	**0.21**	**852**	**±355**	**0.42**

[1] Includes lower 0.2 miles of Minnow Creek.

Table 4. Summary of the six productivity models of juvenile (age-0) Chinook salmon in the Chiwawa River basin. Models are shown, including the number of parameters (*K*), AIC_c values, AIC_c difference scores (Δ_i), the likelihood of the model given the data ($£(g_i|x)$), Akaike weights (w_i), and adjusted R^2 values. The sample size (*n*) for all models was 20. Models describe the relationship between juvenile Chinook numbers (dependent variable) and redd numbers (independent variable).

Model	K^a	AIC_c	Δ_i	$£(g_i\|x)$	w_i	Adj R^2
Beverton-Holt	3	-101.32	0.00	1.00	0.61	0.83
Smooth Hockey Stick	3	-100.05	1.27	0.53	0.32	0.82
Ricker	3	-95.31	6.01	0.05	0.03	0.77
Gamma[b]	4	-94.92	6.40	0.04	0.03	0.78
Cushing	3	-94.51	6.82	0.03	0.02	0.76

[a] ***K*** is the number of structural parameters in the model plus 1 for σ^2.
[b] The γ parameter in the Gamma model was greater than 0, which means that this model is nearly identical to the Ricker model. The reason it did not rank higher than the Ricker model is because the Gamma model contains an extra parameter, which means that it has less bias and greater variance than the Ricker model (less parsimonious).

Table 5. Estimated mean densities (fish/hectare and fish/m^3), total numbers, 95% confidence bounds on total numbers, and error of the estimated total number of age-0 (<4 in) steelhead/rainbow in reaches in the Chiwawa River basin, Washington, August 2013.

Reach	Mean density		Surface area (ha)			Volume (m^3)		
	Fish/ha	Fish/m^3	Total No.	95% C.B.	± Error	Total No.	95% C.B.	± Error
Chiwawa River								
1	200.8	0.060	3,848	±147	0.04	3,879	±195	0.05
2	325.2	0.092	2,608	±280	0.11	2,792	±49	0.02
3	239.7	0.066	2,555	±91	0.04	2,615	±88	0.03
4	341.4	0.088	1,212	±354	0.29	1,493	±261	0.17
5	311.9	0.073	3,047	±53	0.02	2,929	±95	0.03
6	211.8	0.060	987	±57	0.06	999	±125	0.13
7	115.1	0.019	3,197	±1,564	0.49	3,051	±1,599	0.52
8	18.3	0.003	431	±238	0.55	410	±224	0.55
9	0.0	0.000	0	±0	0.00	0	±0	0.00
10	0.5	0.000	4	±3	0.75	6	±4	0.67
Phelps Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Chikamin Creek[1]								
1	684.1	0.433	602	±338	0.56	674	±350	0.52
Rock Creek								
1	948.8	0.453	816	±518	0.63	916	±356	0.39
Unnamed Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Big Meadow Creek								
1	7,445.6	4.542	2,189	±464	0.21	3,454	±401	0.12
Alder Creek								
1	6,285.7	6.567	44	±0	0.00	44	±0	0.00
Brush Creek								
1	14,142.9	29.118	99	±0	0.00	99	±0	0.00
Clear Creek								
1	7,166.7	5.733	43	±0	0.00	43	±0	0.00
Y Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Grand Total	**170.5**	**0.039**	**21,682**	**±1,827**	**0.08**	**23,404**	**±1,777**	**0.08**

[1] Includes lower 0.2 miles of Minnow Creek.

Table 6. Estimated mean densities (fish/hectare and fish/m^3), total numbers, 95% confidence bounds on total numbers, and error of the estimated total number of age-1+ (4-8 in) steelhead/rainbow in reaches in the Chiwawa River basin, Washington, August 2013.

Reach	Mean density		Surface area (ha)			Volume (m^3)		
	Fish/ha	Fish/m^3	Total No.	95% C.B.	± Error	Total No.	95% C.B.	± Error
Chiwawa River								
1	98.1	0.029	1,880	±113	0.06	1,891	±156	0.08
2	131.3	0.036	1,053	±234	0.22	1,089	±201	0.18
3	76.6	0.021	817	±58	0.07	853	±57	0.07
4	98.9	0.024	351	±72	0.21	406	±60	0.15
5	101.1	0.024	988	±37	0.04	952	±40	0.04
6	62.0	0.017	289	±45	0.16	290	±58	0.20
7	33.2	0.005	922	±507	0.55	872	±524	0.60
8	1.0	0.000	24	±38	1.58	26	±42	1.62
9	0.0	0.000	0	±0	0.00	0	±0	0.00
10	14.9	0.004	115	±37	0.32	135	±48	0.36
Phelps Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Chikamin Creek[1]								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Rock Creek								
1	55.8	0.024	48	±31	0.65	48	±37	0.77
Unnamed Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Big Meadow Creek								
1	2,605.4	1.710	766	±85	0.11	1,300	±68	0.05
Alder Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Brush Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Clear Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Y Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Grand Total	**57.0**	**0.013**	**7,253**	**±590**	**0.08**	**7,862**	**±601**	**0.08**

[1] Includes lower 0.2 miles of Minnow Creek.

Table 7. Estimated mean densities (fish/hectare and fish/m^3), total numbers, 95% confidence bounds on total numbers, and error of the estimated total number of steelhead/rainbow larger than 8 inches in reaches in the Chiwawa River basin, Washington, August 2013.

Reach	Mean density		Surface area (ha)			Volume (m^3)		
	Fish/ha	Fish/m^3	Total No.	95% C.B.	± Error	Total No.	95% C.B.	± Error
Chiwawa River								
1	0.6	0.000	11	±11	1.00	13	±21	1.62
2	0.6	0.000	5	±1	0.20	3	±6	2.00
3	0.3	0.000	3	±0	0.00	4	±0	0.00
4	1.4	0.000	5	±0	0.00	5	±0	0.00
5	0.3	0.000	3	±0	0.00	4	±0	0.00
6	0.0	0.000	0	±0	0.00	0	±0	0.00
7	0.4	0.000	12	±9	0.75	16	±13	0.81
8	0.0	0.000	0	±0	0.00	0	±0	0.00
9	1.1	0.000	11	±5	0.45	12	±10	0.83
10	3.4	0.001	26	±7	0.27	34	±10	0.29
Phelps Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Chikamin Creek[1]								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Rock Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Unnamed Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Big Meadow Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Alder Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Brush Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Clear Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Y Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Grand Total	**0.6**	**0.000**	**76**	**±17**	**0.22**	**91**	**±29**	**0.32**

[1] Includes lower 0.2 miles of Minnow Creek.

Table 8. Estimated mean densities (fish/hectare and fish/m^3), total numbers, 95% confidence bounds on total numbers, and error of the estimated total number of juvenile bull trout (2-8 in) in reaches in the Chiwawa River basin, Washington, August 2013.

Reach	Mean density		Surface area (ha)			Volume (m^3)		
	Fish/ha	Fish/m^3	Total No.	95% C.B.	± Error	Total No.	95% C.B.	± Error
Chiwawa River								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
2	0.0	0.000	0	±0	0.00	0	±0	0.00
3	0.0	0.000	0	±0	0.00	0	±0	0.00
4	0.0	0.000	0	±0	0.00	0	±0	0.00
5	0.0	0.000	0	±0	0.00	0	±0	0.00
6	0.0	0.000	0	±0	0.00	0	±0	0.00
7	0.4	0.000	10	±8	0.80	16	±25	1.56
8	1.3	0.000	30	±28	0.93	26	±29	1.12
9	7.4	0.001	76	±50	0.66	72	±47	0.65
10	15.7	0.005	121	±12	0.10	141	±27	0.19
Phelps Creek								
1	320.0	0.215	16	±0	0.00	16	±0	0.00
Chikamin Creek[1]								
1	12.5	0.007	11	±0	0.00	11	±0	0.00
Rock Creek								
1	40.7	0.019	35	±18	0.51	38	±15	0.39
Unnamed Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Big Meadow Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Alder Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Brush Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Clear Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Y Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Grand Total	**2.4**	**0.001**	**299**	**±62**	**0.21**	**320**	**±68**	**0.21**

[1] Includes lower 0.2 miles of Minnow Creek.

Table 9. Estimated mean densities (fish/hectare and fish/m^3), total numbers, 95% confidence bounds on total numbers, and error of the estimated total number of adult bull trout (>8 in) in reaches in the Chiwawa River basin, Washington, August 2013.

Reach	Mean density		Surface area (ha)			Volume (m^3)		
	Fish/ha	Fish/m^3	Total No.	95% C.B.	± Error	Total No.	95% C.B.	± Error
Chiwawa River								
1	0.3	0.000	6	±11	1.83	6	±10	1.67
2	1.1	0.000	9	±1	0.11	9	±9	1.00
3	1.2	0.000	13	±1	0.08	16	±2	0.13
4	4.2	0.001	15	±2	0.13	15	±9	0.60
5	1.9	0.001	19	±2	0.11	20	±2	0.10
6	1.5	0.000	7	±3	0.43	7	±3	0.43
7	7.9	0.001	220	±62	0.28	210	±110	0.52
8	7.1	0.001	167	±61	0.37	185	±114	0.62
9	13.1	0.002	135	±39	0.29	125	±53	0.42
10	28.3	0.009	218	±29	0.13	267	±34	0.13
Phelps Creek								
1	140.0	0.094	7	±0	0.00	7	±0	0.00
Chikamin Creek[1]								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Rock Creek								
1	4.7	0.002	4	±0	0.00	4	±0	0.00
Unnamed Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Big Meadow Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Alder Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Brush Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Clear Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Y Creek								
1	0.0	0.000	0	±0	0.00	0	±0	0.00
Grand Total	**6.4**	**0.002**	**820**	**±100**	**0.12**	**871**	**±171**	**0.20**

[1] Includes lower 0.2 miles of Minnow Creek.

APPENDIX A. Numbers of redds, eggs, age-0 Chinook salmon, parr per redd, and percent egg-to-parr survival in the Chiwawa River basin, brood years 1991-2012; NS = not sampled. Numbers of eggs were calculated as the number of redds times the mean fecundity of females collected for broodstock.

Brood Year	Chinook Salmon			Parr/Redd	Egg-to-parr survival (%)
	Redds	Eggs	Age-0 (parr)		
1991	104	478,400	45,483	437	9.5
1992	302	1,570,098	79,113	262	5.0
1993	106	556,394	55,056	519	9.9
1994	82	485,686	55,240	674	11.4
1995	13	66,248	5,815	447	8.8
1996	23	106,835	16,066	699	15.0
1997	82	374,740	68,415	834	18.3
1998	41	218,325	41,629	1,015	19.1
1999	34	166,090	NS	NS	NS
2000	128	642,944	114,617	895	17.8
2001	1,078	4,984,672	134,874	125	2.7
2002	345	1,605,630	91,278	265	5.7
2003	111	648,684	45,177	407	7.0
2004	241	1,156,559	49,631	206	4.3
2005	332	1,436,564	79,902	241	5.6
2006	297	1,284,228	60,752	205	4.7
2007	283	1,256,803	82,351	291	6.6
2008	689	3,163,888	106,705	155	3.4
2009	421	1,925,233	128,220	305	6.7
2010	502	2,165,628	141,510	282	6.5
2011	492	2,157,420	103,940	211	4.8
2012	808	3,412,184	149,563	185	4.4
Average	**296**	**1,357,421**	**78,826**	**412**	**8.4**

APPENDIX B. Estimated numbers of salmonids (based on fish/ha) in the Chiwawa River basin, Washington, 1992-2013; NS = not sampled.

Survey year	Chinook salmon		Steelhead/Rainbow			Bull trout	
	Age-0	Age-1+	Age-0	Age-1+	>8 in[1]	2-8 in	>8 in
1992[2]	45,483	563	4,927	2,533	1,869	299	208
1993	79,113	174	4,004	2,860	768	158	156
1994	55,056	18	1,410	5,856	67	90	76
1995	55,241	13	7,357	9,517	140	97	664
1996	5,815	22	4,245	11,849	78	79	343
1997	16,066	5	8,823	6,905	48	220	472
1998	68,415	63	3,921	10,585	78	300	900
1999	41,629	41	5,838	22,130	33	130	423
2000	NS	NS	NS	NS	NS	NS	NS
2001	114,617	69	45,727	10,623	420	505	542
2002	134,874	32	20,521	9,090	181	217	521
2003	91,278	134	18,020	6,179	49	196	282
2004	45,177	21	10,380	8,190	8	140	157
2005	49,631	79	11,463	6,188	48	125	346
2006	79,902	388	16,245	10,533	50	238	686
2007	60,752	41	14,073	8,448	77	95	520
2008	82,351	189	15,230	10,576	144	124	510
2009	106,705	54	17,179	5,629	85	82	618
2010	128,220	291	25,018	9,616	63	79	547
2011	141,510	967	39,446	14,903	65	86	621
2012	103,940	767	27,134	8,576	65	159	768
2013	149,563	852	21,682	7,253	76	299	820

[1]During 1992-1993, numbers included both hatchery and wild rainbow trout. Thereafter, only wild trout were observed.
[2]Only the Chiwawa River was sampled in 1992. No tributaries were sampled in that year.

APPENDIX C. Proportion of total habitat available, fraction of all age-0 Chinook within each habitat type, and densities (fish/ha) and numbers of age-0 Chinook within each habitat type in the Chiwawa River basin, survey years 1992-2013; NS = not sampled.

Habitat	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Proportion of total habitat available											
Glide	0.10	0.09	0.10	0.10	0.10	0.09	0.09	0.09	NS	0.07	0.08
Pool	0.19	0.19	0.21	0.18	0.18	0.17	0.16	0.17	NS	0.15	0.16
Riffle	0.61	0.61	0.57	0.59	0.57	0.57	0.58	0.55	NS	0.49	0.48
M. Chan	0.10	0.11	0.12	0.14	0.14	0.17	0.17	0.19	NS	0.29	0.28
Fraction of all age-0 Chinook within habitat types											
Glide	0.07	0.03	0.02	0.01	0.02	0.01	0.01	0.01	NS	0.03	0.01
Pool	0.30	0.28	0.22	0.21	0.30	0.16	0.17	0.14	NS	0.23	0.24
Riffle	0.19	0.16	0.12	0.11	0.43	0.23	0.08	0.11	NS	0.18	0.15
M. Chan	0.45	0.53	0.64	0.67	0.24	0.60	0.74	0.74	NS	0.57	0.60
Densities of age-0 Chinook within habitat types (fish/ha)											
Glide	254	251	93	55	11	12	78	13	NS	351	187
Pool	584	1,049	619	541	82	122	607	257	NS	1,392	1,468
Riffle	116	188	124	91	38	52	79	62	NS	336	300
M. Chan	1,710	3,408	2,985	2,328	84	449	2,620	1,201	NS	1,820	2,069
Number of age-0 Chinook within habitat types											
Glide	2,967	2,458	857	623	137	130	837	157	NS	3,231	1,931
Pool	13,468	21,814	12,131	11,294	1,755	2,553	11,454	5,933	NS	25,890	32,612
Riffle	8,531	12,616	6,698	6,197	2,525	3,699	5,392	4,626	NS	20,629	19,754
M. Chan	20,517	42,225	35,370	36,965	1,396	9,682	50,728	30,912	NS	64,866	80,576

APPENDIX C. Continued.

Habitat	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Proportion of total habitat available											
Glide	0.07	0.07	0.08	0.08	0.07	0.09	0.08	0.08	0.08	0.07	0.07
Pool	0.17	0.16	0.16	0.16	0.17	0.23	0.22	0.23	0.18	0.23	0.23
Riffle	0.49	0.50	0.47	0.47	0.47	0.51	0.54	0.53	0.57	0.53	0.53
M. Chan	0.26	0.27	0.29	0.30	0.29	0.17	0.15	0.16	0.17	0.17	0.17
Fraction of all age-0 Chinook within habitat types											
Glide	0.02	0.01	0.01	0.03	0.02	0.03	0.02	0.02	0.04	0.01	0.02
Pool	0.23	0.07	0.19	0.31	0.46	0.40	0.36	0.34	0.34	0.41	0.37
Riffle	0.15	0.14	0.07	0.12	0.12	0.11	0.11	0.11	0.19	0.15	0.13
M. Chan	0.60	0.77	0.73	0.54	0.40	0.45	0.51	0.53	0.43	0.43	0.48
Densities of age-0 Chinook within habitat types (fish/ha)											
Glide	200	58	49	237	113	238	230	286	526	173	321
Pool	951	155	492	1,240	1,211	1,210	1,453	1,436	1,805	1,360	1,890
Riffle	216	101	60	166	118	156	175	200	330	221	281
M. Chan	1,626	1,008	1,057	1,147	603	1,872	2,993	3,293	2,515	2,061	3,190
Number of age-0 Chinook within habitat types											
Glide	1,884	540	442	2,498	1,120	2,668	2,371	3,164	6,122	1,535	2,822
Pool	21,091	3,183	9,626	26,754	28,851	34,314	39,382	44,765	48,846	42,209	55,651
Riffle	13,783	6,501	3,367	10,753	7,809	9,773	11,558	14,446	27,883	15,418	19,619
M. Chan	54,519	34,952	36,196	46,580	25,409	38,275	55,607	69,609	61,944	44,779	73,057

APPENDIX C. Concluded.

Habitat	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Mean
Proportion of total habitat available											
Glide											**0.08**
Pool											**0.19**
Riffle											**0.53**
M. Chan											**0.20**
Fraction of all age-0 Chinook within habitat types											
Glide											**0.02**
Pool											**0.30**
Riffle											**0.14**
M. Chan											**0.55**
Densities of age-0 Chinook within habitat types (fish/ha)											
Glide											**171**
Pool											**1,005**
Riffle											**164**
M. Chan											**1,742**
Number of age-0 Chinook within habitat types											
Glide											**1,833**
Pool											**23,504**
Riffle											**11,027**
M. Chan											**43,532**

Appendix B

Fish Trapping at the Chiwawa and Wenatchee Smolt Traps during 2013

STATE OF WASHINGTON
DEPARTMENT OF FISH AND WILDLIFE
FISH PROGRAM -SCIENCE DIVISION
SUPPLEMENTATION RESEARCH TEAM
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March 6, 2014

To: HCP Hatchery Committee

From: John Walter, Ben Truscott, Andrew Murdoch and Todd Miller

Cc: Distribution List

Subject: 2013 Chiwawa and Wenatchee River Smolt Estimates

Smolt monitoring programs in the Wenatchee River basin are intended to estimate the number of naturally produced migrating smolts at either the subbasin (e.g., Chiwawa River) or watershed scale (e.g., Wenatchee River basin) depending on the target stock (Table 1). In addition, population estimates of hatchery Sockeye Salmon emigrating from Lake Wenatchee were used to calculate post release survival (i.e., subyearling parr to yearling smolt). The size of smolt traps operated was determined by water depth and river discharge at each of the locations. The number of smolt traps operated was determined by the expected trap efficiency. Smolt traps were located downstream from all (i.e., Chiwawa spring Chinook Salmon, Wenatchee spring Chinook Salmon, and Wenatchee Sockeye Salmon), or the majority (i.e., Wenatchee summer Chinook Salmon and Wenatchee steelhead) of the spawning areas (Figure 1).

Table 1. Target stocks and corresponding smolt trapping locations used in 2012.

Stock	Smolt trap location	Smolt trap	
		Number	Diameter (m)
Chiwawa spring Chinook Salmon	Chiwawa	1	2.6
Wenatchee Sockeye Salmon	Upper Wenatchee	2	1.5
Wenatchee spring Chinook Salmon	Lower Wenatchee	2	2.6
Wenatchee summer Chinook Salmon	Lower Wenatchee	2	2.6
Wenatchee steelhead	Lower Wenatchee	2	2.6

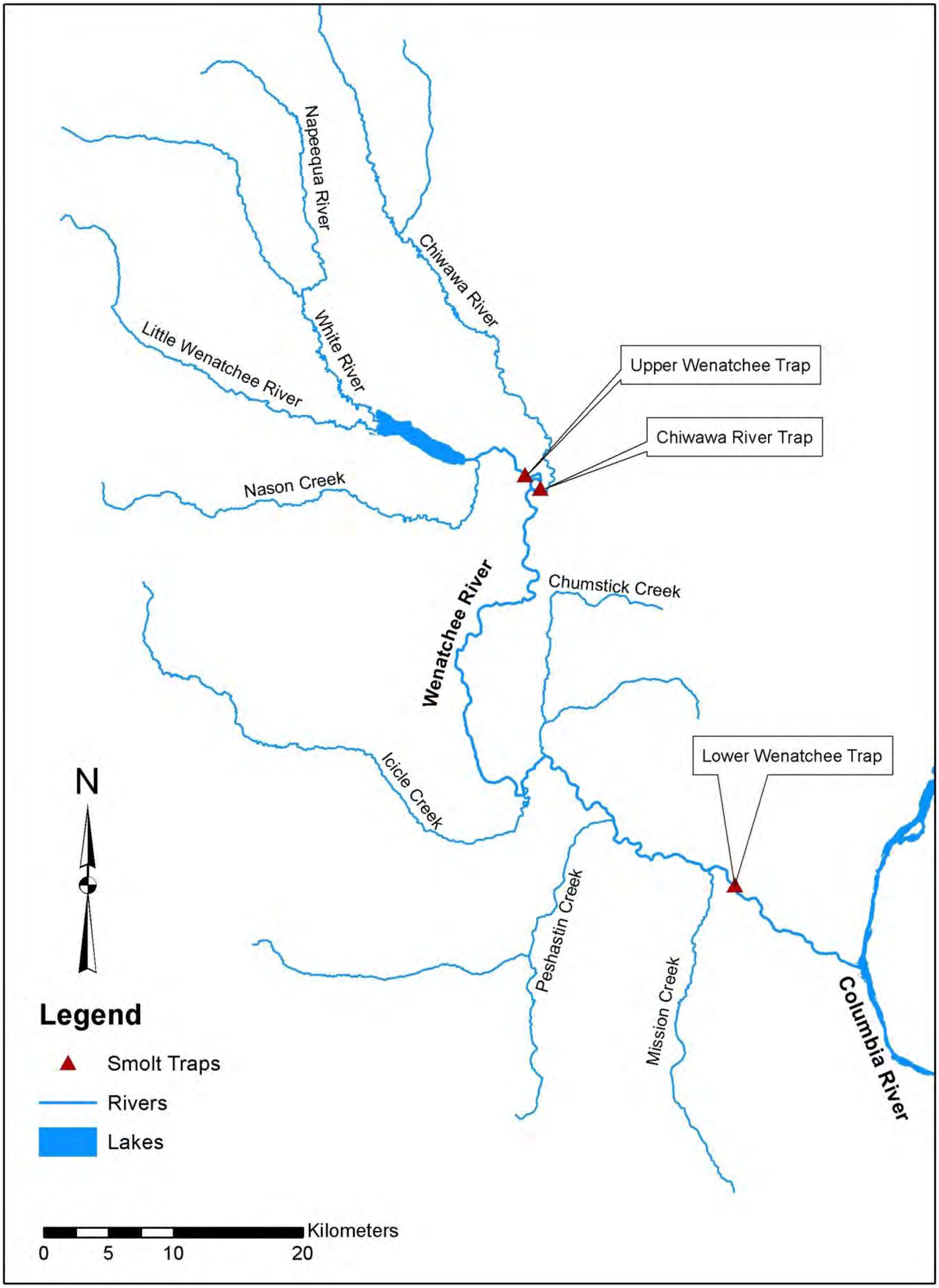

Figure 1. Locations of the upper Wenatchee, Chiwawa, and lower Wenatchee River smolt traps.

Methods

Fish were removed from the trap at a minimum of every morning and placed in an anesthetic solution of MS-222. Fish were identified to species, weighed, measured, and counted. Target species (i.e., spring Chinook Salmon, steelhead) >60 mm fork length (FL) were tagged using 12.5 mm FDX PIT tags. All captured fishes were allowed to fully recover in fresh water prior to being released in an area of calm water downstream from the smolt trap. Target species were held in separate live boxes when needed for mark/recapture efficiency trials conducted in the evening.

Fork length was measured to the nearest millimeter and weight to the nearest 0.1 g. A Fulton type condition factor ($WH10^5/FL^3$) was calculated for all target species. The degree of smoltification (parr, transitional, or smolt) was assessed by visual examination. Juvenile yearling spring Chinook Salmon and steelhead were classified as parr if parr marks were distinct, transitional if parr marks were not distinct, and smolts if parr marks were not visible and the fish exhibited a silvery appearance. Juvenile subyearling Chinook Salmon and steelhead were classified as fry at FL <50 mm, and parr at FL ≥50 mm.

Mark/recapture efficiency trials were conducted throughout the trapping season. The frequency of mark/recapture trials was dependent on the number of fish captured (i.e., no less than 100) and the river discharge. These trials were conducted over the widest range of discharge possible (interval depends on trap location). Fish utilized for mark/recapture trials were marked by clipping the tip of either the upper or lower lobe of the caudal fin or were PIT tagged. Chinook Salmon fry used in mark/recapture trials were dyed using a Bismark brown solution. Marked fish were distributed evenly on both sides of the river in pools or in calm pockets of water around boulders. Marked fish were released between 1800 h and 2000 h. All recaptures of marked fish typically occurred within 48 h after each trial. Emigration estimates were calculated using estimated daily trap efficiency derived from the regression formula using trap efficiency (dependent variable) and discharge (independent variable). In past years the Peterson estimator of population was used (Seber 1982; 59). The Bailey estimator was used (Bailey 1951) for the 2010-2012 brood year spring Chinook Salmon emigration at the Chiwawa Trap.

Peterson Population and Variance Equations

Trap efficiency was calculated using the following formula:

$$\text{Trap efficiency} = E_i = R \;/\; Mi_,$$

Where E_i is the trap efficiency during time period i; M_i is the number of marked fish released during time period i; and R_i is the number of marked fish recaptured during time period i. The number of fish captured was expanded by the estimated daily trap efficiency (e) to estimate the daily number of fish migrating past the trap using the following formula:

Estimated daily migration = $\hat{N}_i = C_i / \hat{e}_i$

where N_i is the estimated number of fish passing the trap during time period i; C_i is the number of unmarked fish captured during time period i; and e_i is the estimated trap efficiency for time period i based on the regression equation.

The variance for the total daily number of fish migrating past the trap was calculated using the following formulas:

Variance of daily migration estimate = $$\text{var}\left[\hat{N}_i\right] = \hat{N}_i^2 \frac{\text{MSE}\left(1 + \frac{1}{n} + \frac{(X_i - \overline{X})^2}{(n-1)s_X^2}\right)}{\hat{e}_i^2}$$

where X_i is the discharge for time period i, and n is the sample size. If a relationship between discharge and trap efficiency was not present (i.e., $P < 0.05$; r^2 ~0.5), a pooled trap efficiency was used to estimate daily emigration:

Pooled trap efficiency = $e_p = \sum R / \sum M$

The daily emigration estimate was calculated using the formula:

Daily emigration estimate = $\hat{N}_i = C_i / e_p$

The variance for daily emigration estimates using the pooled trap efficiency was calculated using the formula:

Variance for daily emigration estimate = $$\text{var}\left[\hat{N}_i\right] = \hat{N}_i^2 \frac{e_p(1 - e_p)/\sum M}{e_p^2}$$

The total emigration estimate and confidence interval was calculated using the following formulas:

Total emigration estimate = $\sum \hat{N}_i$

95% confidence interval = $1.96 \times \sqrt{\sum \text{var}\left[\hat{N}_i\right]}$

Bailey Population and Variance Equations

Trap efficiency was calculated using the following formula:

$$\text{Trap efficiency} = E_i = R+1 \ / Mi,$$

$$\text{Estimated daily emigration} = \hat{N}_i = \frac{C_i + 1}{\hat{e}_i}$$

The variance of the total population abundance was calculated as follows:

$$Var\left(\sum_{i=1}^{n} \hat{N}_i\right) = \underbrace{\sum_i Var\left(\frac{(C_i + 1)}{\hat{e}_i}\right)}_{Part\ A} + \underbrace{\sum_i \sum_j Cov\left(\frac{(C_i + 1)}{\hat{e}_i}, \frac{(C_j + 1)}{\hat{e}_j}\right)}_{Part\ B}$$

Part A is the variance of the daily estimates where C_i is the number of fish caught in period i, e_i is the estimated trap efficiency for period i, and *Cov* is the between day covariance for days that the same linear model is used (part B). For a more detailed explanation and derivation of Peterson and Bailey estimation methods see Murdoch et al. (2012).

Emigration during non-trapping periods

Subyearling spring Chinook Salmon parr were remotely captured and tagged during September and October throughout the Chiwawa River basin. The total number of tagged fish (t) divided by the total parr abundance estimate (p) (generated using standard snorkeling techniques, Hillman et al. 2013) resulted in an overall tag rate (t_i). In order to representatively tag the population throughout all reaches, the number of fish tagged in each reach was relative to the reach specific abundance encountered during snorkeling surveys. A flow-efficiency regression model was developed for the lower Chiwawa River PIT tag interrogation site (CHL) using the same mark/recapture trials used for estimating efficiency at the smolt trap. This CHL model was used to calculate emigration outside of the trapping period by incorporating the tag rate into the Bailey estimator.

$$\text{Estimated daily emigration} = \left(\hat{N}_i = \frac{C_i + 1}{\hat{e}_i}\right) \Big/ t_i$$

Where t_i is equal to the tag rate = $t_i = \frac{t}{p}$

Results

Emigration during the winter non-trapping period (2011 Brood Year)

WDFW conducted remote tagging and capture of subyearling Chinook Salmon during September and October 2012. A total of 3,547 subyearling Chinook Salmon were captured and 3,181 PIT tags were applied. Tags were representatively distributed throughout the basin relative to parr encountered during snorkel surveys in August 2012 by BioAnalyst (Figure 2). During winter months of non-trapping, two flow efficiency models for detection probability were used to calculate emigration over the CHL array. Six mark/recapture trials were used to calculate detection efficiency in discharges ranging from 2.7 m^3/s to 9.3 m^3/s and five mark/recapture trials were used to calculate detection efficiency during discharges ranging from 9.3 m^3/s to 20.7 m^3/s ($R^2 = 0.82$, $P < 0.01$ and $R^2 = 0.70$, $P = 0.1$ respectively). These models resulted in an estimate (95% C.I.) of 3,665 (±4,621) spring Chinook Salmon emigrants (2011 BY) during the non-trapping winter months.

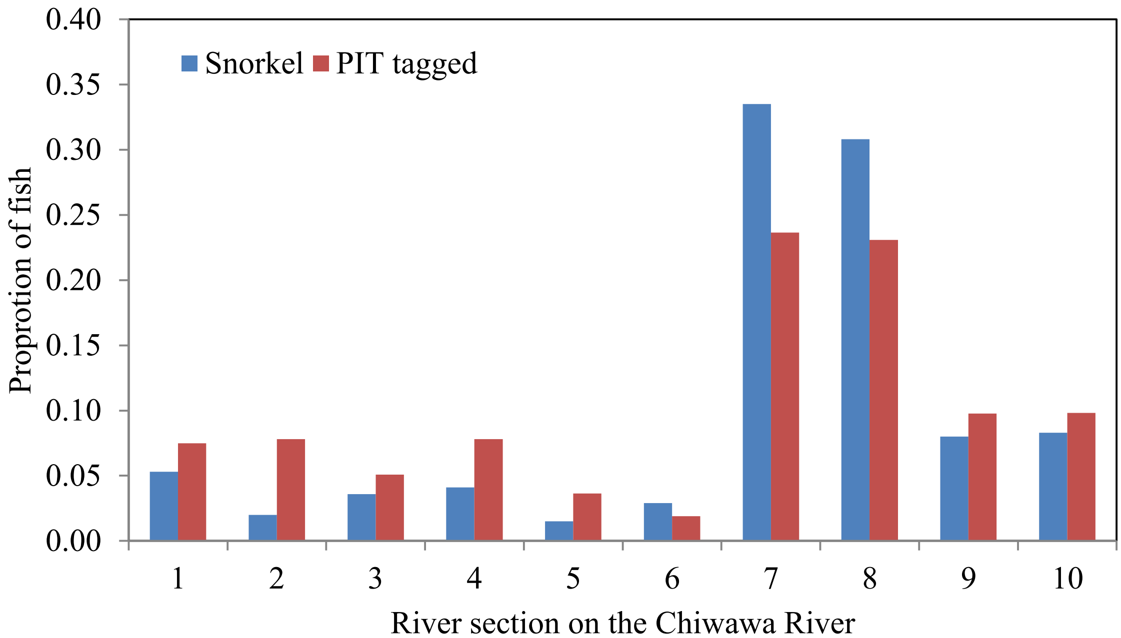

Figure 2. Distribution by reach of spring Chinook Salmon parr encountered during snorkel surveys and PIT tagged parr in the Chiwawa River 2012.

Chiwawa River Smolt Trap

The Chiwawa River smolt trap was located approximately 1 km upstream from the confluence with the Wenatchee River. The smolt trap operated between 22 February and 21 November, when ice and slush prevented further operation of the trap. During that time period the trap was inoperable for 16 days as a result of high river flows, debris, snow/ice, or mechanical failure. During breaks in operation, the estimated number of Chinook Salmon captured was calculated from the mean number of fish captured two days prior and two days after the break in operation. The trap was operated in two positions dependent on river discharge (i.e., lower > 12 m^3/s and upper < 12 m^3/s). Daily trap efficiencies were estimated from two regression models (independent variable = discharge) depending on trap position and age class (i.e., upper position subyearling and lower position yearling Chinook Salmon).

2011 Brood Year

Wild yearling spring Chinook Salmon (2011 brood) were primarily captured between 25 March and 7 July (Figure 2). A total of 3,199 yearling Chinook Salmon were captured (Appendix A) and an estimated 3,942 would have been captured if the trap had operated without interruption. Mortality for the season totaled 41 yearling spring Chinook Salmon (1.28%). Six mark/recapture efficiency trials were conducted in the lower position with a mean (SD) trap efficiency of 11.86% (0.02). In 2013, mark/recapture trials were conducted at all desired discharge levels and a statistically significant flow-efficiency regression model was obtained for the lower position. The 2013 regression model for the lower position (R_a^2 = 0.75, $P < 0.01$) was used to estimate emigration. The estimated number (95% C.I.) of yearling spring Chinook Salmon that emigrated from the Chiwawa River in 2013 was 37,185 (±4,022).

2012 Brood Year

Wild subyearling spring Chinook Salmon were captured between 25 February and 21 November, with major peaks occurring in August, September, and October (Figure 2). A total of 14,831 subyearling parr were captured and an estimated 15,374 subyearling parr would have been captured if the trap had operated without interruption (Figure 2). Mortality for the season totaled 69 subyearling spring Chinook Salmon (0.5%). Thirteen mark/recapture efficiency trials were conducted with a mean (SD) trap efficiency of 26.5% (0.12), which resulted in a significant regression model (i.e., upper trap position; R_a^2 = 0.83, $P < 0.001$). In 2013, the estimated number of subyearling spring Chinook Salmon (excluding fry < 50 mm FL) that moved downstream of the Chiwawa River smolt trap during the sampling period was 49,774 (± 6,026).

Subyearling Fry

The proportion of subyearling spring Chinook Salmon that were captured and classified as fry was higher in 2013 (45%) than 2012 (19%). Fry have not been included in our estimate of subyearling emigrants because previously reported data suggests fry capture is a result of displacement, not emigration, due to the inability of fry to maintain their position in the water column, and the interaction of water temperature and discharge levels. Abundance of fry captured was also related to redd abundance within close proximity to the trap site (Walter et al. 2011). Additionally, Hillman and Miller (2002) reported large numbers of subyearling Chinook Salmon in areas of the Chiwawa River where no spawning had been reported. These data suggest considerable fish movement during summer rearing.

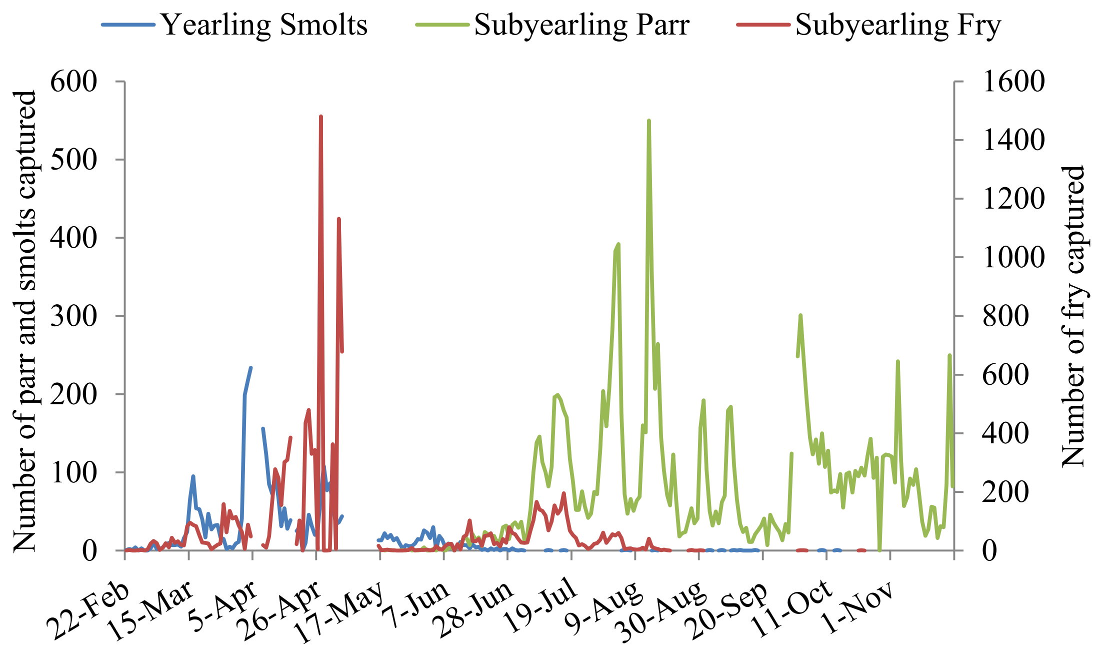

Figure 2. Daily number of spring Chinook Salmon; smolts, parr, and fry captured at the Chiwawa River smolt trap in 2012.

Emigrant Survival

The estimated total egg deposition was calculated by multiplying the mean fecundity of the 2011 brood spawners by the total number of redds found during surveys in the Chiwawa River basin in 2011 (Hillman et al. 2013). Egg-to-emigrant survival was calculated by dividing the estimated egg deposition by the total number of subyearling (excluding fry) that emigrated in 2012 and yearling spring Chinook Salmon that emigrated in 2013. The estimated egg-to-emigrant survival for the 2011 brood was 5.0% (Table 2).

Table 2. Estimated egg deposition (# of redds x mean broodstock fecundity) and egg-to-emigrant survival rates for Chiwawa River spring Chinook Salmon.

Brood year	Number of redds	Estimated egg deposition	Estimated number				Egg-to-emigrant survival (%)
			Subyearling	Non Trapping	Yearling	Total emigrants	
1992	302	1,570,098	25,818		39,723	65,541	4.2
1993	106	556,394	14,036		8,662	22,698	4.1
1994	82	485,686	8,595		16,472	25,067	5.2
1995	13	66,248	2,121		3,830	5,951	9.0
1996	23	106,835	3,708		15,475	19,183	18.0
1997	82	374,740	16,228		28,334	44,562	11.9
1998	41	207,675	2,855		23,068	25,923	11.9
1999	34	166,090	4,988		10,661	15,649	9.4
2000	128	642,944	14,854		40,831	55,685	8.7
2001	1,078	4,836,704	459,784		86,482	546,266	11.0

Brood year	Number of redds	Estimated egg deposition	Estimated number				Egg-to-emigrant survival (%)
			Subyearling	Non Trapping	Yearling	Total emigrants	
2002	345	1,605,630	93,331		90,948	184,279	11.5
2003	111	648,684	16,881		16,755	33,637	5.2
2004	241	1,156,559	44,079		72,080	116,158	10.0
2005	333	1,436,564	108,595		69,064	177,659	12.3
2006	297	1,284,228	62,922		45,050	107,972	8.4
2007	283	1,241,521	60,196		25,809	86,006	6.9
2008	689	3,163,199	85,161		35,023	120,184	3.8
2009	421	1,925,233	30,996		30,959	61,955	3.2
2010[a]	502	2,165,628	53,619		47,511	101,130	4.7
2011[a]	492	2,157,420	67,982	3,665	37,185	108,832	5.0
2012[a]	880	3,716,240	49,774	--	--	--	--

[a] calculated with Bailey model

Refinement of Variance Calculation

Smolt abundance and variance calculation methods were investigated and compared by Murdoch et al. (2012) after data indicated the previous methods employed may have been incorrect. The study revised the total variance estimator based on the inclusion of the covariance between daily totals, process error of daily catches and the arcsine, square root transformation of the efficiency (Murdoch et al. 2012; Ryding 2000). The 2010-2012 brood years have been estimated with the newly derived estimators; however, recalculation of all previous years estimates would be presumptive until the study has been peer reviewed.

Length and Weight

Individual length and weight measurements were recorded from a sample of the daily catch. The mean fork length (SD) of captured yearling and subyearling spring Chinook Salmon (fry excluded) was 88 (8.8) mm and 71 (9.6) mm, respectively (Table 3).

Table 3. Mean fork lengths (mm), weights (g), and body condition factor of spring Chinook Salmon captured in the Chiwawa River smolt trap during 2013.

	Yearling smolts			Subyearling parr		
	Mean	SD	*N*	Mean	SD	*N*
Fork length	88	8.7	3,180	71	9.6	10,678
Weight	7.7	2.8	3,135	4.1	1.7	10,181
K factor	1.09	0.2	3,135	1.09	0.39	10,181

Non-target Salmonids

During the trapping period, 85 steelhead smolts and 1,949 steelhead/rainbow parr were captured. Mortality for the season totaled 6 steelhead juveniles (0.29%). The mean fork length (SD) of steelhead parr and smolts captured was 81 (34) mm and 163 (20) mm, respectively (Table 4). Bull trout also comprised a large proportion of incidental species captured. During the trapping period, 51 adult (i.e., >300 mm) and 310 juvenile bull trout were captured (Table 5). Mortality for the season totaled 1 juvenile bull trout (0.28%). The total number of steelhead and bull trout that emigrated from the Chiwawa River was not calculated due to the low numbers of fish captured during the sampling period. The monthly totals of all fish captured are presented in Appendix A.

Table 4. Mean fork lengths (mm), weights (g), and body condition factor of steelhead/rainbow parr and steelhead smolts captured in the Chiwawa River smolt trap during 2013.

	Parr			Smolts		
	Mean	SD	*N*	Mean	SD	*N*
Fork length	81	33.6	1,650	163	20.7	84
Weight	9.5	20.1	1,624	46.5	15.5	83
K factor	1.03	0.34	1,624	1.03	0.08	83

Table 5. Mean fork lengths (mm), weights (g), and body condition factor of bull trout captured in the Chiwawa River smolt trap during 2013. Weights were not measured on adults.

	Juvenile			Adult		
	Mean	SD	*N*	Mean	SD	*N*
Fork length	192	41.14	300	484	101.4	19
Weight	76.5	44.44	289	--	--	--
K factor	1.07	0.75	289	--	--	--

Upper Wenatchee River Smolt Trap

The upper Wenatchee River smolt trap was relocated to rkm 81, 5.3 km downstream from the previous trapping site. This was the second year the trap was operated at this location. The trap was operated between 03 March and 30 June 2013. During that time period the trap did not operate for a total of 18 days due to high discharge levels and debris loads. The trap was removed from the river on 2 July. A total of 877 wild and 15 hatchery Sockeye Salmon were captured during the trapping period (Figure 4). The trap also captured 98 wild spring Chinook Salmon smolts, 7,371 subyearling Chinook Salmon, 72 wild juvenile steelhead, and 468 steelhead/rainbow fry. Mortality totaled 2 wild Sockeye Salmon (0.2%), 45 subyearling Chinook Salmon (0.6%) and 6 steelhead/rainbow fry (1.3%). The monthly totals of all fish captured are presented in Appendix B.

Due to the low number Sockeye Salmon captured only three mark/recapture trials were conducted. One fish was recaptured during the three trials. Three subyearling Chinook Salmon trials were conducted and only two of those trials produced recaptures. The resulting capture efficiencies were 0.08% for Sockeye Salmon and 1.19% for Chinook Salmon. These low trap efficiencies indicated that fish may have been traveling elsewhere than the thalweg where the trap was located. Detections of tagged fish at the upper Wenatchee River PIT tag interrogation site (UWE), located immediately downstream from the smolt trap site, indicated that fish were traveling more to the center of the stream, whereas the trap was operated in the thalweg near the right bank. To test the possibility of capturing more fish the two cone trap was separated and one half of the trap operated farther to the center of the river. This spilt trap configuration did not increase the capture rate. Therefore, no mark-recapture trials were conducted in this configuration to test for an increase in efficiency. Due to inadequate results from mark-recapture trials no estimate was calculated for wild or hatchery Sockeye Salmon.

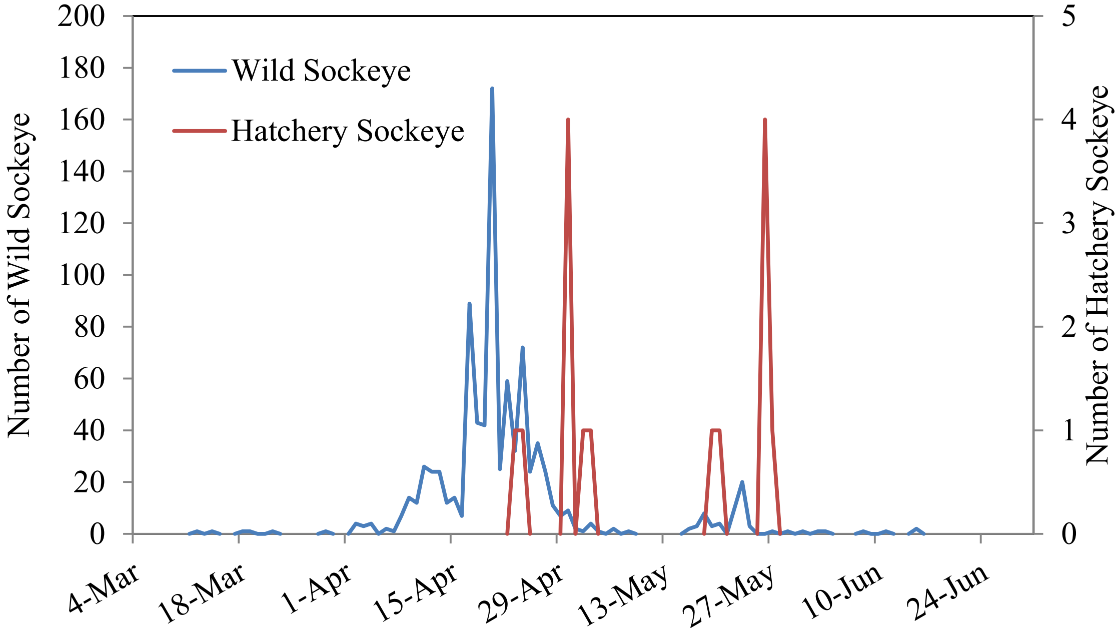

Figure 4. Number of wild and hatchery Sockeye Salmon captured at the upper Wenatchee River smolt trap, 2013.

Table 6. Age composition derived from scale samples and estimated number of wild Sockeye Salmon smolts emigrating from Lake Wenatchee.

Run year	Proportion of wild smolts			Total emigrants
	Age 1+	Age 2+	Age 3+	
1997	0.075	0.906	0.019	55,359
1998	0.955	0.037	0.008	1,447,259
1999	0.619	0.381	0.000	1,944,966
2000	0.599	0.400	0.001	985,490
2001	0.943	0.051	0.006	39,353
2002	0.961	0.039	0.000	729,716
2003	0.740	0.026	0.000	5,439,032
2004	0.929	0.071	0.000	5,771,187
2005	0.230	0.748	0.022	723,413
2006	0.994	0.006	0.000	1,266,971
2007	0.996	0.004	0.000	2,797,313
2008	0.804	0.195	0.001	549,682
2009[b]	0.927	0.073	0.000	355,549
2010[b]	0.963	0.036	0.001	3,958,888
2011	0.786	0.214	0.000	1,500,730
2012	0.769	0.231	0.000	NA
2013[a]	0.909	0.091	0.000	NA

[a] No estimate available and ages have not been confirmed with scale analysis.
[b] Estimates were refined based on PIT tag survival to McNary Dam

Table 7. Estimated egg deposition (mean fecundity x estimated # of females) and egg-to-emigrant survival rates for Lake Wenatchee Sockeye Salmon.

Brood year	Estimated egg deposition	Estimated number of wild smolts				Egg-to-smolt survival (%)
		Age 1+	Age 2+	Age 3+	Total	
1995	4,902,120	4,174	53,549	0	57,723	1.2
1996	10,035,288	1,382,133	741,032	985	2,124,150	21.2
1997	13,223,588	1,203,934	394,196	236	1,598,366	12.1
1998	5,692,106	590,309	2,007	0	592,316	10.4
1999	1,188,488	37,110	28,459	0	65,569	5.5
2000	30,506,949	701,257	1,378,795	0	2,080,052	6.8
2001	64,187,600	4,024,884	409,754	15,915	4,450,553	6.9
2002	49,197,456	5,361,433	541,113	0	5,902,546	12.0
2003	7,576,738	166,385	7,602	0	173,987	2.3
2004	38,749,845	1,259,369	11,189	275	1,270,833	3.3
2005	15,946,506	2,786,123	107,243	0	2,893,366	18.1
2006[b]	7,296,032	442,164	25,919	1,507	469,590	6.4
2007[b]	6,232,804	329,629	142,916	594	473,139	7.6
2008[b]	30,084,691	3,814,226	320,567	0	4,134,794	13.74
2009[a]	9,684,965	1,179,569	--	--	--	--
2010[a,c]	33,190,467	--	--	--	--	--
2011[a,c]	28,873,491	--	--	--	--	--

[a] Incomplete brood year.
[b] estimates refined based on PIT tag survival to McNary Dam
[c] no estimate available

Table 8. Release-to-smolt survival rates for Lake Wenatchee hatchery Sockeye Salmon.

Brood year	Release year	Run year	Number of fish released	Fork length (mm) at release (SD)	Date of release	Number of fish captured	Estimated number of smolts	Release to smolt survival
1995	1996	1997	150,808	106 (6)	25 Oct	130	28,828	19.1%
1996	1997	1998	284,630	107 (7)	22 Oct	279	55,985	19.8%
1997	1998	1999	197,195	122 (7)	09 Nov	586	112,524	57.1%
1998	1999	2000	121,344	112 (8)	29 Oct	66	24,684	20.3%
1999	2000	2001	84,466	94 (9)	28 Aug	319	30,326	35.9%
1999	2000	2001	83,489	134 (15)	01 Nov	548	63,720	76.3%
2000	2001	2002	92,055	123 (8)	27 Aug	142	30,918	33.6%
2000	2001	2002	98,119	146 (12)	27 Sept	416	90,593	92.3%
2001	2002	2003	96,486	118 (9)	28 Aug	162	36,484	37.8%
2001	2002	2003	104,452	135 (9)	23 Sept	465	103,838	99.4%
2002	2003	2004	98,509	73 (5)	16 Jun	31	5,192	4.4%
2002	2003	2004	104,855	118 (9)	25 Aug	376	98,412	85.9%
2002	2003	2004	112,419	145 (14)	22 Oct	292	112,419	100.0%
2003	2004	2005	32,755	79 (4)	15 Jun	0	0	0.0%
2003	2004	2005	104,879	118 (7)	25 Aug	229	19,574	18.7%
2003	2004	2005	102,825	158 (13)	03 Nov	1,185	102,825	100.0%
2004	2005	2006	81,428	116 (7)	29 Aug	1,500	159,500	92.2%

Brood year	Release year	Run year	Number of fish released	Fork length (mm) at release (SD)	Date of release	Number of fish captured	Estimated number of smolts	Release to smolt survival
2004	2005	2006	91,495	151 (7)	02 Nov			
2005	2006	2007	140,542	149 (14)	30 Oct	516	140,542	100.0%
2006[a]	2007	2008	225,670	138 (15)	31 Oct	1,367	121,843	54.0%
2007[a]	2008	2009	252,133	137 (7)	29 Oct	263	119,908	47.6%
2008[a]	2009	2010	154,772	138 (13)	28 Oct	1,909	126,326	81.3%
2009	2010	2011	227,743	145 (13)	27 Oct	3,017	159,089	69.9%
2010[b]	2011	2012	241,918	132(19)	26 Oct	45	--	--
2011[b]	2012	2013	211,255	142(10)	29 Oct	15	--	--

[a] Estimates were refined based on the relative PIT tag survival rates to McNary Dam
[b] No estimate available

Lower Wenatchee River Smolt Trap

The lower Wenatchee River smolt trap was previously located at the West Monitor Bridge (rkm 9.6). The trap did not operate during the 2011 or 2012 sampling years. Chelan County Public Utility District (CCPUD) completed construction and site preparation for the new lower Wenatchee River smolt trap site at rkm 13.4. Trap operations at this site began 13 February 2013 and lasted until 31 October 2013. The trap did not operate for a total of 22 days due to high flows, heavy debris or major hatchery releases, with a major break occurring from 7 May to 16 May (Figure 5).

Capture for the season totaled 1,854 wild yearling spring Chinook Salmon, 13,979 hatchery yearling Chinook Salmon, and 52,652 wild subyearling summer Chinook Salmon (Figure 5). Steelhead capture for the season totaled 537 wild steelhead parr, 173 wild steelhead smolts, and 819 hatchery steelhead (Figure 6). Wild and hatchery juvenile Sockeye Salmon capture totaled 4,520 and 72 respectively (Figure 7). Additionally, six juvenile bull trout were captured. Mortality of target species for the season totaled 96 (0.18%) subyearling summer Chinook Salmon, 5 (0.27%) wild yearling spring Chinook Salmon, 2 (0.01%) hatchery yearling Chinook Salmon, 4 (0.56%) wild juvenile steelhead, 1 (0.12%) hatchery juvenile steelhead, and 7 (0.15%) wild Sockeye Salmon. Monthly totals of all species captured are listed in Appendix C.

During this first year of operation five mark-recapture trials were conducted with wild yearling spring Chinook Salmon. Additionally, one mark/recapture trial was conducted with hatchery yearling Chinook Salmon, wild Sockeye Salmon, hatchery Coho Salmon. Six trials were also conducted with wild subyearling summer Chinook Salmon (Table 9). Trials to test for equal mixing of left bank and right bank released fish were conducted and no significant difference in probability of recapture was found (t = 0.53, df = 4, p = 0.62). No significant relationship was found between river discharge and trap efficiency (R_a^2 = -0.10, P = 0.49), so a pooled efficiency (E_i = 2.31%) was used to estimate emigration. The estimated number (95% C.I.) of wild yearling spring Chinook Salmon that emigrated from the Wenatchee River basin in 2013 was 89,917 (±579,521) (Table 10). Similarly, a pooled efficiency (E_i = 1.23%) was used to estimate 6,286,648 (±794,773) subyearling summer Chinook Salmon emigrants past the trap site (Table 11). Due to summer Chinook Salmon spawning below the trap site (BY2012, n = 175 redds, Hillman et al. 2013) the trap estimate was expanded using the ratio of the number of redds below the trap to the number of redds above the trap site to calculate a total emigrant estimate of 6,759,024 summer Chinook Salmon emigrating from the entire Wenatchee River basin (Table 11). No mark-recapture trials were conducted with juvenile steelhead and no estimate was calculated for wild juvenile steelhead.

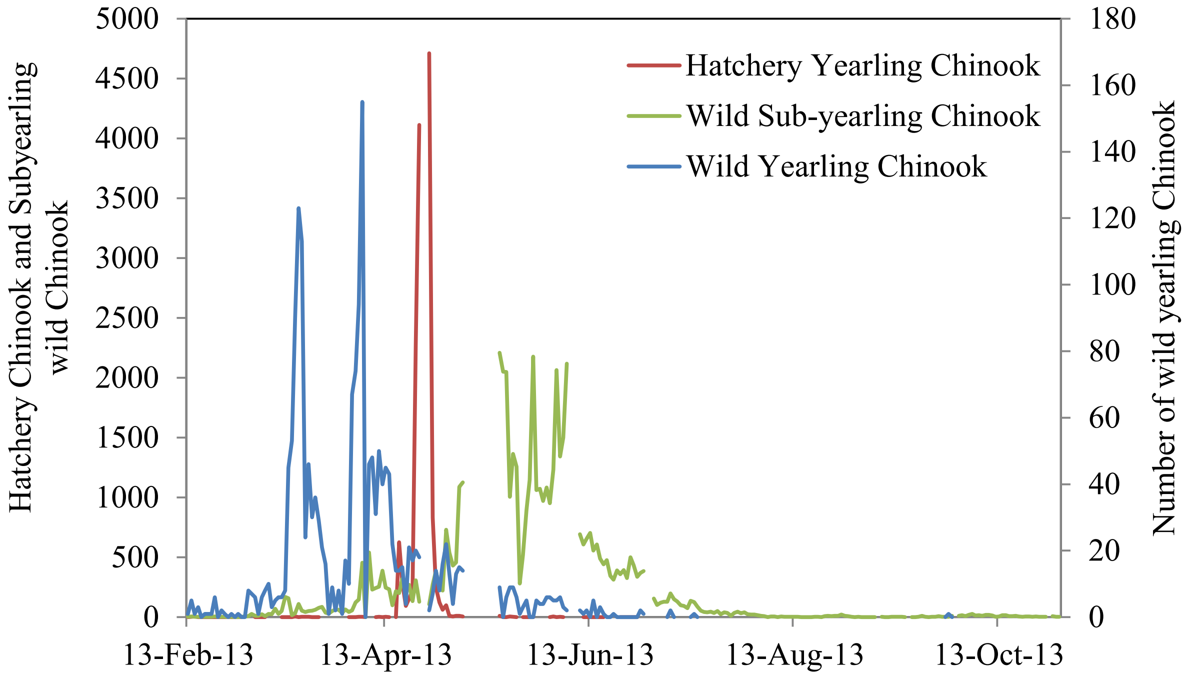

Figure 5. Daily capture of wild yearling Chinook Salmon, hatchery yearling Chinook Salmon and subyearling Chinook Salmon at the lower Wenatchee River smolt trap, 2013.

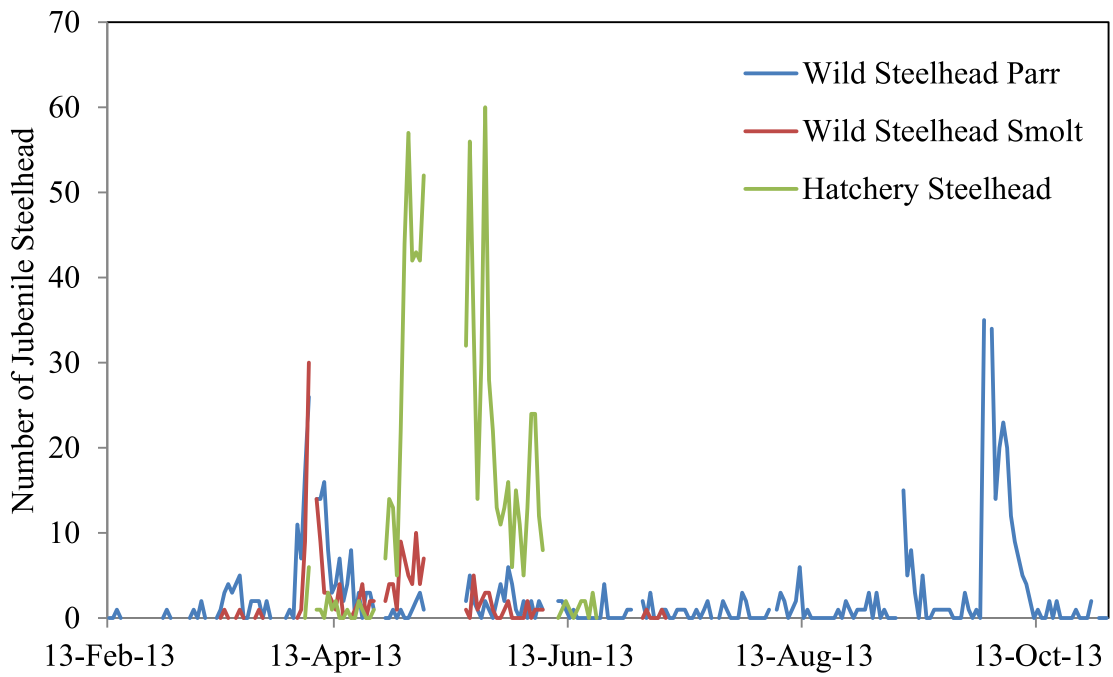

Figure 6. Daily capture of wild and hatchery steelhead at the lower Wenatchee River smolt trap, 2013.

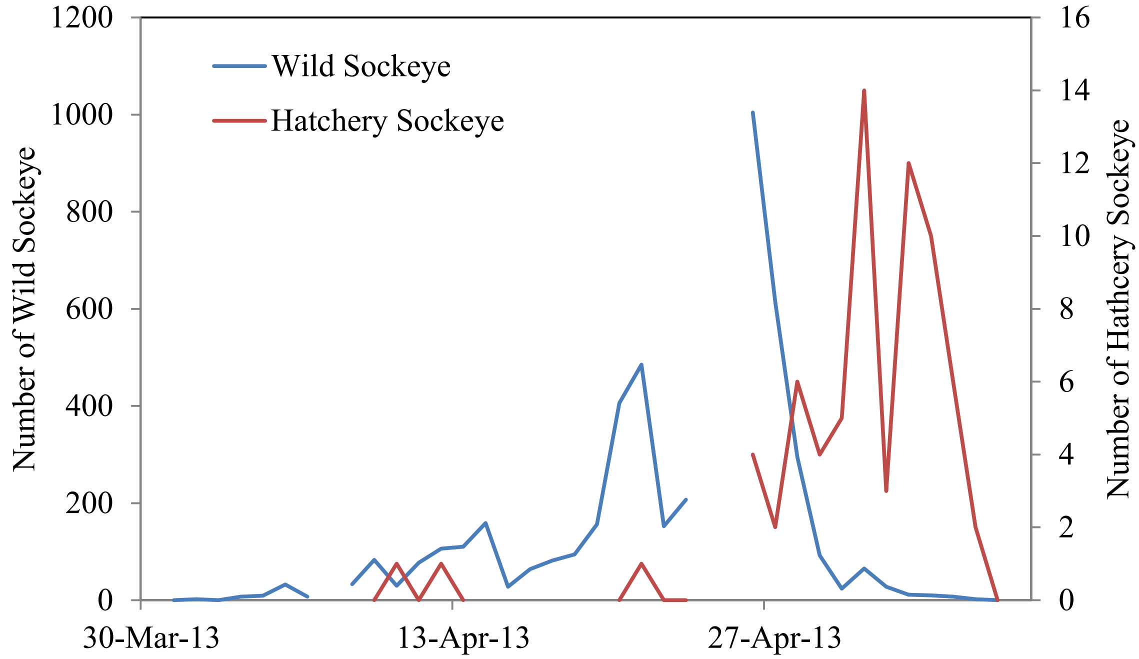

Figure 7. Daily capture of wild and hatchery Sockeye Salmon at the lower Wenatchee River smolt trap, 2013.

Table 9. Mark-recapture trials at the Lower Wenatchee River smolt trap, 2013.

Release Date	Number Released(M_i)	Number Recaptured(R)	Efficiency %(E_i)		Weighted Discharge (m^3/s)
			R/M_i	$(R+1)/M_i$	
		Wild Yearling Chinook			
3/19/13	233	6	2.58	3.00	88.2
3/27/13	100	1	1.00	2.00	36.7
4/5/13	225	7	3.11	3.56	211.6
4/8/13	186	3	1.61	2.15	187.2
4/11/13	121	3	2.48	3.31	173.9
		Hatchery Yearling Chinook			
4/17/13	538	23	4.28	4.46	104.9
		Hatchery Yearling Coho			
4/27/13	565	3	0.53	0.71	141.6
		Wild Sockeye			
4/26/13	565	6	1.06	1.24	141.6
		Wild Subyearling Chinook			
5/17/13	946	10	1.06	1.16	269.1
5/23/13	800	8	1.00	1.13	201.4
5/26/13	992	12	1.21	1.31	160.0
5/29/13	1000	19	1.90	2.00	170.0
7/14/13	317	1	0.32	0.63	74.7

Table 10. Estimated egg deposition (# of redds x mean broodstock fecundity) and egg-to-smolt survival rates for Wenatchee Basin spring Chinook Salmon.

Brood year	Number of redds	Estimated egg deposition	Estimated number	
			Total emigrants	Egg-to-smolt survival (%)
2000	350	1,758,050	76,643	4.36
2001	1,876	8,674,624	243,516	2.81
2002	1,139	5,300,906	165,116	3.11
2003	323	1,887,612	70,738	3.75
2004	555	2,663,445	55,619	2.09
2005	829	3,587,083	302,116	8.42
2006	588	2,542,512	85,558	3.37
2007	466	2,069,506	60,219	2.91
2008	1,411	6,479,312	82,137	1.27
2009	--	--	--	--
2010	--	--	--	--
2011	872	3,823,720	89,917	2.35

Table 11. Estimated egg deposition (peak total redd expansion x mean broodstock fecundity) and egg-to-emigrant survival rates for Wenatchee Basin summer Chinook Salmon.

Brood year	Peak Total Redd Expansion	Estimated egg deposition	Redds Above trap / Total Redds	Estimated number		
				Trap Estimate	Total emigrants	Egg-to-emigrant survival (%)
1999	2,738	13,654,406	0.988	9,572,392	9,685,591	70.93
2000	2,540	13,820,140	0.983	1,299,476	1,322,383	9.57
2001	3,550	18,094,350	0.987	8,229,920	8,340,342	46.09
2002	6,836	37,488,624	0.977	13,167,855	13,475,368	35.95
2003	5,268	28,241,748	0.996	20,336,968	20,426,149	72.33
2004	4,874	26,207,498	0.989	14,764,141	14,935,745	56.99
2005	3,538	17,877,514	0.993	11,612,939	11,695,581	65.42
2006	8,896	45,663,168	0.979	9,397,044	9,595,512	21.01
2007	1,970	10,076,550	0.983	4,470,672	4,546,838	45.12
2008	2,800	14,302,400	0.978	4,309,496	4,405,473	30.80

Brood year	Peak Total Redd Expansion	Estimated egg deposition	Redds Above trap / Total Redds	Estimated number		
				Trap Estimate	Total emigrants	Egg-to-emigrant survival (%)
2009	3,441	18,206,331	0.983	6,695,977	6,814,805	37.43
2010	3,261	16,184,343	0.957	--	--	--
2011	3,078	15,122,214	0.958	--	--	--
2012	2,504	12,302,152	0.930	6,286,648	6,759,024	54.94

Discussion

Chiwawa River Smolt Trap

The BY2011 yearling spring Chinook Salmon estimate of 37,185 (± 4,022) utilized a discharge dependent efficiency model (R_a^2 = 0.75, P < 0.01) built from six mark-recapture trials conducted in spring of 2013. During the winter non-trapping period 3,665 (±4,621) spring Chinook Salmon were estimated to leave the Chiwawa River using detections at the CHL and two discharge dependent models of detection efficiency (R_a^2 = 0.82, P < 0.01 and R_a^2 = 0.70, P = 0.1). Combining these two estimates with the 2011 brood year subyearling spring Chinook Salmon estimate from the fall of 2012 (67,982 (±11,382)) yielded a total emigrant estimate of 108,832 (±12,926) for the 2011 brood year spawners. Egg to emigrant survival for this brood year was calculated at 5.04%

For the 2012 brood subyearling spring Chinook Salmon, a discharge dependent efficiency model (R_a^2 = 0.83, P < 0.001) developed from 13 mark-recapture efficiency trials was utilized to estimate 49,774 (± 6,026) subyearling Chinook Salmon emigrants leaving the Chiwawa River from 1 July - 21 November, 2013. Subyearling Chinook Salmon parr were again remotely captured and tagged and detections at CHL will be used to estimate emigration during the non-trapping period. These results will be included in the 2014 report.

This is the first reporting cycle that an estimate for non-trapping emigration has been reported. This method of estimating emigration using the combination of efficiency trials, parr snorkel surveys and remote tagging throughout the Chiwawa River basin has great utility for refining estimates of emigration and would not have been possible without funding provided in 2012 by the McNary Mitigation fund. The study was renewed for the fall of 2013 for a final year of development and review. It will be continued through the new CCPUD monitoring and evaluation plan slated to start in spring of 2014.

Upper Wenatchee River Smolt Trap

The second year of trapping at the new upper Wenatchee River smolt trap site was hindered by low capture rates. Mark-recapture trials were unsuccessful due to low number of fish released and low trap efficiency. Only one of the three Sockeye Salmon trials conducted produced resulting recaptures. This one successful trial was conducted by capturing wild Sockeye Salmon at the lower Wenatchee River smolt trap and transporting fish by truck upstream of the trap site. This release of 700 wild Sockeye Salmon had 1 recapture. An attempt was made to increase capture by separating the two traps and searching for an area of higher fish passage density. This attempt did not produce higher capture rates. There is no current plan for operating the upper Wenatchee River smolt trap next year. The effort to monitor Sockeye Salmon emigrating from the Wenatchee River basin will be shifted to the Lower Wenatchee River smolt trap.

Lower Wenatchee River Smolt Trap

A pooled efficiency (E_i = 2.31%) was used to estimate 89,917 (±579,521) wild spring Chinook smolts emigrating from the Wenatchee River basin. This estimate resulted in an egg-to-smolt survival of 2.35%. This is likely an underestimate due to the use of the low pooled efficiency. Similarly, a pooled estimate (E_i = 1.23%) was used to calculate 6,286,648 (±794,773) subyearling summer Chinook Salmon emigrants past the trap site. This estimate resulted in an egg-to-emigrant (i.e., subyearling life stage) survival of 54.94%. No discharge dependent trap efficiency model was produced in the first year of operation at the lower Wenatchee River smolt trap site. However, the mark/recapture trials conducted will be utilized in developing a multiple year model. Development of an “in-year” discharge dependent trap efficiency model is the goal for each trapping season, and while efforts are made annually to produce such a model it may not always be possible. Using multiple year models is acceptable when the trap position is held as constant as possible from year to year. Mark-recapture trials were conducted for all target species in 2013 except for steelhead. In 2014, hatchery steelhead may be utilized in mark-recapture trials to develop a model for estimating wild steelhead smolt emigration.

Operations during the first year of trapping at the new lower Wenatchee River smolt trap site indicated that the trap will be able to operate through a wide range of discharges. The trap was able to operate in one trap position and cone depth at discharges ranging from 50 m^3/s to 283 m^3/s. At discharges below 50 m^3/s, the cone depth could be raised and trapping could continue. At discharges above 283 m^3/s, the trap buoyancy seemed to be compromised and the front of the trap tended to sink. Utilization of the cable winches to move the trap upstream and apply more tension and lift to the front of the trap may enable trapping to continue at discharges above 283 m^3/s. Operation of the trap in a different position during higher flows would require the development of another model to estimate emigration while trapping in that position, but also contribute to the refinement of the emigration estimate. Continued development of operational standards will be a primary focus in the upcoming seasons, as fish health and trap integrity will have to be carefully observed and balanced against operation in higher flows.

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Appendix A. Monthly total juvenile capture information for the Chiwawa River smolt trap.

				2013						
Species/Origin	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
Chinook											
Wild yearling	11	632	1,977	379	187	3	3	5	2	0	3,199
Wild subyearling	5	1,481	5,332	2,230	1,302	5,466	4,771	1,506	3,783	1,745	27,621
Hatchery yearling	0	0	15,908	0	0	0	0	1	0	0	15,909
Steelhead											
Wild											
Smolt	0	0	68	9	1	7	0	0	0	0	85
Parr	0	11	136	331	165	69	350	617	252	18	1,949
Hatchery	0	0	0	1,399	127	3	1	7	2	0	1,539
Coho											
Wild yearling	0	1	0	0	0	0	0	0	0	0	1
Wild subyearling	0	0	0	0	0	0	0	0	0	0	0
Hatchery yearling	0	0	9	1	0	0	0	0	0	0	10
Bull trout											
Juvenile	4	21	18	30	23	9	7	52	84	62	310
Adult	0	0	0	0	0	1	2	37	11	0	51
Cutthroat	0	0	0	9	17	9	17	34	0	0	86
Eastern brook	0	0	0	2	5	0	1	1	2	2	13
Whitefish	0	19	3	2	6	278	1,482	202	40	76	2,108
Northern pikeminnow	0	0	0	0	0	18	36	17	0	0	71
Longnose dace	2	9	35	117	694	231	130	764	247	28	2257
Sucker spp.	0	0	0	0	0	0	3	3	0	0	6
Redside shiner	0	0	0	0	0	0	0	0	0	0	0
Yellow perch	0	0	0	0	0	0	0	0	0	0	0
Sculpin spp.	1	1	4	11	15	17	20	8	10	4	91

Appendix B. Monthly total juvenile capture information for the upper Wenatchee River smolt trap.

	2013									
Species/Origin	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
Chinook										
Wild yearling	57	36	5	0						98
Wild subyearling	997	4641	1,278	405						7321
Hatchery yearling	0	2	4	0						6
Steelhead										
Wild	8	29	25	478						540
Smolt	1	2	0	0						3
Parr	7	27	25	10						69
Fry	0	0	0	468						468
Hatchery	0	3	20	1						24
Sockeye										
Wild	6	791	67	6						870
Hatchery	0	6	9	0						15
Coho										
Wild yearling	1	1	0	1						3
Wild subyearling	1	1	3	1						5
Hatchery yearling	47	36	62	4						149
Bull trout										
Juvenile	1	0	0	3						4
Adult	0	0	0	0						0
Cutthroat	1	0	0	0						1
Lake Chub	0	0	0	0						62
Whitefish	0	0	0	2						2
Northern pikeminnow	0	0	0	0						0
Longnose dace	0	1	0	2						3
Sucker spp.	0	0	0	0						0
Redside shiner	0	0	0	0						0
Yellow perch	0	0	0	6						6
Sculpin spp.	9	14	7	13						43

Appendix C. Monthly total juvenile capture information for the lower Wenatchee River smolt trap.

	2013										
Species/Origin	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
Chinook											
Wild yearling	24	721	912	148	45	3	0	1	0	--	1854
Wild subyearling	45	1,489	6,143	23,517	18,584	2,319	184	77	294	--	52,652
Hatchery yearling	14	21	13,761	168	15	0	0	0	0	--	13,979
Steelhead											
Wild											
Smolt	0	3	107	56	5	2	0	0	0	--	173
Parr	2	31	154	39	19	22	27	85	158	--	537
Hatchery	0	0	80	641	98	0	0	0	0	--	819
Sockeye											
Wild	1	0	4,359	128	6	12	13	0	1	--	4,520
Hatchery	0	0	24	48	0	0	0	0	0	--	72
Coho											
Wild yearling	11	58	336	74	47	20	3	13	35	--	597
Wild subyearling	0	29	301	144	160	241	9	29	10	--	923
Hatchery yearling	0	7	10,161	2,481	311	0	0	0	0	--	12,960
Bull trout											
Juvenile	0	0	2	0	1	0	2	0	1	--	6
Adult	0	0	0	0	0	0	0	0	0	--	0
Cutthroat	0	0	0	0	0	0	0	0	0	--	0
White fish	14	7	6	3	13	11	6	38	12	--	110
Northern pikeminnow	0	0	0	15	1	4	9	7	3	--	39
Longnose dace	1	16	60	50	92	203	103	416	441	--	1,382
Speckled dace	0	0	0	0	0	0	0	0	0	--	0
Umatilla dace	0	0	0	0	0	0	0	0	0	--	0
Sucker spp.	0	1	5	9	7	13	11	47	147	--	240
Peamouth	0	0	0	0	0	0	1	0	9	--	10
Chiselmouth	0	0	0	0	0	4	6	0	0	--	10
Redside shiner	0	0	1	3	5	46	46	272	50	--	423
Yellow bullhead	0	0	0	0	0	0	0	0	0	--	0
Pacific lamprey	0	47	335	92	78	56	13	50	91	--	762
River lamprey	0	0	0	0	0	0	0	0	0	--	0
Sculpin spp.	0	4	10	11	13	17	63	107	17	--	242
Stickleback (3 spined)	0	0	2	14	133	46	0	1	0	--	196

Appendix D. Yearly total juvenile capture information for the Chiwawa River smolt trap.

Species origin	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999
Chinook														
Wild yearling	7,626	4,848	6,482	3,765	8,711	4,433	4,974	2,874	4,326	8,012	1,423	2,763	1,791	3,917
Wild subyearling	14,831	20,561	13,344	30,641	12,741	16,286	14,584	10,933	5,257	25,150	53,818	5,188	1,480	564
Hatchery yearling	30,751	25,620	22,481	14,097	22,367	17,634	9,796	3,965	7,557	5,893	2,926	0	6	60
Steelhead														
Wild	1,921	1,176	1,226	1,957	1,700	1,211	1,789	1,672	2,441	1,662	778	1,091	326	253
Smolt	183	195	210	248	448	152	53	45	280	32	86	63	181	133
Parr	1,738	981	1,016	1,709	1,250	1,056	1,736	1,627	2,161	1,630	692	1,028	145	120
Hatchery	1,664	8,250	9,921	2,708	2,684	1,964	1,384	2,104	9,678	5,886	2,720	134	45	78
Coho														
Wild yearling	1	3	4	0	0	0	3	4	0	0	0	0	0	0
Wild subyearling	0	4	5	1	13	12	2	0	0	0	0	0	0	0
Hatchery yearling	3	0	3	3	1	0	126	8	0	0	0	2	0	0
Bull Trout *Juvenile*	488	351	499	496	513	250	125	175	238	438	339	264	421	234
Bull Trout *Adult*	31	7	45	24	33	29	39	41	12	6	8	25	19	16
Cutthroat	60	38	54	66	52	40	56	44	45	28	37	183	22	13
Eastern brook	66	3	0	8	4	3	4	4	2	6	7	25	10	9
Whitefish	3,291	990	778	3,340	2,672	2,186	2,267	3,672	3,669	1,212	871	1,825	837	317
Northern pikeminnow	34	20	5	47	7	15	0	0	13	1	3	14	12	2

Appendix D. cont.

Species origin	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999
Longnose dace	2	1,526	1,393	2,081	2,934	2,349	1,951	3,133	3,162	1,557	604	1,217	1,456	130
Sucker spp.	0	0	0	7	9	1	8	10	5	4	0	6	40	3
Redside shiner	0	0	0	0	0	0	1	2	1	1	0	0	0	0
Yellow perch	0	0	0	0	0	0	0	0	0	0	1	14	0	1
Sculpin spp.	4	129	51	78	143	73	104	23	34	13	58	77	56	24

Appendix E. Yearly total juvenile capture information for the upper Wenatchee River smolt trap.

Species/Origin	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999
Chinook														
Wild yearling	88	786	569	323	194	1,597	138	61	355	257	34	62	49	228
Wild subyearling	4,978	109	254	312	71	213	2,012	2,541	139	40	5	118	10	84
Hatchery yearling	7	292	245	1,074	398	750	10	6	1	0	0	0	0	5
Steelhead														
Wild	132	135	95	66	28	80	42	36	55	14	2	37	1	9
Smolt	5	8	43	37	14	15	10	1	1	0	2	4	1	1
Parr	127	127	52	29	14	65	32	35	54	14	0	33	0	8
Hatchery	65	376	357	637	61	178	160	354	27	43	41	0	0	0
Sockeye														
Wild	603	48,128	60,792	7,314	9,133	38,628	20,309	6,580	37,953	25,165	3,299	848	2,635	9,887
Hatchery	45	3,017	1,909	2,444	1,367	2,387	1,500	1,416	1,866	668	558	1,581	66	572
Coho														
Wild yearling	4	9	4	9	6	3	10	2	1	0	0	0	0	0
Wild subyearling	61	0	15	1	16	0	0	5	0	0	0	0	0	0
Hatchery yearling	203	688	632	585	120	311	125	340	81	98	27	119	11	10
Bull Trout *Juvenile*	0	14	4	9	3	5	1	5	0	0	1	3	6	4
Bull Trout *Adult*	0	1	0	0	0	2	0	3	1	0	0	2	0	0
Cutthroat	0	2	2	2	2	1	0	1	2	0	0	12	0	0
Whitefish	0	74	81	78	35	49	3	26	19	6	4	16	4	16
Northern pikeminnow	0	279	201	234	106	113	46	17	46	23	5	28	26	43
Longnose dace	0	8	9	42	8	24	2	53	58	0	0	20	3	6
Sucker spp.	0	9	14	30	3	18	2	28	47	12	0	23	5	25
Redside shiner	0	49	66	90	21	37	21	47	62	14	0	21	15	23
Yellow perch	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Sculpin spp.	105	109	244	188	251	201	35	85	68	34	12	96	46	67

Appendix F. Yearly total juvenile capture information for the lower Wenatchee River smolt trap.

Species/Origin	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000
Chinook											
Wild yearling	1,079	5,346	612	1,906	652	333	1,061	1,619	336	206	284
Wild subyearling	50,685	37,568	30,547	86,142	63,580	224,858	225,549	110,528	39,714	70,952	72,244
Hatchery yearling	43,613	6,709	19,440	45,467	35,261	23,709	11,846	20,939	3,421	8,758	2,753
Steelhead											
Wild	484	264	319	495	151	246	360	413	252	341	468
Smolt	407	216	220	433	105	210	299	343	187	273	426
Parr	77	48	99	62	45	36	61	70	76	68	42
Hatchery	2,735	1,949	2,106	2,697	3,769	2,013	3,465	2,175	2,260	1,711	2,219
Sockeye											
Wild	3,153	1,259	216	6,340	5,204	202	3,224	7,544	5,042	58	1,114
Hatchery		263	207	248	68	79	335	271	281	131	12
Coho											
Wild yearling	188	114	111	292	103	189	58	199	72	0	0
Wild subyearling	2,112	515	1,013	431	1,460	1,846	927	29	1,443	191	0
Hatchery yearling	8,013	9,709	4,296	29,305	13,627	11,943	15,455	8,034	12,363	11,265	12,305
Bull Trout *Juvenile*	2	0	1	2	1	3	2	0	1	1	4
Bull Trout *Adult*	0	0	0	0	0	0	0	0	0	0	0
Cutthroat	0	1	1	0	0	0	0	0	0	2	0
Whitefish	48	52	67	23	118	9	34	115	31	78	73
Northern pikeminnow	198	13	57	135	475	90	75	21	93	10	9
Longnose dace	643	383	568	1,820	801	659	2,374	488	593	445	319
Speckled dace	0	0	1	0	0	0	5	4	3	7	17
Umatilla dace	0	0	2	0	0	0	2	1	12	36	17
Sucker spp.	390	63	612	339	3,420	203	208	172	169	201	121
Peamouth	62	1	2	1	0	0	0	0	0	0	11

Appendix F. cont.

Species/Origin	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000
Chiselmouth	1	0	0	1	32	0	7	2	7	1	6
Redside shiner	570	18	69	84	952	166	100	14	47	47	8
Yellow bullhead	1	0	0	0	0	0	0	0	0	0	1
Pacific lamprey	680	1,245	1,431	2,876	1,933	685	650	922	978	1,267	1,393
River lamprey	0	0	0	0	0	0	0	1	0	18	20
Sculpin spp.	70	123	49	64	118	171	86	71	97	55	76
Stickleback (3 spined)	4	7	4	39	78	51	85	18	48	246	0

Appendix C

Summary of PIT-Tagging Activities in the Wenatchee Basin, 2013

Appendix C. Numbers of fish captured, PIT tagged, lost, and released in the Wenatchee River basin during February through November, 2013.

Sampling Location	Species and Life Stage	Number held	Number of recaptures	Number tagged	Number died	Shed Tags	Total released	Percent mortality
Chiwawa Trap	Wild Subyearling Chinook	9,827	544	9,098	8	4	9,086	0.08
	Wild Yearling Chinook	3,179	6	3,105	12	0	3,093	0.38
	Wild Steelhead/Rainbow	1,360	7	1,228	0	0	1,228	0.00
	Hatchery Steelhead/Rainbow	0	0	0	0	0	0	--
	Wild Coho	0	0	0	0	0	0	--
	Total	**14,366**	**557**	**13,431**	**20**	**4**	**13,407**	**0.14**
Chiwawa Remote	Wild Subyearling Chinook	3,114	75	3,039	22	0	3,017	0.71
	Wild Yearling Chinook	0	0	0	0	0	0	--
	Wild Steelhead/Rainbow	0	0	0	0	0	0	--
	Hatchery Steelhead/Rainbow	0	0	0	0	0	0	--
	Wild Coho	0	0	0	0	0	0	--
	Total	**3,114**	**75**	**3,039**	**22**	**0**	**3,017**	**0.71**
Upper Wenatchee Trap	Wild Subyearling Chinook	0	0	0	0	0	0	--
	Wild Yearling Chinook	96	1	94	0	0	94	0.00
	Wild Steelhead/Rainbow	45	2	43	0	0	43	0.00
	Hatchery Steelhead/Rainbow	0	0	0	0	0	0	--
	Wild Coho	0	0	0	0	0	0	--
	Wild Sockeye	0	0	0	0	0	0	--
	Total	**141**	**2**	**137**	**0**	**0**	**137**	**0.00**
Middle Wenatchee Remote	Wild Subyearling Chinook	0	0	0	0	0	0	--
	Wild Yearling Chinook	0	0	0	0	0	0	--
	Wild Steelhead/Rainbow	895	43	852	2	0	850	0.22
	Hatchery Steelhead/Rainbow	2	0	2	0	0	2	0.00
	Wild Coho	0	0	0	0	0	0	--
	Total	**897**	**43**	**854**	**2**	**0**	**852**	**0.22**
Lower Wenatchee Trap	Wild Subyearling Chinook	2	0	2	0	0	2	0.00
	Wild Yearling Chinook	1,839	16	1,711	1	0	1,710	0.05
	Wild Steelhead/Rainbow	625	6	599	1	0	598	0.16
	Hatchery Steelhead/Rainbow	2	0	2	0	0	2	0.00
	Wild Coho	3	0	2	0	0	2	0.00
	Wild Sockeye	0	0	0	0	0	0	--
	Total	**2,471**	**22**	**2,316**	**2**	**0**	**2,314**	**0.08**
Total:	**Wild Subyearling Chinook**	**12,941**	**619**	**12,137**	**30**	**4**	**12,103**	**0.23**
	Wild Yearling Chinook	**5,116**	**121**	**4,912**	**13**	**0**	**4,899**	**0.25**
	Wild Steelhead/Rainbow	**2,932**	**66**	**2,737**	**3**	**0**	**2,734**	**0.10**
	Hatchery Steelhead/Rainbow	**2**	**0**	**2**	**0**	**0**	**2**	**0.00**
	Wild Coho	**3**	**0**	**2**	**0**	**0**	**2**	**0.00**
	Wild Sockeye	**0**	**0**	**0**	**0**	**0**	**0**	**--**
Grand Total:		**20,994**	**806**	**19,790**	**46**	**4**	**19,740**	**0.22**

Appendix D

Wenatchee Steelhead Spawning Ground Surveys, 2013

STATE OF WASHINGTON
DEPARTMENT OF FISH AND WILDLIFE
FISH PROGRAM – SCIENCE DIVISION
SUPPLEMENTATION RESEARCH TEAM

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February 28, 2014

To: Distribution List

From: Chris Moran, Fish Biologist, WDFW

Subject: 2013 Wenatchee River Basin Steelhead Spawning Ground Surveys

Summer steelhead migrate to their spawning grounds as early as nine months prior to spawning. Run escapement estimates of summer steelhead counted at Columbia River dams or at Tumwater Dam in the Wenatchee River may not accurately reflect the size of the spawning population because of fallback and prespawn mortality that may occur prior to spawning. English et al. (2003) reported fallback rates for Rock Island (4.9%) and Rocky Reach (6.5%) dams were similar, but no information regarding Tumwater Dam was reported. In the same study, survival to spawning was not explicitly calculated, but kelting rates for the Wenatchee River ranged between 68% and 77% and may serve as a minimum survival rate. Keefer et al. (2008) conducted a more comprehensive study throughout the Columbia Basin and reported mortality rates of summer steelhead that overwintered in the Columbia River or tributaries was 14.5% and 18.9%, respectively.

Redd counts may be used to calculate a more accurate estimate of the spawning population, but requires knowledge concerning the number of redds constructed per female and the number of fish per redd. Female steelhead have been reported to construct multiple redds, ranging between 1.02 and 6.91 redds (Reingold 1965; Gallagher and Gallagher 2005; Kuligowski et al. 2005). Large variation in the reported number of redds per female within and across populations may be natural or more simply a lack of precision in the methodology used (e.g., errors in redd counts or the number of female spawners). While the sex ratio may be an appropriate surrogate for the number of fish per redd under the assumption females construct a single redd. However, if female steelhead construct multiple redds, it is also likely male steelhead spawn at multiple redd locations with either the same or different females resulting in an overestimate of the spawning population. An estimate of the spawning population coupled with other population specific information (i.e., ratio of hatchery and wild spawners and age composition) are critical data needed to assess the productivity of the population (i.e., recruits per spawner).

Our objectives in conducting steelhead spawning ground surveys were to 1) determine spawn timing of naturally spawning steelhead (both hatchery and wild origin) and 2) estimate the abundance of redds constructed within selected tributaries. We also examined the relationship between run escapement upstream of Tumwater Dam (i.e., female and total) and redd counts as a method of assessing the precision of our estimates.

Methods

Run Escapement

Steelhead migrating upstream of Tumwater Dam were captured, sampled (sex, length, weight, scales), and PIT tagged as part of a separate study. Gender was determined using ultrasonography and secondary sexual characteristics (i.e., kype, coloration, body shape). Origin was determined using hatchery marks (i.e., fin clip, VIE, CWT, or eroded fins) or scale pattern analysis if no marks were identified.

Spawning Ground Surveys

Spawning grounds surveys were primarily concentrated in the upper Wenatchee Basin because all hatchery fish were released upstream of Tumwater Dam. Peshastin Creek was included in our surveys because it was identified as a potential reference stream (i.e., no hatchery releases since 1998) for the Wenatchee Basin. Survey methodology involved surveying non-random index areas, defined as major spawning area(s) for each stream, once a week. Redds were either individually flagged or in the case of large aggregates of localized spawning, mapped and numbered sequentially. All redds were also geo-referenced using handheld global positioning devices. Between 2000 and 2003, the number of index areas has increased as more information became available. Beginning in 2004, survey methodology has remained similar. Hence, direct comparisons of redd counts for years before 2004 may not be appropriate.

Index area spawning ground surveys were conducted by foot or raft on the Wenatchee River and most major tributaries (Appendix A). For each index area, the same surveyor(s) conducted all surveys. However, when the end of spawning within an index area was thought to be nearly complete, a different observer (i.e., naïve) surveyed the index area to determine the number of redds still visible at the end of spawning. At approximately the same time, non-index areas within a reach or stream were also surveyed. The total number of redds in non-index areas was estimated by dividing the number of redds found in non-index areas by the proportion of redds still visible inside the index area. The reach total redd count was calculated by combining the number of redds in the index area and the estimated number of redds in the non-index areas. Murdoch and Peven (2005) provide a more detailed description of the methodology (Appendix F, Task 7-3).

The sex ratio of the entire population upstream of Tumwater Dam was used as the redd expansion factor (i.e., number fish per redd). The sex ratio was calculated using the number of female and male steelhead allowed to pass upstream of Tumwater Dam during trapping and video count operations. Spawning escapement was estimated by multiplying the estimated total number of redds by the number of fish per redd. Linear regression analysis was used to examine the relationship between run escapement estimates, index area redd counts, and total redd counts upstream of Tumwater Dam. Fallback rates at Tumwater Dam were calculated based on the number of PIT tagged steelhead recaptured or tagged at Tumwater Dam that were detected downstream of Tumwater Dam prior to spawning divided by the total number of PIT tagged steelhead.

Results

Run Escapement

The estimated total steelhead run escapement to Tumwater Dam was 2,449. This includes 65 wild and 61 hatchery steelhead collected as broodstock and 1,236 hatchery steelhead removed to reduce the abundance of hatchery fish on the spawning grounds. The estimated steelhead run escapement upstream of Tumwater Dam was 1,087 fish that includes 607 fish detected on videotape and 480 trapped and released upstream. Run escapement in 2013 was 3% higher than in 2012, and was 28% lower than the previous 5-year average of 1,513 fish (Table 1). Without the removal of excess hatchery origin steelhead, the run escapement for 2013 would be 2,449 steelhead or 8% higher than the 2010 run escapement, the last year before adult management and 73% greater than the 2006-2010 average. The male to female steelhead ratio of those fish released upstream of Tumwater Dam was 0.65 males per female resulting in a fish per redd value of 1.65. Of those steelhead passed upstream of Tumwater Dam 69% (N = 745) were determined to be naturally produced.

Spawning Ground Surveys

Above average snow pack coupled with cool air temperatures led to below average stream flows for a large part of the survey season. During the last week of April an increase in air temperature resulted in a temporary increase in stream flow on the Chiwawa River preventing spawning ground surveys for approximately 20 days. Beginning the first week of May, air temperatures increased such that snowmelt resulted in elevated water conditions on all streams for up to 30 days preventing spawning ground surveys. Overall, survey conditions in 2013 were less than optimal compared to previous years. Poor environmental conditions (i.e., snow, rain, wind and clouds) were more common in 2013 and likely had a negative impact on redd observer efficiency.

Steelhead commenced spawning the second week of March in Icicle Creek with most redds being documented the first week of April. Steelhead spawning began by third week of March in the Wenatchee River and the last week of March in Peshastin Creek, Chiwawa River, and Nason Creek. Spawning activity appeared to begin once the mean daily stream temperature reached about 4.8°C and was observed in water temperatures ranging from 2.0 to 7.0°C. Steelhead spawning peaked during the second week of April in the Icicle River, the third week of April in the Wenatchee River, and the last week of April in Peshastin Creek, Nason Creek, and Chiwawa River (Appendix B).

The estimated number of redds in the Wenatchee Basin increased 15% between 2012 and 2013 (N = 410 and N = 472 respectively) and was 20% lower than the previous 5-year average of 589 redds (Appendix C). In 2013, the proportion of redds in Nason Creek (28.6%) was slightly greater than the 5-year mean (28.1%; Table 3). Redd distribution in Nason Creek continues to primarily be occurring in the middle two reaches (85%; Appendix D1). The steelhead redds observed in the Chiwawa River were also found in locations consistent with previous years (Appendix D2). In the Wenatchee River the proportion of redds found in index areas upstream of Tumwater Dam was 85% in 2013 (Appendix D3). The number of redds in Peshastin Creek was similar in 2013 to 2012 (Appendix D4). The number of steelhead redds in Icicle Creek, another major spawning tributary downstream of Tumwater Dam, was similar in 2013 (*N*=48) and to that observed in 2012 (*N* = 47). The overall number of redds in the Wenatchee River increased from 135 in 2012 to 199 in 2013.The proportion of all redds in the Wenatchee River also increased from 33% in 2012 to 42% in 2013. The proportion of redds found within index and non-index areas upstream of Tumwater Dam in 2013 was higher than 2012 (93% and 97% respectively), and was higher than the previous 10 year average (82.6%; Table 4).

Table 1. The total number, gender, and sex ratio of steelhead upstream of Tumwater Dam between 2001 and 2013. Sex ratio in 2001 was determined by the number of fish passed and collected during broodstock collection at Tumwater and Dryden dams. For 2002-2008, gender was determined visually at Tumwater Dam. For 2009 - 2013, gender was determined visually and/or by ultrasound.

Year	Number of steelhead upstream of Tumwater Dam			Male to female ratio	Number of fish per redd
	Total	Female	Male		
2001	820	394	426	1.08	2.08
2002	1,720	641	1,079	1.68	2.68
2003	1,813	1,137	676	0.59	1.59
2004	1,918	869	1,049	1.21	2.21
2005	2,598	1,620	978	0.60	1.60
2006	1,057	505	552	1.09	2.09
2007	657	339	318	0.94	1.94
2008	1,328	473	855	1.81	2.81
2009	1,781	973	808	0.83	1.83
2010	2,270	973	1,297	1.33	2.33
2011	1,130	631	499	0.79	1.79
2012	1,055	527	528	1.00	2.00
2013	1,087	658	429	0.65	1.65

Table 2. Comparison of the number and distribution of steelhead redds in 2013 and the five year geometric mean (2008-2012).

Stream	2013		Geo. mean (2008-2012)	
	Number of redds	Distribution (%)	Number of redds	Distribution (%)
Nason Creek	135	28.6	149	28.1
Chiwawa River	28	5.9	30	7.3
White River	0	0.0	0	0.0
L. Wenatchee River	0	0.0	0	0.0
Peshastin Creek	62	13.1	62	11.8
Icicle Creek	48	10.2	80	16.2
Wenatchee River	199	42.2	192	36.6
Above Tumwater	169	35.8	142	27.1
Below Tumwater	30	6.4	38	9.3
Total	472	100.0	530	100.0

Table 3. Comparison of the number of redds found within index areas and the estimated number of redds in non-index areas upstream of Tumwater Dam between 2001 and 2013.

Year	Index area	Non-index area	Estimated total	Within index area (%)
2001	118	19	137	86
2002	296	179	475	62
2003	353	88	441	80
2004	277	92	369	75
2005	828	136	964	86
2006	192	34	226	85
2007	105	29	134	78
2008	124	35	159	78
2009	284	107	391	73
2010	546	95	641	85
2011	427	33	460	93
2012	273	22	295	93
2013	276	9	285	97

Female and total escapement explained a similar proportion of the variation in the estimated total number of redds (Figure 1). Given the variation in sex ratios and that only female steelhead construct redds, we would expect female escapement to explain a greater proportion of the variation in number of redds. This would also suggest that the mean number of redds constructed by a female is relatively constant.

However, total run escapement explained a greater proportion of the variation in total redd counts than index redd counts (Figure 2). As run escapement increases, habitat within the index areas may be near capacity and subsequently a greater proportion of redds are found outside index areas.

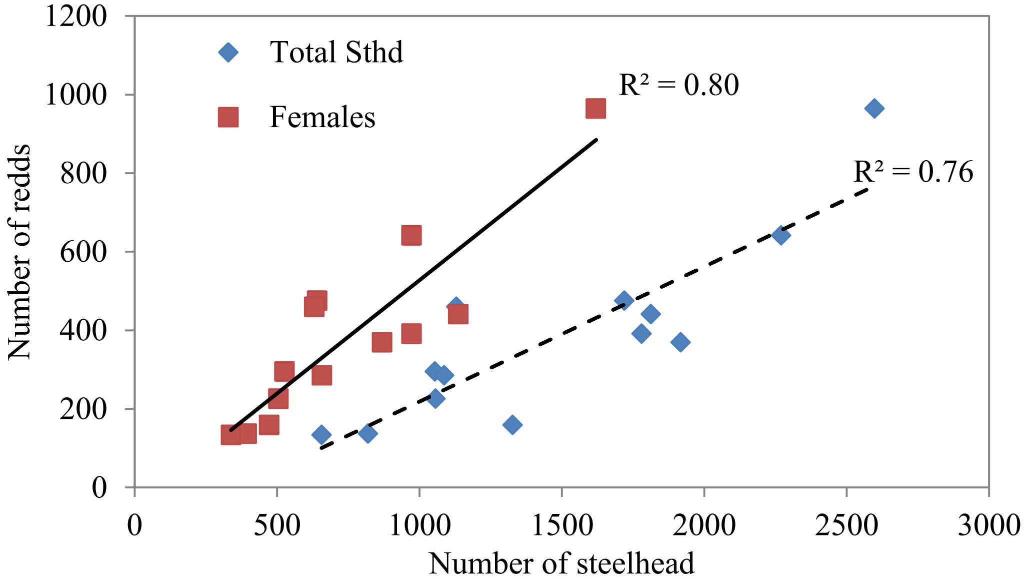

Figure 1. Relationship between steelhead run escapement (total steelhead and female) upstream of Tumwater Dam and total redd counts (2001-2013).

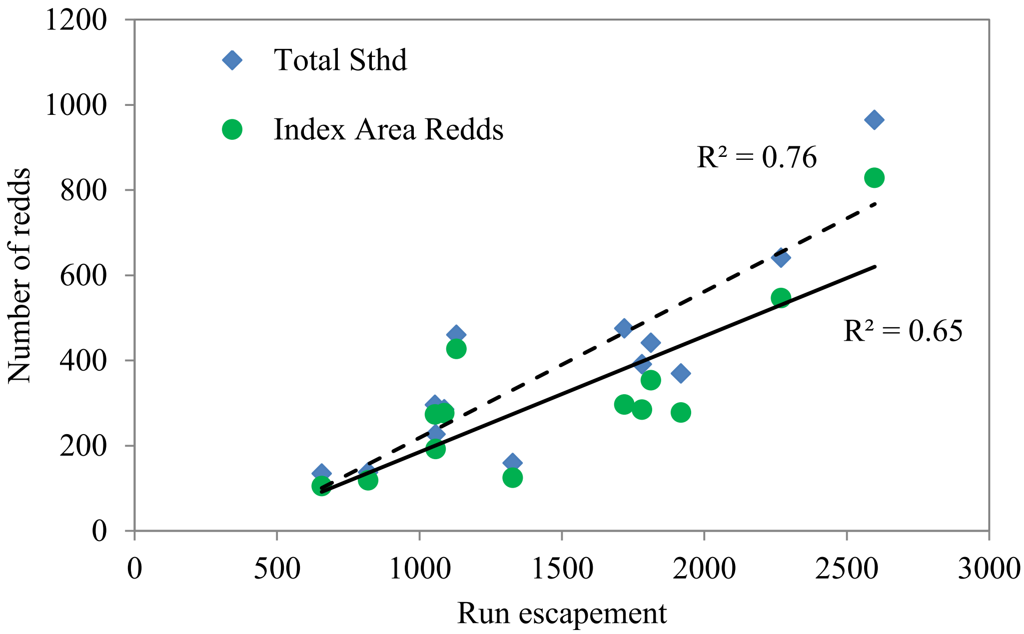

Figure 2. Relationship between steelhead run escapement upstream of Tumwater Dam and total and index area redd counts (2001-2013).

Spawning Escapement

In 2013, only 43% of the steelhead migrating above Tumwater Dam were accounted for on the spawning grounds compared to the 5-year average (2008-2012) of 54% (Table 4). While environmental conditions do affect the accuracy of our estimates, other factors also contribute to the differences observed between run and spawning escapement estimates that can be estimated or quantified (i.e., prespawn mortality and fallback). Because no estimate of survival to spawning is available for steelhead in the Wenatchee Basin, we assumed that survival to spawning was at a minimum similar to that of steelhead overwintering in lower Columbia River tributaries (i.e., Deschutes and John Day) reported by Keefer et al (2008). Actual survival in the Wenatchee River may be considerably lower than that reported by Keefer et al. (2008) as a result of colder water temperatures and depleted energy reserves attributed to a greater migration distance.

While direct enumeration of steelhead upstream of Tumwater Dam is possible, it may not be appropriate to assume that all steelhead that migrate upstream of Tumwater Dam spawn upstream of Tumwater Dam (i.e., fallback). Using PIT tag recapture data, we were able to calculate a minimum fallback rate for steelhead at Tumwater Dam in 2013. Approximately 75% of the steelhead that migrated past Tumwater Dam were implanted with a PIT tag at Tumwater Dam or prior to reaching Tumwater Dam. PIT tag detection at all Columbia and Snake River hydroelectric projects and some major spawning tributaries downstream of Tumwater Dam (e.g., lower Wenatchee, Icicle, Mission, Chumstick and Peshastin Creek) provided recapture data. Of the PIT tagged steelhead that were passed upstream of Tumwater Dam ($N = 475$), 8 were determined to be fallbacks. We used estimates of prespawn mortality and applied a 1.7% fallback rate to adjust run escapement estimates upstream of Tumwater Dam that may better represent the actual size of the spawning population. After adjustment, the proportion of the run escapement accounted for on the spawning grounds increased from 43% to 54% (Table 5).

Table 4. Comparison of run and estimated spawning escapement for steelhead upstream of Tumwater Dam between 2001 and 2012.

Year	Run escapement (A)	Number of redds (B)	Number of fish per redd (C)	Estimated spawning escapement (D = B x C)	Proportion of run escapement (E = D/A)
2001	820	137	2.08	285	0.35
2002	1,720	475	2.68	1,273	0.74
2003	1,813	441	1.59	701	0.39
2004	1,918	369	2.21	815	0.42
2005	2,598	964	1.60	1,542	0.59
2006	1,057	226	2.09	472	0.45
2007	657	134	1.94	260	0.40
2008	1,328	159	2.81	447	0.34
2009	1,781	391	1.83	716	0.40
2010	2,270	641	2.33	1,494	0.66
2011	1,130	460	1.79	823	0.73
2012	1,055	295	2.00	590	0.56
2013	1,087	285	1.65	470	0.43

Table 5. Comparison of steelhead run escapement estimates at Tumwater Dam to the estimate spawning escapement derived from redd counts after adjusting for fallback and prespawn mortality (2001-2013).

Year	Tumwater Dam count	Adjusted Tumwater Dam counts		Number of redds	Number of fish per redd	Estimated spawning escapement	Proportion of run escapement
		Fallback	Prespawn mortality				
	(A)	(B = A - 3.0%)	(C = B - 18.9%)	(D)	(E)	(F = D x E)	(G = F/C)
2001	820	795	645	137	2.08	285	0.44
2002	1,720	1,668	1,353	475	2.68	1,273	0.94
2003	1,810	1,756	1,424	441	1.6	706	0.50
2004	1,869	1,813	1,470	369	2.21	815	0.55
2005	2,650	2,571	2,085	964	1.61	1,552	0.74
2006	1,053	1,021	828	226	2.05	463	0.56
2007	657	637	517	134	1.94	260	0.50
2008	1,358	1,317	1,068	159	2.81	447	0.42
2009	1,781	1,728[a]	1,401	391	1.83	716	0.51
2010	2,270	2,202[b]	1,786	641	2.33	1,494	0.84
2011	1,130	1,096[c]	889	460	1.79	823	0.93
2012	1,055	1,023	830	295	2.00	590	0.71
2013	1,087	1,069[d]	867	285	1.65	470	0.54

[a] Adjusted for a fallback rate of 8.0% as determined by PIT tag detections for the 2009 brood.
[b] Adjusted for a fallback rate of 1.3% as determined by PIT tag detections for the 2010 brood.
[c] Adjusted for a fallback rate of 0.9% as determined by PIT tag detections for the 2011 brood.
[d] Adjusted for a fallback rate of 1.7% as determined by PIT tag detections for the 2013 brood.

Discussion

The 2011 steelhead run year, was the first year an adult management program was initiated at Tumwater Dam with an escapement goal of 1,094 steelhead. The escapement goal prioritizes maximizing the number of natural origin recruits with shortfalls in escapement being made up with hatchery origin fish with natural origin parents (i.e., WxW matings). The proportion of natural origin fish on the spawning grounds in 2013 was 69%. The 2011-2013 average proportion of natural origin steelhead passed above Tumwater was 68%. The proportion of natural origin steelhead above Tumwater Dam in the three year period prior to adult management was approximately 30%.

Suboptimal survey conditions as a result of above normal river discharge during and following the peak of spawning likely decreased observer efficiency compared to previous years and may have resulted in an underestimate of redd abundance. Despite these factors, the proportion of the run escapement accounted for on the spawning grounds was much greater than expected. We attributed this increase to the increase in survey frequency. In previous years, index areas were surveyed approximately once a week. Female steelhead appear to have a relatively short redd residence time (1-3 d) compared to Chinook salmon (4-16 d). Hence, the probability of detecting a steelhead redd is likely greater when the redd is newly constructed and the female steelhead is still present on the redd. However, redd density was correlated to observer efficiency and may have contributed to a greater proportion of run escapement.

High correlation between the expanded total redd counts and run escapement ($r = 0.87$; $P < 0.0001$) suggests that the methodology used to estimate spawner abundance can inform trends in abundance. It also suggests that factors responsible for the observed difference in run and estimated spawning escapement are relatively constant with respect to escapement levels across years. Given the large differences between run and spawn escapement upstream of Tumwater Dam, it is evident that multiple factors are contributing to the difference in the escapement estimates.

Estimates of the Number of Redds

The current methodology does not involve conducting weekly surveys of the entire available spawning habitat (e.g., spring Chinook, summer Chinook, and sockeye). Steelhead are thought to have a greater range of spawning habitats than other anadromous species making a total redd census logistically impractical and costly. In the Wenatchee Basin, the Integrated Status and Effectiveness Monitoring Program (ISEMP) has been conducting probabilistic sampling (e.g., GRTS) of those areas not covered under the current methodology. When available, annual estimates of redd abundance outside of the current survey area should provide some indication regarding the extent of steelhead spawning habitat. Beginning in 2011, temporary PIT tag arrays were placed at the upper extent of spawning ground survey reaches in an effort to enumerate spawning activity outside the current survey area. Based on these data, spawning escapement estimates will be recalculated at the tributary level at a later date. Within the current survey area, while a majority of the steelhead redds are consistently found within index areas, this may simply be a result of an artifact in the methodology and river reaches surveyed. Furthermore, observer efficiency is potentially a large source of error in conducting redd counts (Dunham et al. 2001; Muhlfeld et al. 2006). Studies were conducted in 2011 and 2012 to estimate observer efficiency and not only identify, but also quantify sources of error (redd omission or false identification). When data from these studies have been analyzed the results will be incorporated into existing spawning escapement estimates.

Spawning Escapement Estimates

Monitoring and evaluation plans require estimates of the spawning population in order to evaluate hatchery program effectiveness (e.g., wild and hatchery abundance and productivity) and determine appropriate escapement levels (i.e., carrying capacity). Steelhead exhibit a diverse life history and complex migration patterns thereby reducing the reliability that run escapement estimates (i.e., dam counts) accurately reflect the size of the spawning population. Steelhead spawning ground surveys are currently conducted in every major steelhead population in the Upper Columbia Basin. However, uncertainty in using these data to estimate the size of the spawning population lies in some factors previously discussed (i.e., observer efficiency and sampling design), but also in the manner in which redd counts are expanded to estimate the population.

The conversion of redd counts to an estimate of the spawning population requires knowledge of the average number of redds constructed per female and the number of fish per redd (Gallagher et al. 2007). In some populations, female steelhead were reported to construct multiple redds. If steelhead in the Wenatchee Basin do construct multiple redds, differences in run and escapement estimates would increase as a result of a lower spawning escapement estimate. For example, if female steelhead construct an average of 1.5 redds, the difference in run and spawning escapement estimates would increase 9%. Redd abundance estimates are used to estimate the female escapement, which are then expanded by the sex ratio to estimate the male population on the spawning grounds. The number of fish per redd is based on the sex ratio of the population. This approach assumes 1) equal survival to spawning and 2) every male spawns on average at one redd location. A tagging study is needed and planned in the next few years to test these assumptions.

Recommendations

Of all the factors that are contributing to the difference between run and spawning escapement estimates, redds constructed in streams not included in the survey area have the potential to account for a significant portion of the observed difference. The reported number of redds upstream of Tumwater Dam underestimate the total number of redds because all available spawning habitat (i.e., low order streams) is not surveyed. Studies have been ongoing in the Wenatchee Basin designed to estimate the number of redds in areas not covered under the current survey design. Data from these studies (i.e., ISEMP) must be analyzed and incorporated into spawning escapement estimates.

The accuracy and precision of the current methodology used in estimating the redd abundance and observer efficiency are currently ongoing. Studies focused on testing assumptions used in estimating the size of the spawning population (number of redds per female and number of fish per redd) should incorporate an assessment of 1) fallback 2) survival to spawning 3) the spawning distribution of the hatchery and wild steelhead. Information from these studies is required to ensure spawning escapement estimates have sufficient accuracy and precision, such that inferences regarding the efficacy of naturally spawning hatchery steelhead can be made in a timely manner.

Spawning distributions of hatchery and wild steelhead in the Wenatchee Basin can be assessed at the tributary level using PIT tags. All major and minor spawning areas will eventually have instream PIT tag antenna arrays. However, this methodology requires that an adequate and representative sample of adults is tagged every year. Spawning distribution within tributaries at a reach level can also be assessed using instream arrays if desired. However, assessment of spawn timing in the natural environment is problematic and will require a periodic assessment of individuals on the spawning grounds.

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Appendix A. Wenatchee River Basin survey reaches and index/reference areas – surveys conducted weekly from March through June.

Reach	Index/reference area
Wenatchee River	
Sleepy Hollow Bridge to Lower Cashmere Bridge(W2)	Sleepy Hollw Bridge To Lower Cashmere Br.
Leavenworth Bridge to Icicle Road Bridge (W6)	Leavenworth boat ramp to Icicle River
Tumwater Dam to Tumwater Bridge (W8)	Island below Swiftwater to Swiftwater CG
Tumwater Bridge to Mouth of Chiwawa river(W9)	Tumwater Bridge to Plain Bridge
Mouth of Chiwawa River to Lake Wenatchee (W10)	Chiwawa pump station to Lake Wenatchee
Peshastin Creek	
Mouth to Private Bridge (P1)	Pull out 1,500 ft below King's Bridge to Private Bridge
Ingalls Creek to Negro Creek (P3)	Ingalls Creek to Negro Creek
Negro Creek to Scotty Creek (P4)	HWY 97 MP 175 to FR7320 Bridge
Chiwawa River	
Mouth to Grouse Creek (C1)	Mouth to Road 62 Bridge rm 6.4
Grouse Creek to Chickamin Creek (C2)	Grouse Creek to Chikamin Creek
Clear Creek	
Mouth to HWY 22 (V1)	Mouth to HWY 22
HWY 22 to Lower culvert rm 2.0 (V2)	HWY 22 to Lower culvert
Nason Creek	
Mouth to Kahler Creek Bridge (N1)	Mouth to Kahler Creek Bridge
Cement Bridge to Lower R.R. Bridge (N3)	Cement Bridge to Lower R.R Bridge
Lower R.R. Bridge to Whitepine Creek (N4)	Lower R.R. Bridge to Whitepine Creek
Icicle River	
Mouth to NFSH Hatchery (I1)	Mouth to NFSH Hatchery
NFSH Hatchery Sow	

Appendix B. Summary of steelhead spawning ground index surveys in the Wenatchee River basin in 2012.

Reach	Survey Week of index Area															Index Total	Reach Total	Expanded # of redds
	24 Feb	3 Mar	10 Mar	17 Mar	24 Mar	31 Mar	7 Apr	14 Apr	21 Apr	28 Apr	5 May	12 May	19 May	26 May	2 Jun			
Wenatchee River																		
W1																	0	0
W2		0	0	0	0	1	1	7	12	5				0		26	26	26
W3																	0	0
W4																	0	0
W5																	0	0
W6		0	0	0	0	0	0	0	3	0		0	0	1		4	4	4
W7																	0	0
W8				0	0	0	0	5	1	0				0		6	6	6
W9			0	1	9	12	13	17	11	15				1		79	79	79
W10			0	0	4	5	9	17	24	21				4		84	84	84
Total		0	0	1	13	18	23	46	51	41		0	0	6		199	199	199
Beaver Creek																		
Total					0	0	0	1		0		0	0			1	1	1
Peshastin Creek																		
P1		0	0	0	4	1	0	9	18	4		0	0	0		36	42	42
P2																	0	0
P3			0	0	0	0	1	0	2	3	0	0	2	0		8	8	8
P4		0	0	0	0	0	0	0	0	1	1	1	6	0		9	12	12
Total		0	0	0	4	1	1	9	20	8	1	1	8	0		53	62	62
Mill Creek																		
Total		0	0	0	0	0	0	0	0	0		0	0	0			0	0

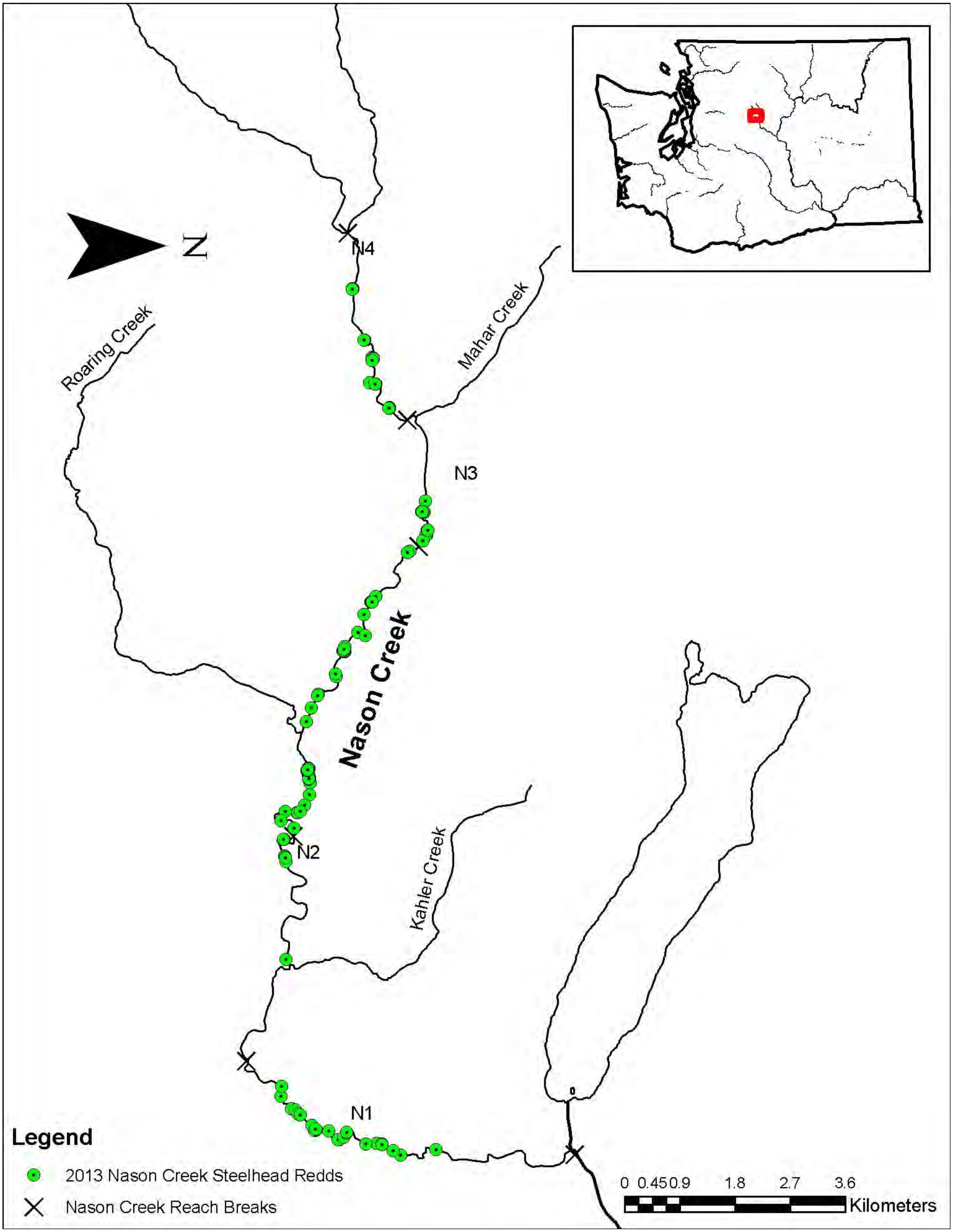
Appendix B. Continued.

Reach	Survey Week of index Area															Index Total	Reach Total	Expanded # of redds
	26 Feb	4 Mar	11 Mar	18 Mar	25 Mar	1 Apr	8 Apr	15 Apr	22 Apr	29 Apr	6 May	13 May	20 May	27 May	3 Jun			
									Chiwawa River									
C1				0	2			2	5	3					0	12	12	12
C2				0	0			2	6	0					0	8	8	8
Total				0	2			4	11	3					0	20	20	20
									Clear Creek									
V1						0	0	0		2	1	1	1			5	5	5
V2																	0	0
Total						0	0	0		2	1	1	1			5	5	5
									Nason Creek									
N1		0	0	0		2	1	2			5			2		12	12	12
N2		0	0	0	1	0	2	1	2	14	23					43	61	65
N3		0	0	0	0	0	7	14	4	11	34			3		73	73	73
N4		0	0	0	0	0	1	4			3	0		0		8	8	8
Total		0	0	0	1	2	11	21	6	25	65	0		5		136	154	158
									Icicle River									
I1		0	0	0	0	1	7	16		4	13	1		1		43	43	43
I2				0	0	0	0	2		1	1					4	4	4
Total		0	0	0	0	1	7	18	0	5	14	1		1		47	47	47
									Wenatchee River Basin									
Total		0	0	1	1	11	40	68	7	42	140	41	7	20	1	381	410	415

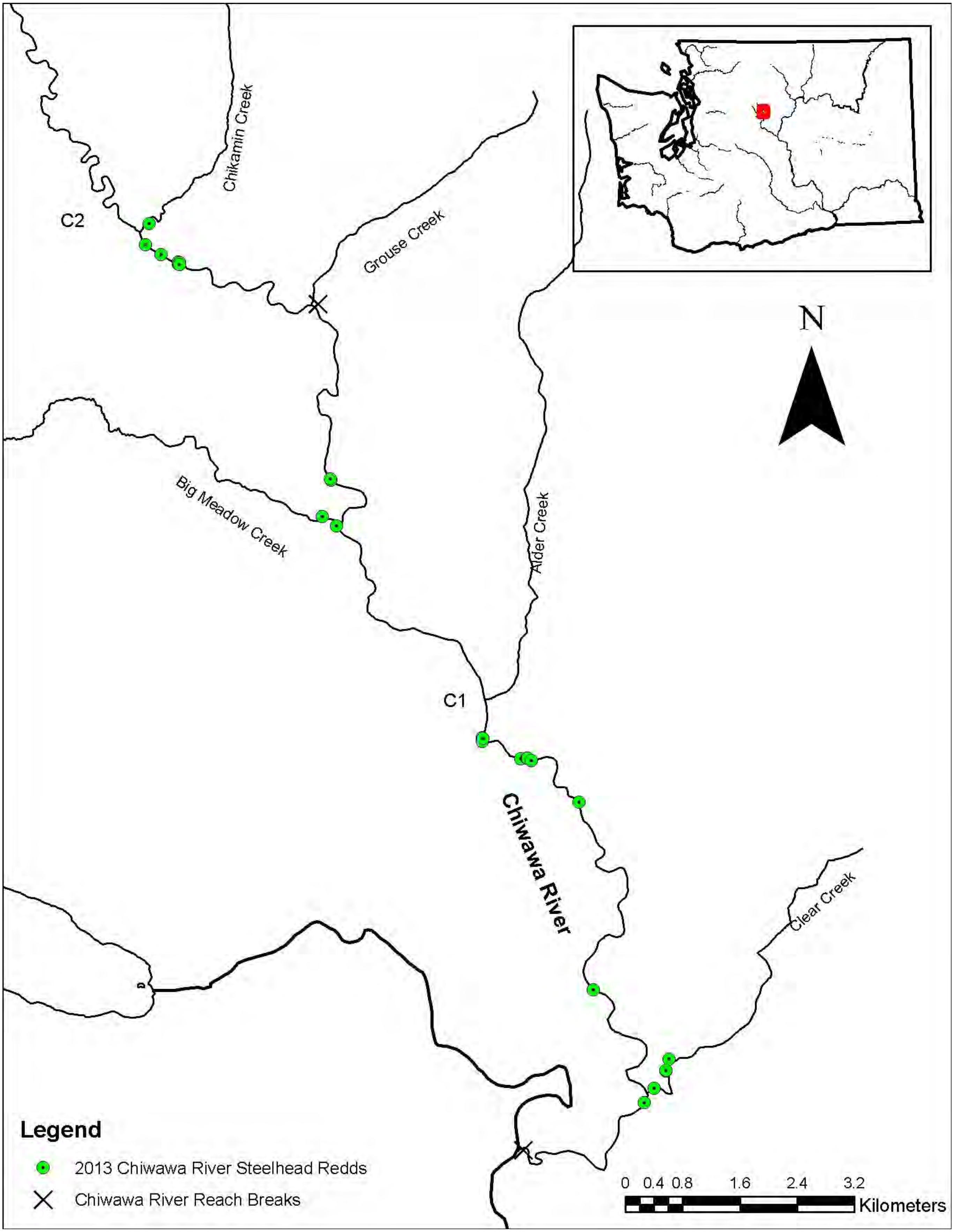
Appendix C. Steelhead spawning surveys in the Wenatchee River basin, 2001 – 2012. Redd counts are expanded values derived from sample rates within index areas.

Basin/subbasin	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
			Chiwawa River Basin										
Chiwawa River	25	27	26	17	118	8	3	9	68	40	63	3	20
Rock Creek	--	1	0	0	0	0	--	--	0	0	0	0	--
Chikamin creek	--	0	0	1	2	1	0	--	2	11	2	0	1
Meadow Creek	--	5	1	5	16	3	0	0	3	3	0	0	2
Twin Creek	--	4	0	--	0	--	--	--	--	0	--	--	--
Goose Creek	--	0	--	--	--	--	--	--	--	--	--	--	--
Alder Creek	--	0	5	2	14	0	0	0	0	8	1	0	0
Deep Creek	--	0	--	--	--	--	--	--	--	--	--	--	--
Clear Creek	--	43	32	37	12	7	8	2	2	12	11	5	4
Subtotal	25	80	64	62	162	19	11	11	75	74	77	8	27
			Nason Creek Basin										
Nason Creek	27	80	121	124	410	74	78	87	126	269	235	158	135
White Pine Creek	--	--	--	0	0	0	0	--	0	1	0	--	--
Un-named Creek	--	--	--	3	0	3	0	1	0	0	0	0	0
Roaring Creek	--	--	--	--	2	0	0	0	0	0	0	0	0
Mahar Creek													0
Coulter Creek													0
Subtotal	27	80	121	127	412	77	78	88	126	270	235	158	135
			White River Basin										
White River	--	0	1	0	2	0	1	0	0	3	0	--	--
Panther Creek	--	--	0	0	0	0	0	0	0	--	--	--	--
Napeequa River	--	0	2	0	0	0	0	1	0	0	--	--	--
Subtotal		0	3	0	2	0	1	1	0	3	0		
			Little Wenatchee River										
Mainstem	--	1	5	0	0	--	0	--	0	4	2	--	--
			Icicle Creek										
Mainstem	19	27	16	23	8	41	6	37	102	120	180	[b]47	[b]48
			Peshastin Creek Basin										
Peshastin Creek	--	--	15	32	91	67	17	48	32	115	113	65	62
Mill Creek	--	--	--	--	1	0	0	1	0	0	0	0	0
Ingalls Creek	--	--	0	0	0	0	--	--	--	--	--	--	--
Ruby Creek	--	--	0	0	0	--	--	--	0	0	0	--	--
Tronsen Creek	--	--	0	2	5	0	0	0	0	3	2	--	--
Scotty Creek	--	--	0	0	0	0	0	0	0	0	0	--	--
Shaser Creek	--	--	0	0	0	0	0	0	0	0	0	--	--
Schafer Creek	--	--	--	0	0	0	0	0	0	0	0	--	--
Subtotal	--	--	15	34	97	67	17	49	32	118	115	65	62
			Wenatchee River										
Mainstem	116	315	248	136	456	191	46	100	327	377	320	135	199
Beaver Creek	--	0	0	[a]15	3	0	0	0	0	2	2	2	1
Chiwaukum Creek	--	--	0	--	0	0	--	0	0	1	1	--	--
Subtotal	116	315	248	151	459	191	46	100	327	380	323	137	200
Wenatchee Basin Total	**187**	**503**	**472**	**397**	**1,140**	**395**	**159**	**286**	**662**	**969**	**932**	**415**	**472**

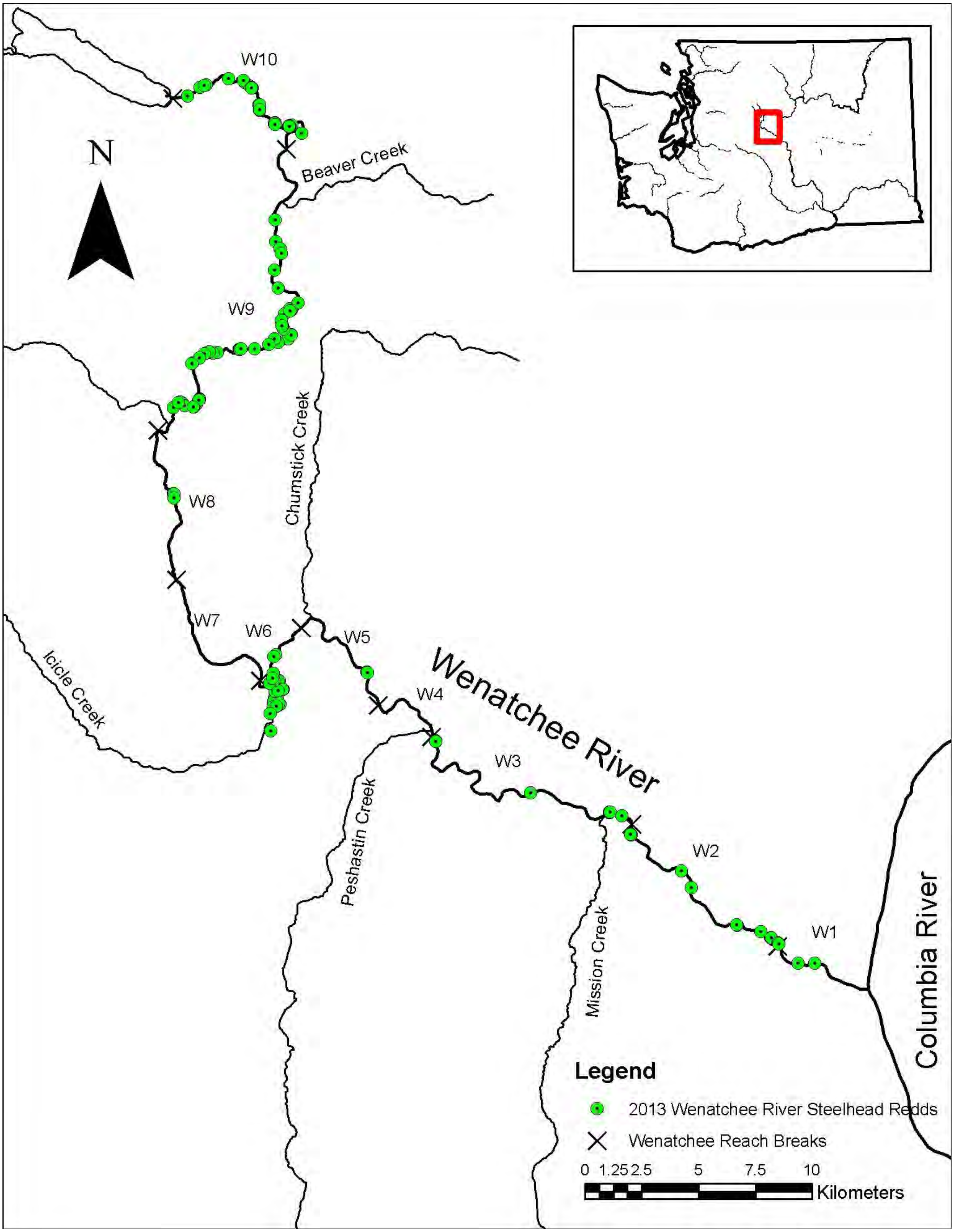
[a]Redds were enumerated by USFS
[b]Redds were a total of reaches I1 and I2



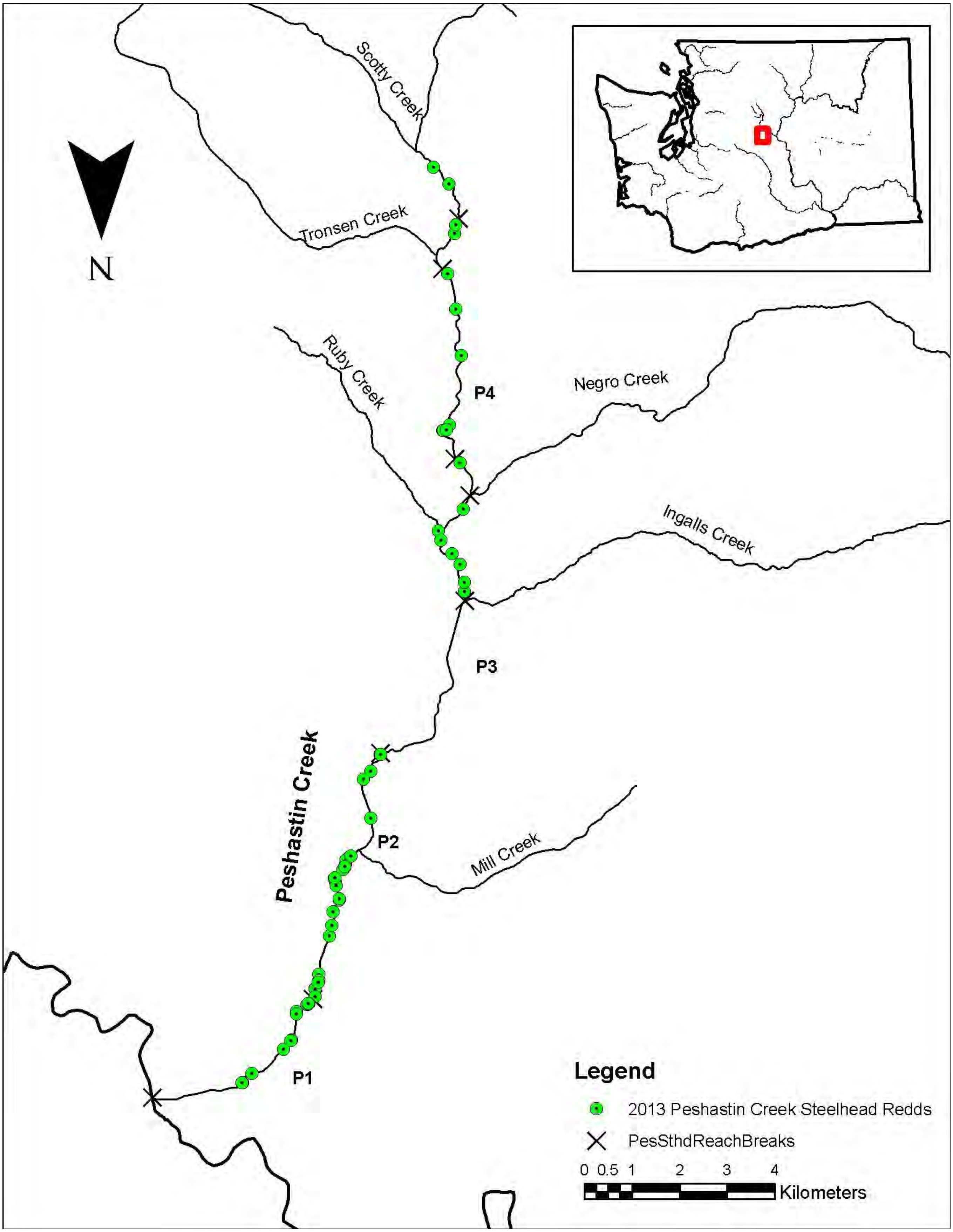
Appendix D1. Steelhead spawning distribution in the Nason Creek Basin in 2013.



Appendix D2. Steelhead spawning distribution in the Chiwawa River Basin in 2013.



Appendix D3. Steelhead spawning distribution in the Wenatchee River and Icicle Creek in 2013.



Appendix D4. Steelhead spawning distribution in the Peshastin Creek Basin in 2013.

Appendix E

Genetic Diversity of Wenatchee Summer Steelhead

Examining the Genetic Structure of Wenatchee Basin Steelhead and Evaluating the Effects of the Supplementation Program

Developed for

Chelan County PUD

and the

Rock Island Habitat Conservation Plan Hatchery Committee

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17 January 2012

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Executive Summary

In 1997, Wenatchee River summer steelhead, as part of the upper Columbia River evolutionarily significant unit (ESU), were listed as threatened under the Endangered Species Act (ESA). To address concerns about effects of hatchery supplementation, the hatchery program for hatchery produced (HOR) summer steelhead to be planted in the Wenatchee River changed from using mixed ancestry broodstock collected in the Columbia River to using Wenatchee River broodstock collected in the Wenatchee River. Three monitoring and evaluation (M&E) indicators were developed to measure the genetic effects of hatchery production on wild fish populations. To address these indicators, temporal collections of tissue samples from Wenatchee River hatchery-produced (HOR) and natural origin (NOR) adults captured and sampled at Dryden and Tumwater dams and from NOR juveniles from three Wenatchee River tributaries and the Entiat River were surveyed for genetic variation with 132 genetic (SNPs) markers. Peshastin Creek (a Wenatchee River tributary) and the Entiat River served as no-hatchery-outplant controls, meaning they have stopped receiving HOR juvenile outplants. As per the M&E plan, we interrogated these data for the presence or absence of spatial and temporal trends in allele frequencies, genetic distances, and effective population size.

Allele frequencies – Changes to the summer steelhead hatchery supplementation program had no detectable effect on genetic diversity of wild populations. On average, HOR adults had higher minor allele frequencies (MAF) than NOR adults, which may simply reflect the mixed ancestry of HOR adults. Both HOR and NOR adults had MAF similar to juveniles collected in spawning tributaries and in the Entiat River. There was no temporal trend in allele frequencies or observed heterozygosity in adult or juvenile collections and allele frequencies in control populations were no different than those still receiving hatchery outplants. This suggests that the hatchery program has had little effect on allele frequencies since broodstock sources changed in 1998.

Genetic distances – As intended, interbreeding of Wenatchee River HOR and NOR adults reduced the genetic differences between Wells Hatchery HOR adults and Wenatchee River NOR adults observed in the first few years after changing the broodstock collection protocol. Though there were detectable genetic differences between HOR and HOR adults, the magnitude of that difference declined over time. HOR adults were genetically quite different from NOR adults and juveniles based on pair-wise F_{ST} and principal components analysis (PCA), most likely because of the much smaller effective population size (N_b) in the hatchery population (see below). Pair-wise F_{ST} estimates and genetic distances between HOR and NOR adults collected the same year declined over time suggesting that the interbreeding of HOR and NOR adults in the hatchery (and presumably in the wild) is slowly homogenizing Wenatchee River summer steelhead. Analyses using brood year (the year fish were hatched, determined using scale-based age estimates) were inconclusive because of limitations of the data.

Effective population size (N_b) – Although the effective population size of the Wenatchee River hatchery summer steelhead program was consistently small, it does not appear to have caused a reduction in the effective population size of wild populations. On average, estimates of N_b were much lower and varied less for HOR adults than for NOR adults and juveniles. Estimates of N_b for HOR adults declined from the earliest brood years to a stable new low value after broodstock practices were changed in 1997. There was no indication that this had any effect on N_b in NOR adults and juveniles; N_b estimates for NOR adults and juveniles were, on average, higher and varied considerably over the time period covered by our dataset (1998 – 2010) and showed no temporal trend.

Introduction

The National Marine Fisheries Service (NMFS) recognizes 15 Evolutionary Significant Units (ESU) for west coast steelhead (*Oncorhynchus mykiss*). The Upper Columbia ESU, which contains steelhead in the Wenatchee Basin, was listed as endangered under the Endangered Species Act (ESA) in 1997. Included in this listing were the Wells hatchery steelhead (program initiated in the late 1960s) that originated from a mixed group of native steelhead and are considered to be genetically similar to natural spawning populations above Wells Dam. Juvenile steelhead from Wells Fish Hatchery was the primary stock released into the Wenatchee River (Murdoch et al. 2003). The 1998 steelhead status review identified several areas of concern for this ESU including the risk of genetic homogenization due to hatchery practices and the high proportion (65% for the Wenatchee River) of hatchery fish present on the spawning grounds (Good et al. 2005). The Biological Review Team (BRT) further identified the relationship between the resident and anadromous forms of *O. mykiss* and possible changes in the population structure ('genetic heritage of the naturally spawning fish') in the basin as two areas requiring additional study. Furthermore, the West Coast Steelhead BRT (2003) recommended that stocks in the Wenatchee, Entiat, and Methow rivers, within the Upper Columbia ESU, be managed as separate populations.

A review of the presence of resident *O. mykiss* in the Upper Columbia ESU (Good et al. 2005) shows that rainbow trout are relatively abundant in upper Columbia River tributaries currently accessible to steelhead as well as in upriver tributaries unavailable to anadromous access by Chief Joseph and Grand Coulee dams (Kostow 2003). U.S. Fish and Wildlife Service (USFWS) biologists surveyed the abundance of trout and steelhead juveniles in the Wenatchee, Entiat, and Methow river drainages in the mid-1980s and found adult trout (defined as those with fork length > 20 cm) in all basins (Mullan et al. 1992). The results also supported the hypothesis that resident *O. mykiss* are more abundant in tributary or mainstem areas upstream of the areas used by steelhead for rearing. No samples of rainbow trout from the Wenatchee were available for this study.

In addition to the mixed ancestry Wells Hatchery steelhead, Skamania Hatchery (Washougal River steelhead ancestry) steelhead were also released into the Wenatchee River basin for several years in the late 1980s (L. Brown, Washington Dept. of Fish and Wildlife [WDFW], personal communication). In 1996, broodstock for the Wenatchee River steelhead program were collected from Priest Rapids Dam and Dryden (rkm 24.9) and Tumwater (rkm 52.6) dams on the Wenatchee River. Because of the ESA listing, broodstock collection after 1996 was restricted to the Wenatchee River in an effort to develop a localized broodstock (Murdoch et al. 2003). Thus, starting in 1998, all juvenile steelhead released into the Wenatchee River and Wenatchee River tributaries were offspring of only Wenatchee River captured broodstock.

In response to the need for evaluation of the supplementation program, both a monitoring and evaluation plan (Murdoch and Peven 2005) and the associated analytical framework (Hays et al. 2006) were developed for the Habitat Conservation Plans Hatchery Committee through the joint effort of the fishery co-managers (Confederated Tribes of the Colville Reservation [CCT], NMFS, USFWS, WDFW, and Yakama Nation [YN]) and Chelan County, Douglas County, and Grant County Public Utility Districts (PUD). These reports outline 10 objectives to be applied to various species assessing the impacts of hatchery operations mitigating the operation of Rock Island and Rocky Reach Dams. This report pertains to Wenatchee River basin steelhead (*O. mykiss*) and the steelhead supplementation program as addressed by objective 3, specifically the first three evaluation indicators.

> **Objective 3:** Determine if genetic diversity, population structure, and effective population size have changed in natural spawning populations as a result of the hatchery program. Additionally, determine if hatchery programs have caused changes in phenotypic characteristics of natural populations.

3.1 Allele Frequency

3.2 Genetic Distances Between Populations

3.3 Effective Spawning Population

To address these evaluation indicators the WDFW Molecular Genetics Lab (MGL) obtained pertinent tissue collections and samples, surveyed genetic variation with SNP markers using our standard laboratory protocols, and calculated the relevant genetic metrics and statistics. We used collections from both the Entiat River and Wenatchee River basins. Both have received hatchery plants from non-local stocks [i.e. Entiat was stocked with both Wenatchee and Wells program juveniles averaging 12K and 18K respectively during 1995-2001, and Wenatchee received on average 177K juveniles from the Wells program during 1995-2001; (Good et al. 2005)], and both have all or some part of the basin designated as natural production "reference" drainage – no hatchery outplanting (i.e., the entire Entiat Basin, and Peshastin Creek in the Wenatchee River basin) (Good et al. 2005).

Materials and methods

Sample collections

To address objectives 3.1 through 3.3, we obtained samples from hatchery (HOR, adipose fin clipped) and natural origin (NOR, adipose fin intact) adult summer steelhead captured at Dryden or Tumwater diversion dams in the summer and fall of 1997 through 2009 (excepting 2004 and 2005; Table 1). All or some fraction of these fish was later used as hatchery broodstock the calendar year following the sampling year. In order to keep things simple we have reported years as the spawning year, i.e., the calendar year the fish were spawned, not the calendar year they were captured.

To address objective 3.2, it was necessary to have samples from natural origin fish from each of the spawning populations in the basin. It is difficult to obtain adult samples from known spawning populations due to the life history and behavior of steelhead, without tributary weirs or some other blocking method of collection. The NOR adult samples used as broodstock collected from Dryden and Tumwater Dams were a mixed collection representing all of the spawning populations located upstream. Therefore to determine population substructure within the basin we obtained collections of juvenile fish from smolt traps located within tributaries representing three major populations in the basin and from the Entiat River (Chiwawa River, Nason Creek, and Peshastin Creek; Table 2). We also obtained two collections of juvenile fish caught in a smolt trap in the lower Wenatchee River. These, like the NOR adult collections, were a mixed collection presumably representing all populations located upstream. Fin tissue was taken from each fish and preserved in 95% ethanol.

Sample processing

Fin tissue samples were processed for 1468 HOR and NOR adult steelhead broodstock (Table 1) and for 1542 juvenile *O. mykiss* from the Wenatchee and Entiat Rivers (Table 2). Samples were genotyped at 152 single nucleotide polymorphism loci (SNPs, Tables 3, 4). We originally proposed to use microsatellites, but WDFW MGL and other regional genetic laboratories (Columbia River Inter-Tribal Fish Commission [CRITFC], Idaho Fish and Game [IDFG], USFWS) are moving toward using SNPs and they provide the same kinds of information with faster processing. Twenty SNP loci were developed to discriminate among trout species; 14 distinguish *O. mykiss* from coastal cutthroat trout (*O. clarkii clarkii*) and westslope cutthroat (*O. clarkii lewisi*), and 6 distinguish steelhead and coastal cutthroat from westslope cutthroat (Table 4). The remaining 132 SNP loci were developed to be used for population structure, parentage assignment, or other population genetic studies of *O. mykiss* (Table 3). These markers comprised the current standard set of SNP markers used for genetic studies of *O. mykiss* at WDFW MGL.

We used Qiagen DNEasy ® kits (Qiagen Inc., Valencia, CA), following the recommended protocol for animal tissues, to extract and isolate DNA from fin tissue. SNP genotypes were obtained through PCR and visualization on Fluidigm EP1 integrated fluidic circuits (chips). Protocols followed Fluidigm's recommendations for TaqMan SNP assays as follows: Samples were pre-amplified by Specific Target Amplification (STA) following Fluidigm's recommended protocol with one modification. The 152 assays were pooled to a concentration of 0.2X and mixed with 2X Qiagen Multiplexing Kit (Qiagen, Inc., Valencia CA), instead of TaqMan PreAmp Master Mix (Applied Biosystems), to a volume of 3.75µl, to which 1.25µl of unquantified sample DNA was added for a total reaction volume of 5µl. Pre-amp PCR was conducted on a MJ Research or Applied Biosystems thermal cycler using the following profile: 95°C for 15 min followed by 14 cycles of 95°C for 15 sec and 60°C for 4 minutes. Post-PCR reactions were diluted with 20µl dH_2O to a final volume of 25µl.

Specific SNP locus PCRs were conducted on the Fluidigm chips. Assay loading mixture contained 1X Assay Loading Reagent (Fluidigm), 2.5X ROX Reference Dye (Invetrogen) and 10X custom TaqMan Assay (Applied Biosystems); sample loading mixture contains 1X TaqMan Universal PCR Master Mix (Applied Biosystems), 0.05X AmpliTaq Gold DNA polymerase (Applied Biosystems), 1X GT sampling loading reagent (Fluidigm) and 2.1 µL template DNA. Four µL assay loading mix and 5 µL sample loading mix were pipetted onto the chip and loaded by the IFC loader (Fluidigm). PCR was conducted on a Fluidigm thermal cycler using a two step profile. Initial mix thermal profile was 70°C for 30min, 25°C for 5 min, 52.3° for 10 sec, 50.1°C for 1 min 50sec, 98°C for 5 sec, 96°C for 9 min 55 sec, 96°C for 15 sec, 58.6°C for 8 sec, and 60.1°C for 43 sec. Amplification thermal profile was 40 cycles of 58.6°C for 10 sec, 96°C for 5 sec, 58.6°C for 8 sec and 60.1°C for 43 sec with a final hold at 20°C.

The SNP assays were visualized on the Fluidigm EP1 machine using the BioMark data collection software and analyzed using Fluidigm SNP genotyping analysis software. To ensure all SNP markers were being scored accurately and consistently, all data were scored by two researchers and scores of each researcher were compared. Disputed scores were called missing data (i.e., no genotype).

Evaluation of loci

A two-tailed exact test of Hardy–Weinberg equilibrium (HWE) was performed for each locus in each collection or population using the Markov Chain method implemented in GENEPOP v4.1 (dememorization number 1000, 100 batches, 1000 iterations per batch; Raymond and Rousset 1995; Rousset 2008). Significance of probability values was adjusted for multiple tests using false discovery rate (Verhoeven et al. 2005). F_{IS}, a measure of the fractional reduction in heterozygosity due to inbreeding in individuals within a subpopulation and an additional indicator of scoring issues, was calculated according to Weir and Cockerham (1984) using GENEPOP v4.1. Allele frequencies were calculated using CONVERT v1.0 (Glaubitz 2004). Expected and observed heterozygosities were calculated using GDA v1.1 (Lewis and Zaykin 2001).

Allele frequencies, genetic distances and population differentiation

To evaluate Q1 of Objective 3.1 and 3.2, we evaluated trends and patterns in allele frequencies, genetic distances and population differentiation. To test for temporal patterns in allele frequencies, we compared sample or spawn year to two diversity metrics, allele frequency and observed heterozygosity, from each adult and juvenile collection. Each SNP locus had only one or two alleles, so we used the minor allele frequency (MAF) of each SNP locus for each adult collection and averaged across loci. We also calculated the average observed heterozygosity (Ho) for each SNP locus within each adult and juvenile collection. We examined the presence or absence of a temporal trend in average allele frequency and observed heterozygosity with logistic regression analysis in R (R Development Core Team 2009).

To partition genetic variance into temporal, spatial (juvenile) and origin (adult) fractions, we performed hierarchical analysis of molecular variance (AMOVA) using ARLEQUIN v3.0 (Excoffier et al. 2005) with 1,000 permutations. We performed this analysis separately for juvenile and adult collections. Juveniles were grouped by sampling location (tributary) and adults were grouped by origin (HOR or NOR). To estimate the magnitude of genetic differences among temporal and spatial collections we calculated pairwise F_{ST} estimates among collections using FSTAT (Goudet 1995) with 1000 permutations. Statistical significance was adjusted using false discovery rate (Verhoeven et al. 2005).

To evaluate the temporal changes in genetic relationships, we compared spawn year to within spawn year pairwise F_{ST} estimates between NOR and NOR adults using beta regression (Simas and Rocha 2010). We used beta regression because the dependent variable was bound by zero and one but not binomial. Analysis was performed in R (package "betareg", Cribari-Neto and Zeileis 2010), with a loglog link.

We used principal component analyses (PCA) to explore the relationship between the covariation among the SNP loci within each collection and genetic differentiation between HOR and NOR collections, and to determine if the degree of differentiation has changed with time. Since each SNP is represented by only two alleles, only one allele per SNP is necessary to fully describe the covariation among all SNPs. We used MATLAB® scripts (2007a, The Mathworks, Natlick, MA) to calculate the principal components from SNP allele frequencies using only the major allele (1-MAF) for each SNP. We defined the major allele as the allele with the higher mean frequency across all collections, regardless of its status within any individual collection. We conducted three PCA analyses using: (1) all adult samples, aggregated based on origin (HOR versus NOR) and spawn year (i.e., the year the adult fish were used as broodstock) (N = 1437, 22 collections), (2) same as #1, but with the addition of all juvenile samples (N = 2938, 37 collections), and (3) only those adults samples with available age information (Mike Hughes, WDFW, personal communication) aggregated based on origin, and spawn year or brood year (i.e., the year the fish were hatched) (N = 1313, 20 spawn-year or 25 brood-year collections).

Molecular differentiation between HOR and NOR adults within a year was calculated based on principal component scores using Euclidian distances. We calculated pair-wise Euclidian distances between HOR and NOR fish within a spawn year or brood year using the first three principal components, and standardized each distance by subtracting from it the mean Euclidian distance calculated across all pair-wise distances. We used Mahalanobis distances to calculate the variation among HOR and NOR collections (calculated separately), again using the first three principal components. Here, we calculated Mahalanobis distances as the Euclidian distances between each collection and the centroid of all collections (HOR and NOR combined), but the Euclidian distances are scaled based on the dispersion of collections around the centroid (i.e., the variance). Euclidian and Mahalanobis distances were calculated using MATLAB scripts.

Effective spawning population

To evaluate Q1 of Objective 3.3, we estimated N_e using the single-sample linkage disequilibrium methods implemented in the program LDNE (Waples and Do 2008). This method requires that you input the P_{crit} value, the minimum frequency at which alleles were included in the analysis, since results can be biased depending on this setting (Waples and Do 2010). SNP markers typically have only one or two alleles; if one of two alleles is excluded based on its frequency in the collection it essentially excludes the locus, reducing the overall dataset. Therefore, we used P_{crit} values ranging from 0.1 to 0.001 to evaluate whether trends in N_e changed given which loci were used. Confidence intervals were calculated using a jackknife procedure.

We calculated an estimate of N_e for all adult and juvenile collections individually. However, the intention of an integrated hatchery program such as the Wenatchee River steelhead hatchery program is that HOR and NOR fish are integrated and progress as a single population through intentional interbreeding in the hatchery and presumed natural interbreeding in the wild. Thus, we also combined annual HOR and NOR collections to calculate an overall N_e estimate as has been done in other genetic monitoring and evaluation analyses (e.g., Small et al. 2007, [Chinook salmon, *O. tshawytscha*]).

Estimates of N_e from linkage refer to the generations that produced the sample. To calculate the ratio of effective population size to census size (N_e/N), we obtained the number of fish spawned in the hatchery (1993 through 2006, i.e., those that produced the adipose fin clipped adults that returned to spawn in the Wenatchee River 1998 through 2010) and the estimated escapement of fish spawning naturally (HOR and NOR separately) for the same time period. Estimates of census population size in spawning tributaries was obtained by multiplying the fraction of redds counted within tributaries (Chad Herring ,WDFW, unpublished data) by the total Wenatchee River census population estimate (Andrew Murdoch, WDFW, unpublished data). To calculate N_e/N, we performed two analyses. First, for adults, we assumed a five year generation time for natural origin adults and a four year generation time for hatchery origin adults and divided the N_e estimate by the census population estimate from four or five years earlier. For juveniles, we assumed an age at outmigration of two years and divided the N_e estimates by the estimate of census population size for the appropriate tributary. Second, we used available adult age data to parse individuals into cohorts originating in brood years (rather than spawn years) and then used LDNE to estimate N_e from cohort collections. We performed both analyses to make full use of all available data; age data were not available for many adults, and because of variable survival and sampling not all cohorts had sufficient numbers of HOR and NOR adults. According to Luikart et al. (2010), estimates produced using linkage disequilibrium should be interpreted as something between effective population size (N_e) and the effective number of breeders (N_b). Using cohorts, the estimate produced by LDNE is clearly an estimate of N_b rather than N_e. In order to keep things simple, we have referred to all estimates as N_b.

Results and Discussion

Collections and samples received

From 1468 samples from HOR and NOR adult steelhead broodstock, 1437 produced sufficient genetic data for further analysis (Table 1). From 1542 samples from NOR juvenile steelhead from Wenatchee River tributaries and the Entiat River, 1501 produced sufficient genetic data for further analysis and were genetically identified as *O. mykiss* (Table 2). Samples genetically identified as *O. clarki* (2 samples from the Chiwawa River, 1 from the Entiat River) or *O. clarki*/*O. mykiss* hybrids (4 – lower Wenatchee River, 4 – Nason Creek, 4 – Chiwawa River, and 1 – Entiat River) were omitted from further analysis.

Evaluation of loci

Three loci showed deviations from HWE in 10 or more of 37 Wenatchee steelhead collections before correcting for multiple tests (AOmy016, AOmy051, AOmy252, Table A1) indicating possible scoring issues. These loci were omitted from further analysis. Nine of the remaining loci were monomorphic or nearly monomorphic in all collections (average MAF < 0.1, AOmy023, AOmy028, AOmy123, AOmy129, AOmy132, AOmy209, AOmy229, AOmy270, AOmy271, Table A1) contributing little or nothing to analytical power. These loci were also omitted from further analysis. No genetic data was available for collection 10FD due to poor PCR amplification at locus AOmy213 for the entire collection. AOmy213 had a relatively low MAF in most collections so rather than re-processing this collection at this locus or running different sets of loci for different tests, we omitted this locus from further analysis. Only six tests of deviation from HWE were significant after correcting for 4348 tests using false discovery rate. Two of these tests were in loci already omitted. The remaining four tests were spread among the remaining loci, indicating no more loci needed to be omitted from further analysis.

Objective 3.1, 3.2 – Allele frequencies and Genetic distances

Allele frequencies

Average MAF of SNP loci ranged from 0.00 to 0.60 in HOR adult collections and from 0.00 to 0.61 in NOR adult collections (Table A1). Observed heterozygosity ranged from 0.00 to 0.75 in HOR adult collections and from 0.01 to 0.67 in NOR adult collections. Juvenile collections produced similar ranges of MAF and Ho (Table A1). Average MAF and Ho of HOR adult collections appeared to be greater than those of natural origin collections. However, logistic regression analysis indicated there was no significant temporal trend in either diversity statistic (Figure 1). Similarly, there was no consistent temporal trend in MAF or Ho of juvenile collections (Figure 2). Both the Chiwawa River and Nason Creek, the two tributaries that currently still receive hatchery juvenile outplants, both appeared to have declining allele frequencies, but neither was statistically significant ($P > 0.90$). However, the power to detect significant trends was limited by the small sample sizes (n = 3 sample years).

Analysis of Molecular Variance

Analysis of molecular variance (AMOVA) of adult collections (i.e., temporal and origin structure) indicated most of the genetic variance was among individuals or among individuals within populations (99.04%). Most of the remaining variance was temporal variation within hatchery and natural origin groups (0.61%) with the remaining variation from origin (0.35%). AMOVA of juvenile collections (i.e., spatial structure) indicated most of the genetic variance was among individuals (98.44%) or among individuals within populations (0.94%). Most of the remaining variance existed among temporal collections within tributary collections (0.37%) with the smallest fraction as among tributary variance (0.24%). Thus, overall, there was more variability among years than among tributaries or origins, but no trend in the temporal variability.

Pair-wise F_{ST} *estimates*

HOR adults were genetically different that NOR adults as estimated by F_{ST} (full pair-wise table in Table A2, all pair-wise F_{ST} estimates with P-values ≤ 0.05 before correcting for multiple tests were significantly different from zero after correcting for multiple tests using false discovery rate). On average, HOR adult collections were as different from one another (mean F_{ST} = 0.011) as they were from NOR adult collections among years (mean F_{ST} = 0.009) or from NOR adult collections within years (mean F_{ST} = 0.010). Among year comparisons of NOR adult collections were, on average, nearly an order of magnitude lower (mean = 0.002). These patterns held whether spawn year or brood year (data not shown) was used to group individuals. Over time, within spawn year pair-wise F_{ST} estimates between HOR and NOR adults declined over time (β = -0.014, P = 0.0185; Figure 3), suggesting that the integration of hatchery and wild fish is slowly genetically homogenizing the groups. That relationship disappeared when adults were grouped by brood year (i.e., comparing fish produced the same year) and all brood years were used (β = -0.009, P = 0.615, data not shown). However, when the dataset was restricted to just those brood years when all typical (age at maturation frequency among all years > 0.10) age classes were present in the dataset (HOR = age 3, 4; NOR = age 4, 5, 6; brood years 1996-1998, 2004-2005) a non-significant (P = 0.278) negative relationship (β = -0.12) of F_{ST} and brood year was apparent. When the data were further restricted to just the years after the hatchery program changed to only collecting broodstock in the Wenatchee River (brood years 1998, 2004-2005), the slope was also negative (β = -0.09), but the relationship was not statistically significant (P = 0.962).

Within tributary among sample year pair-wise comparisons of juvenile collections were, on average, only very slightly smaller than comparisons among tributaries (0.005 vs. 0.006, respectively, Table 5, all pair-wise F_{ST} estimates with P-values ≤ 0.05 before correcting for multiple tests were significantly different from zero after correcting for multiple tests using false discovery rate). Nason Creek and Peshastin Creek on average showed higher among sample year F_{ST} estimates (0.010 and 0.007, respectively) than the Chiwawa or Entiat Rivers (0.004 and 0.002, respectively). The pair-wise comparison of the two collections of lower Wenatchee River smolts, presumably a mix of Chiwawa, Nason, Peshastin smolts and smolts from other spawning tributaries, was an order of magnitude smaller (F_{ST} = 0.0002), and not significantly different than zero (Table 5). There was no temporal trend in pair-wise comparisons of juvenile collections. However with, at most, four annual collections, detecting any temporal trend was unlikely. We also had no collections from years prior to 1998 (the first year of new hatchery program broodstock collecting protocols) with which to compare contemporary data, nor could we find any reports or papers containing pre-hatchery-program-change genetic comparisons among Wenatchee River tributary populations, making it impossible to determine whether or not changing the hatchery program has had any effect at all on population structure. However, these data will be useful for future studies.

Principal Components

Each principal component analysis (Figures 4, 5) indicated that the genetic structure among HOR collections differed from that among NOR collections, and that this difference has decreased with time. When adult fish were aggregated based on origin and spawn-year, there was a clear differentiation between HOR and NOR adult collections along PC 1, and a separation among HOR collections, differentiating the early spawn-years (1998 – 2003) from the later spawn-years (2004 – 2010) along PC 2 and PC 3, respectively (Figure 4). The pair-wise genetic distances between HOR and NOR collections from the same spawn year (i.e., the HOR and NOR fish used as broodstock within the same year) decreased from the largest distance in 1998 to small distances in 2009 and 2010, although the smallest distance occurred in 2004 (Figure 4, top right). That is, within hatchery broodstock, the genetic difference between HOR and NOR fish decreased, on average, from 1998 to 2010, and the decrease appeared to be a mutual convergence of NOR fish shifting right along PC 1 and HOR fish shifting downward along PC 2 and PC 3. This increasing similarity in adult fish mirrored that seen in within year pair-wise F_{ST} estimates between HOR and NOR adults which also declined over time (Figure 3).

Overall, there was considerably more genetic variation among the HOR collections than there was among the NOR collections with average Mahalanobis distances (distance between each collection and the overall centroid [0,0,0]) among the HOR and NOR collections being 4.2 and 1.5, respectively. Since each NOR collection was generally composed of 3-4 brood-years, while HOR collections rarely were composed of more than two brood-years, we attributed the lower year-to-year genetic variability of the NOR broodstock to the greater homogenizing effect of including four or more brood-years compared with only two brood years for the HOR broodstock.

Including the 15 juvenile collections, along with the 22 adult collections, did not materially alter the principal component structure (Figure 6), although the total genetic variation accounted for by the three principal components decreased from 44% using only the adults to 33% when juveniles were included. For the most-part, the juvenile fish appeared intermediate between HOR and NOR fish, but there was greater overlap in principal component scores (and therefore greater genetic similarity) of the juvenile and NOR collections, than of the juvenile and HOR collections. The average Euclidian distance between the juvenile and HOR collections was 0.49, compared to 0.23 between the juvenile and NOR collections, which was no different than 0.23 and 0.22 for the within juvenile and NOR collections, respectively.

By using the available adult age data, we were able to compare the genetic differentiation among the same set of fish when they are aggregated by origin (hatchery versus natural) and brood-year (year fish were hatched) with aggregates based on origin and spawn-year (year adult fish were spawned). A brood-year analysis compares within a year the genetic diversity generated from hatchery broodstock with that naturally produced in the spawning grounds. A spawn-year analysis compares the HOR and NOR genetic diversity that was mixed among cohorts of the parental generations. The same basic pattern of genetic structure that we have seen in spawn-year analyses (Figure 4, Figure 6, and the right side of Figure 5) also occurred in the brood-year analysis (left side of Figure 5). That is, from Figure 5 we saw (1) that HOR and NOR fish were differentiated from each other; (2) there was considerably more genetic variation (temporal variation) among the hatchery-origin collections than there was among the natural-origin collections (for brood-year, Mahalanobis distances = 5.18 and 0.75, respectively; for spawn-year, Mahalanobis distances = 4.25 and 1.25, respectively), and (3) that the genetic distances between HOR and NOR collections were lower in the more recent brood- and spawn-years, than in the earlier brood- and spawn-years (Figure 7; R^2 = 0.41 or 41%, $P < 0.05$). This indicated that the HOR and NOR fish used as broodstock in 2010 were more similar to each other than they were at the inception of the new hatchery program.

The relationship between genetic distance and brood-year was not the same as the relationship between genetic distance and spawn-year. For brood-year, although the slope was negative (i.e., trending downward or decreased differentiation with time) and the two most-recent brood years (2005-2006) showed relatively small HOR and NOR adult differentiation, the negative slope was not significantly different from zero and the regression accounted for only 7% of the variation. This was likely the result of insufficient sampling of certain age classes from many brood years (especially from NOR adults) due to two un-processed sample years (2005 and 2006).

Objective 3.3 – Effective spawning population

There was no difference in the temporal trends in estimates of N_b with P_{crit} set from 0.1 to 0.001 (Figure 8, data not shown for all collections), so we have reported only results with $P_{crit} = 0.001$, i.e., the full genetic dataset. Using either spawn-year or brood year, estimates of NOR adult N_b were higher and varied more than those of HOR adults (Figures 9, 10), concordant with the PCA analysis. Estimates for HOR adults ranged from 17 to 174 (by spawn year, mean = 65) or from 6 to 130 (by brood year, mean = 39). Estimates for NOR adults ranged from 36 to 982 (by spawn year, mean = 405) or from 59 to 2966 (by brood year, mean = 645). Many N_b estimates for NOR adults had confidence intervals extending to infinity on the upper bound. This reflected the difficulty in obtaining precise estimates of N_b for large populations (Waples and Do 2010).

Estimates of N_b for HOR steelhead dropped by approximately half from 1994, when broodstock were still collected at Wells Hatchery, to 1998, when the program used Wenatchee River trapped adults only, suggesting an effect of changing broodstock collection practices, which began in 1997 (Figures 8, 9). Since 1997, the hatchery population N_b remained at a relatively stable lower level (Figures 8, 9, and 10). There was no obvious change in N_b for NOR steelhead since 1993; the N_b estimate for 1993 was the largest, however the confidence interval overlapped estimates from many other years. The temporal trend in N_b estimates from combined collections mirrored those of the HOR collections alone, though estimates using combined collections were slightly larger (Figure 11).

As with N_b estimates, estimates of the ratio of N_b/N for NOR adults varied more than those of HOR adults (Figures 12, 13). However, using spawn year, i.e., mixtures of cohorts, the average N_b/N ratio for HOR adults was equal to that of NOR adults (mean $N_b/N = 0.26$), whereas when using brood year, the average N_b/N ratio for NOR adults was double that of HOR adults (NOR average =0.40, HOR average = 0.20). This is likely a consequence of the homogenizing effect of mixed cohorts. Estimates of N_b for HOR adults using spawn year were close to those estimated using brood year because of the lower diversity in age at maturation, whereas for NOR, grouping by brood year produces different estimates than when grouping by spawn year because of higher diversity in age at maturation. Regardless of which estimate was used, there was no temporal trend in N_b/N for either NOR or HOR adults.

Summary

On average, HOR adults had higher minor allele frequencies (MAF) than NOR adults, and both had similar MAF as juveniles collected in spawning tributaries and in the Entiat River. There was no temporal trend in allele frequencies or observed heterozygosity in adult or juvenile collections and allele frequencies in control populations were no different than those still receiving hatchery outplants suggesting that the hatchery program has had little effect on allele frequencies since 1998.

HOR adults were genetically quite different from NOR adults and juveniles based on pair-wise F_{ST} and principal components analysis (PCA), most likely because of the much smaller effective population size (N_b) in the hatchery population. Pair-wise F_{ST} estimates and genetic distances between HOR and NOR adults collected the same year declined over time suggesting that the interbreeding of HOR and NOR adults in the hatchery (and presumably in the wild) is slowly homogenizing Wenatchee River summer steelhead. Analyses using brood year (the year fish were hatched, determined using scale-based age estimates) were inconclusive because of limitations of the data.

On average, estimates of N_b were much lower and varied less for HOR adults than for NOR adults and juveniles. Estimates of N_b for HOR adults declined from the earliest brood years to a stable new low value after broodstock practices were changed in 1997. There was no indication that this had any effect on N_b in NOR adults and juveniles; N_b estimates for NOR adults and juveniles were, on average, higher and varied considerably over the time period covered by our dataset (1998 – 2010) and showed no temporal trend. Small N_b sizes increase the risk of loss of genetic diversity due to inbreeding and random effects (genetic drift). The N_b of the hatchery component of the population may be increased by spawning more families, using specific mating designs, and minimizing variance in reproductive success. However, given the apparent lack of effects overall, changes to the hatchery protocol may not be necessary.

Overall, hatchery practices appear to have had little effect on natural origin Wenatchee summer steelhead neutral genetic diversity or N_b. We cannot accurately assess their effects on population structure at this time. However, it is interesting to note that when juvenile collections are analyzed separately from adult collections, Peshastin Creek, which has received fewer hatchery outplants in the past and is currently a refuge from hatchery outplants, is genetically different than other tributaries and the Entiat River (data not shown). On the other hand, the Entiat River, which is also a refuge from hatchery outplants and is not a tributary of the Wenatchee River, is genetically very similar to Nason Creek and the Chiwawa River, both Wenatchee River tributaries. This suggests, though it does not conclude, that within basin population structure may have existed before summer steelhead hatchery production began in the upper Columbia River and that the population structure was eliminated by hatchery influence long before 1998.

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Figures

Figure 1. Observed average minor allele frequencies (MAF) and observed heterozygosities (Ho) of 119 SNP loci from 11 annual collections of hatchery-produced (HOR) and natural origin (NOR) adult steelhead from the Wenatchee River. Trend lines are from a logistic regression. Note the X axis does not cross the Y axis at the origin. Neither the slopes nor the intercepts were statistically significant.

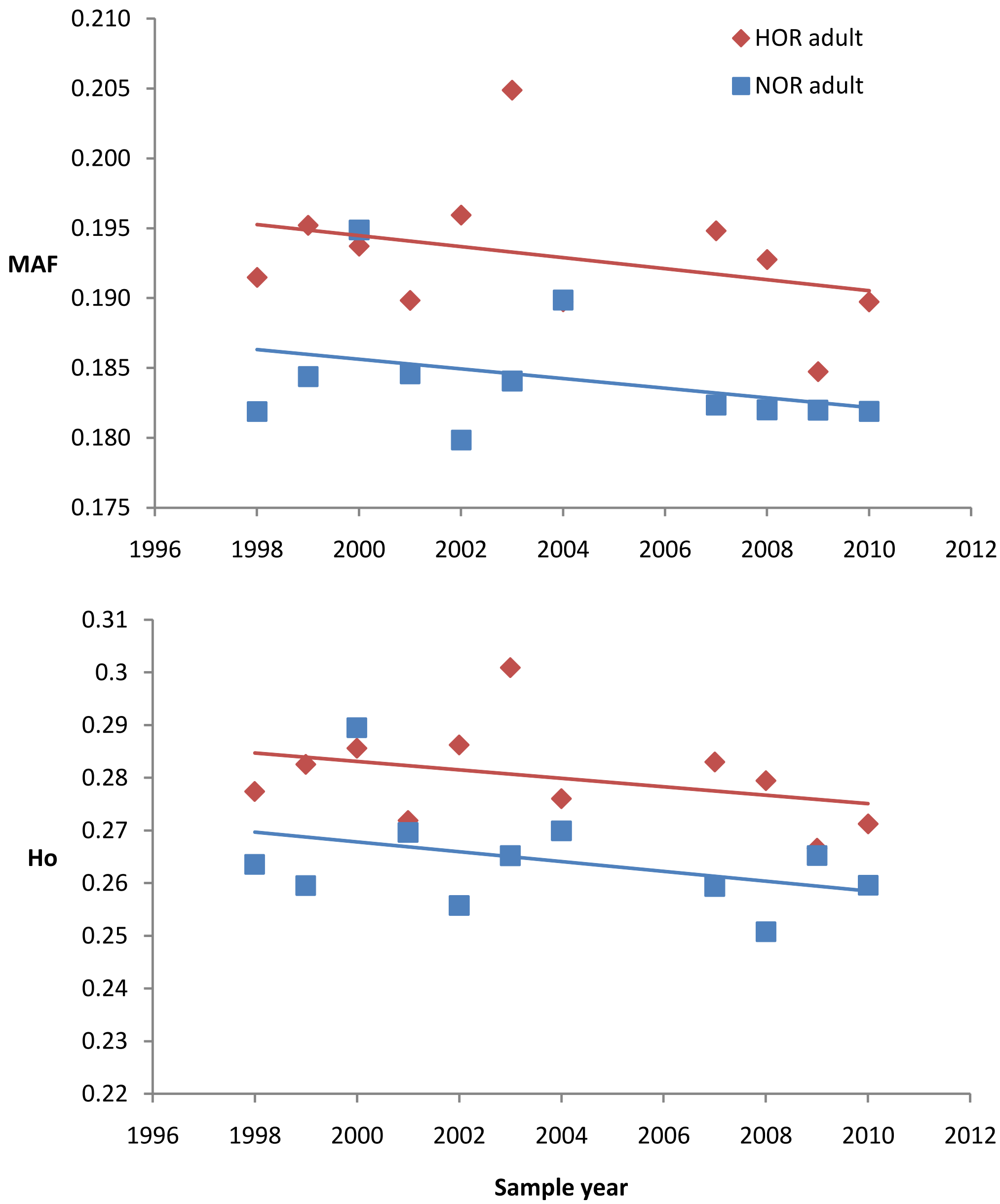
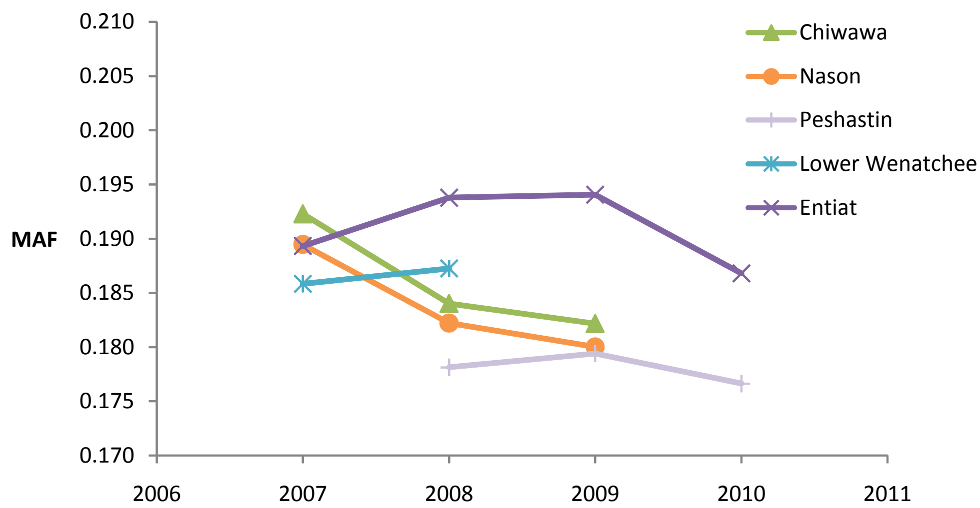


Figure 2. Observed average minor allele frequencies (MAF) and observed heterozygosities (Ho) of 119 SNP loci from 15 collections of natural origin juvenile steelhead from Wenatchee River tributaries, the lower Wenatchee River and the Entiat River. There were no consistent temporal trends in MAF or Ho in these collections.



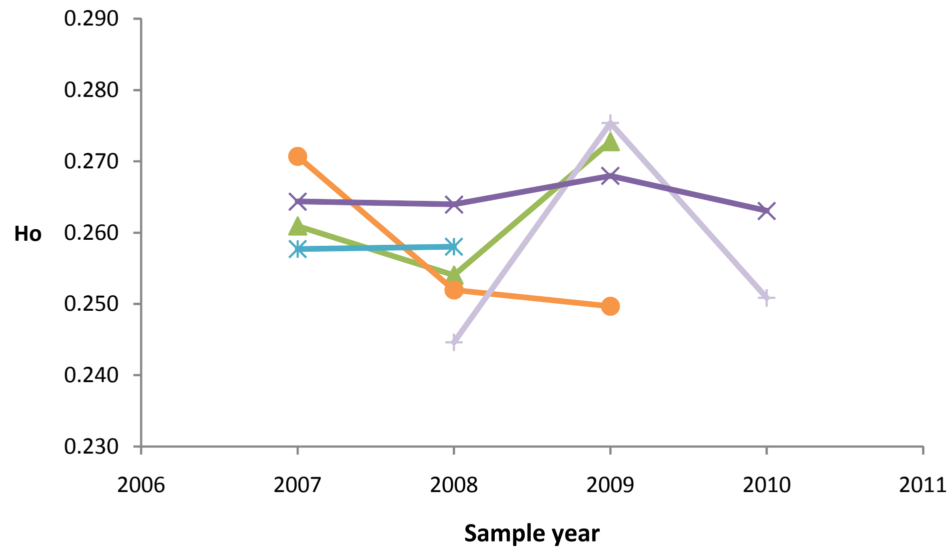


Figure 3. The relationship of time with pairwise F_{ST} estimates between hatchery-produced (adipose fin clipped) and natural origin (unclipped) adults of the same sample year. The line is the prediction based on beta regression.

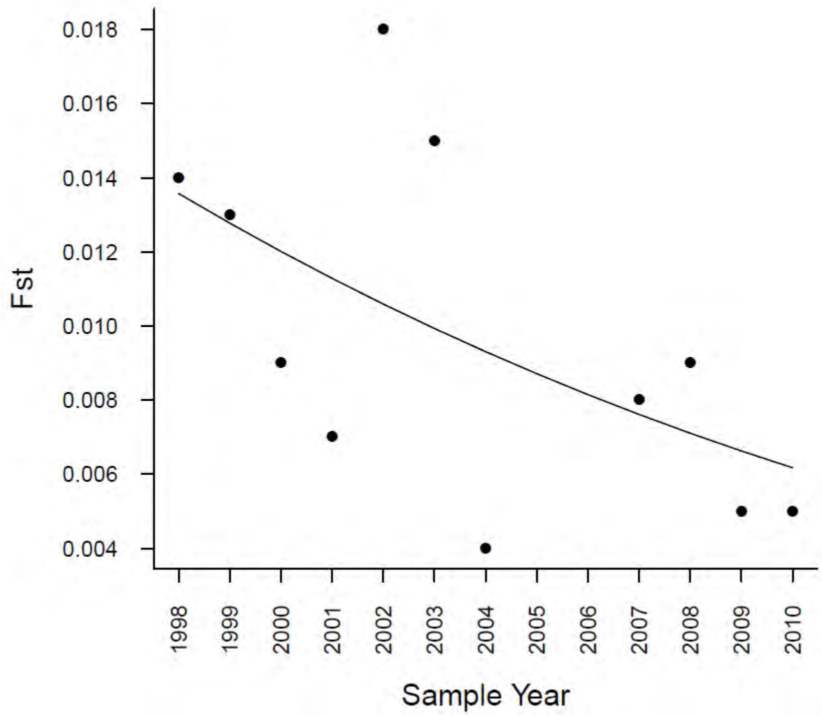


Figure 4. Principal component (PC) 1 versus 2 (top left), PC 1 versus 3 (bottom left), and PC 2 versus 3 (bottom right) based on an analysis using all adults aggregated into origin and spawn-year collections. Natural-origin spawn-years are shown in italicized typeface. The percentage within the label of each axis convey the percent of total genetic variance that is accounted for by that axis. Taken together, the three principal components account for 44% of the total SNP variation. Top right shows pairwise Euclidian distances versus spawn-year, with zero distance equal to average distance across all pairwise distances. Blue line is least-squares fit with $R^2 = 0.45$.

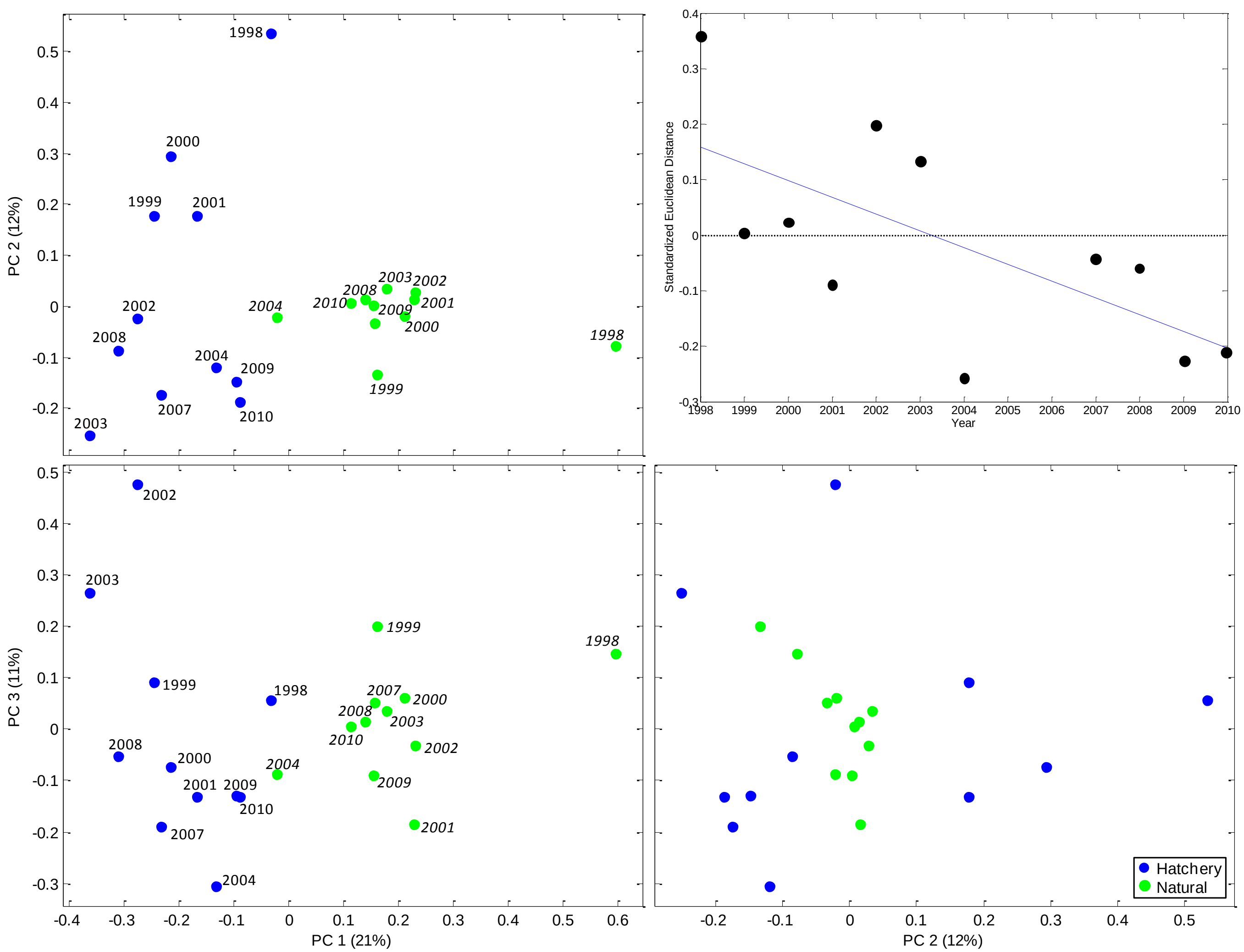


Figure 5. Principal components (PC) 1 versus 2 (top) and 3 (bottom) for adults aggregated into brood-year (BY; left) and spawn-year (SY; right). Spawn-year analysis is the same as in Figure x1, except fewer individuals per collection were included (see methods). Note that for the SY analysis here PC 2 and 3 are similar to PC 3 and 2, respectively, in Figure x1. Only BY1995 (earliest year with paired hatchery-natural data), BY2000 (extreme PC 1 score), and BY2006 (latest year with paired hatchery-natural data) are labeled. Hatchery- and natural-origin individuals from BY1995, BY2000, and BY2006, returned to spawn (spawn-year) in 1999 (hatchery)/1999-2001 (natural), 2003-2004 (hatchery)/2004 and 2007 (natural), and 2009-2010 (hatchery)/2010 (natural), respectively. These years are labeled in the upper right figure. Only 4 year-old BY 2006 natural-origin fish are represented in the SY 2010 collection.

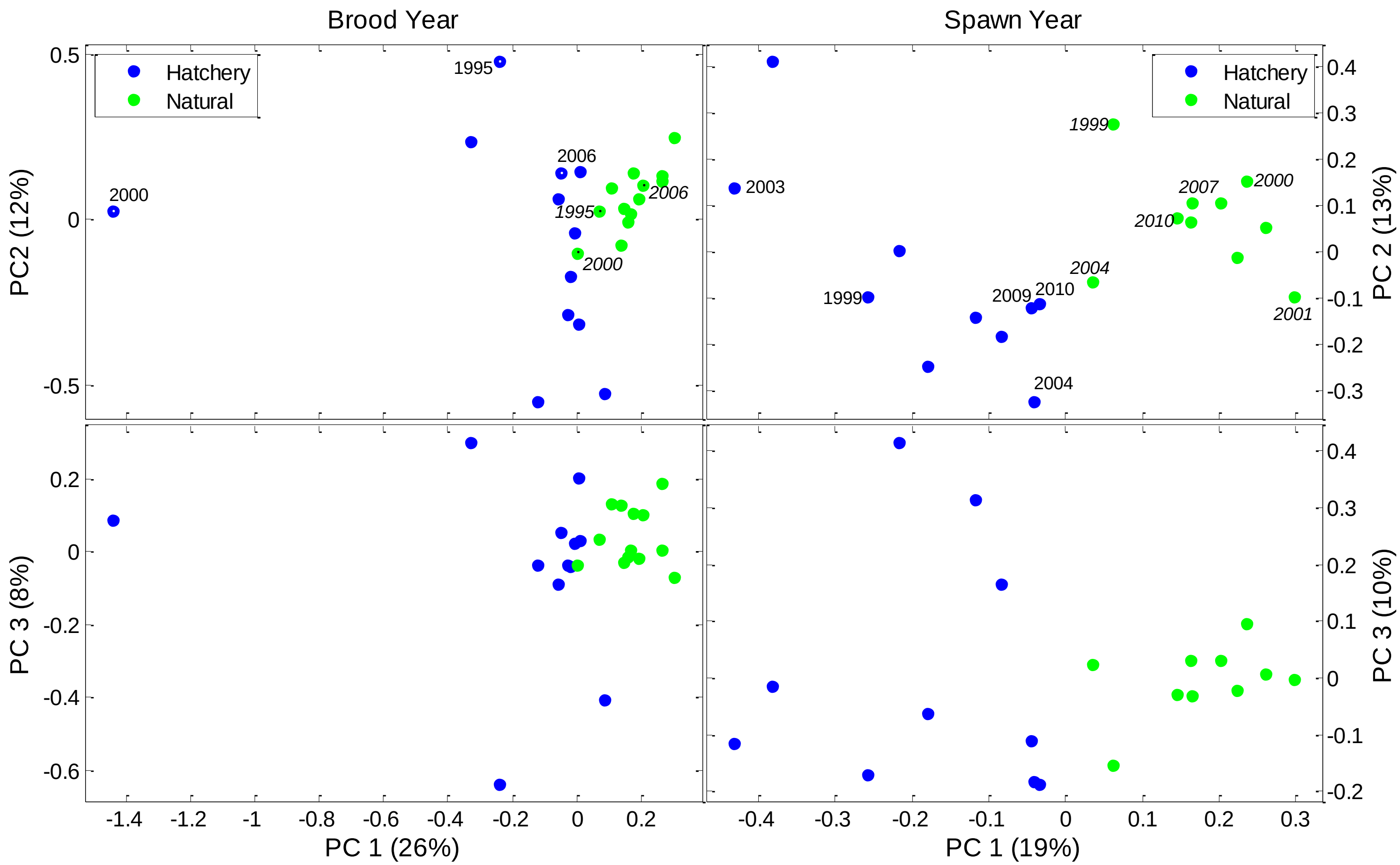


Figure 6. Principal component (PC) 1 versus 2 (top) and PC 1 versus 3 (bottom) based on an analysis using all adult and juvenile fish aggregated into age (juvenile versus adult), origin (hatchery versus adult) and spawn-year collections.

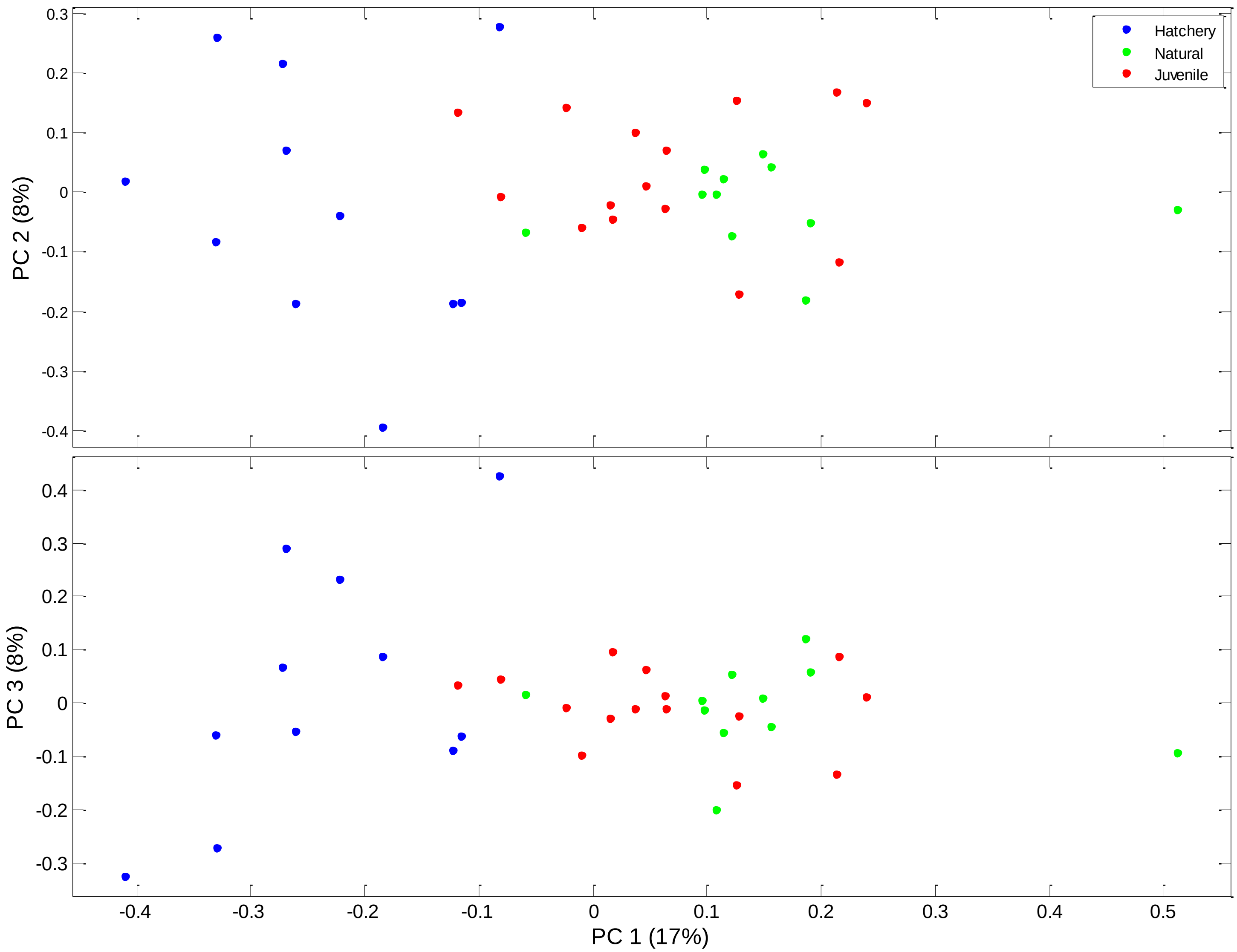


Figure 7. Pairwise Euclidian distances versus brood-year (top) and spawn-year (bottom), with zero distance equal to average distance across all pairwise distances. Blue lines are least-squares fits, which is not significant (slope = 0) for brood-year, but significant (slope > 0) for spawn-year.

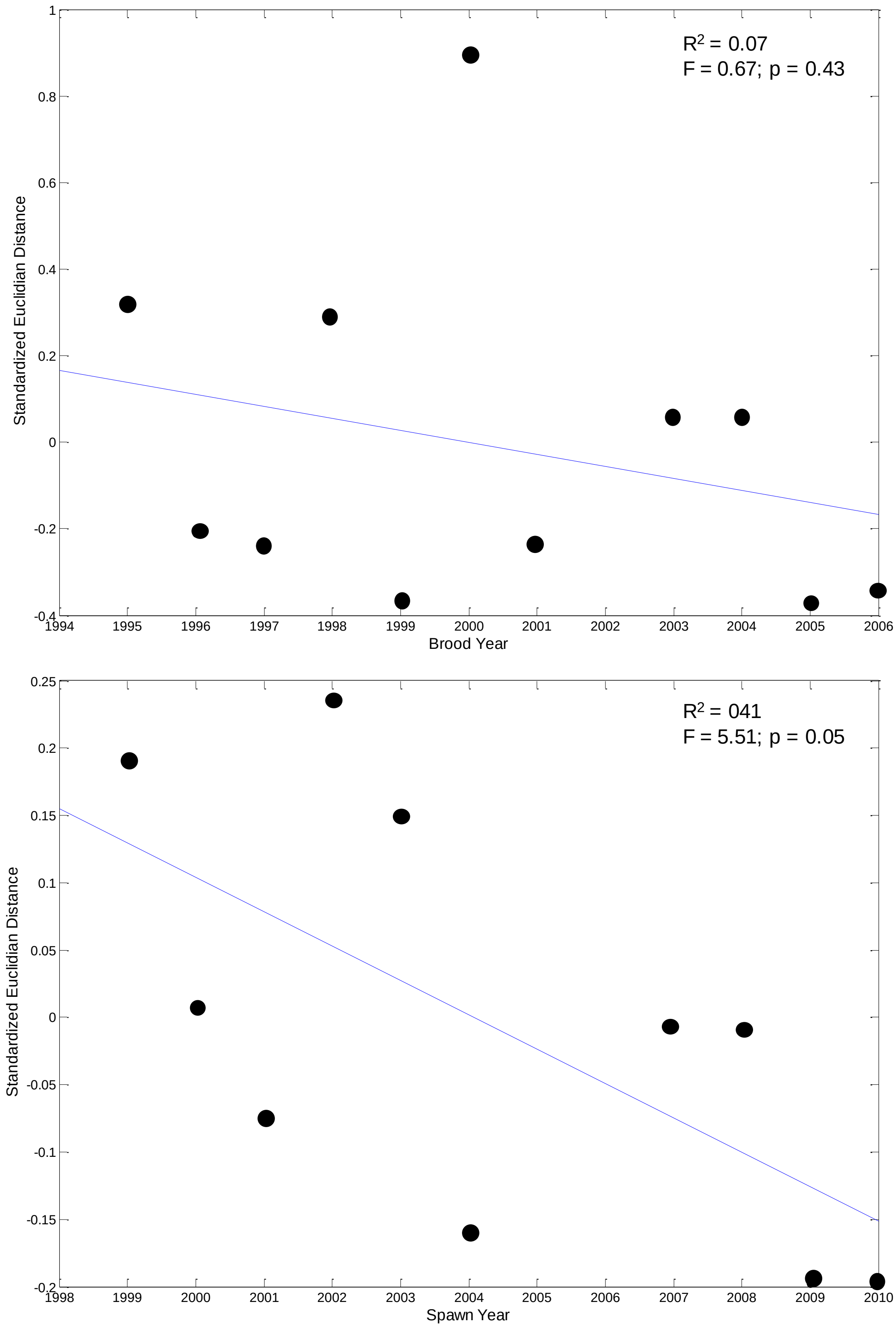


Figure 8. Effective population size estimates (N_b) from Wenatchee River adult hatchery-produced steelhead annual collections calculated using single sample methods implemented in the program LDNE (Waples and Do 2008). Each line connects annual estimates of N_b estimated with a different value of P_{crit}, the smallest allelic proportion allowed during analysis. With SNP data, omitting an allele omits the locus. Estimates of N_b changed very little when P_{crit} varied from 0.1 to 0.001. Setting P_{crit} = 0.001 forced the use of all available loci.

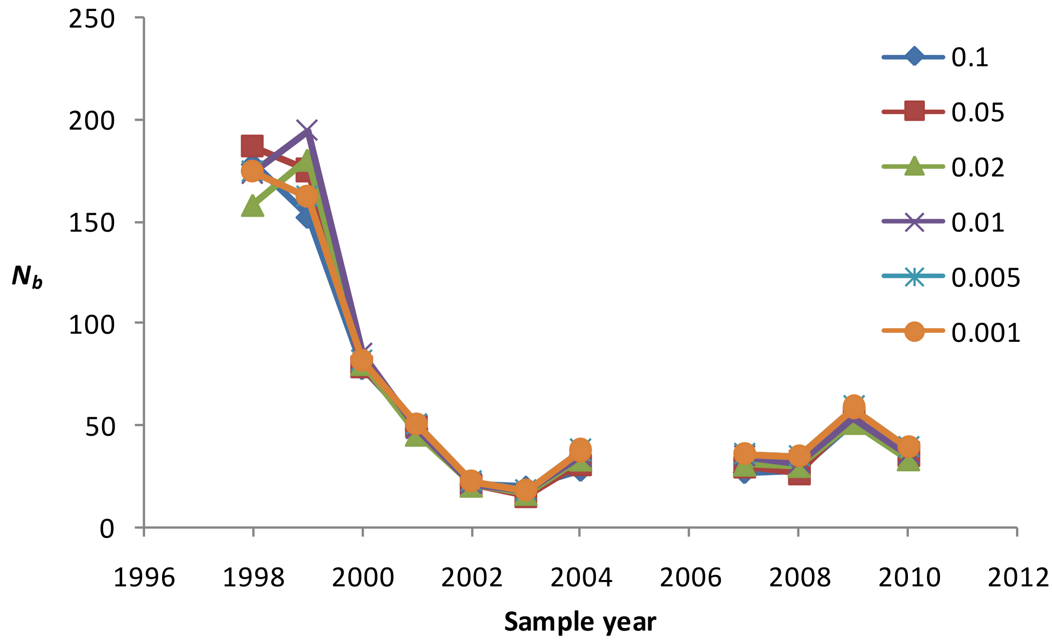


Figure 9. Estimates of Wenatchee River steelhead effective number of breeders (N_b) estimated using the single sample methods incorporated in the program LDNE (Waples and Do 2008). Estimates of N_b refer to parental (and even grantparental) generations. N_b data were plotted against their estimated parental brood year. We assumed a 5 year generation time for natural origin adults (NOR), a 4 year generation time for hatchery-produced adults (HOR) and an age of smolt outmigration of age 2 for smolt collections from Wenatchee River tributaries (Chiwawa River, Nason Creek, Peshastin Creek), the lower Wenatchee River, and the Entiat River. Bars represent the 95% confidence interval estimated by jackknife procedure. Bars that exceed the upper limit of the Y axis are labeled with the upper bound (Inf. = infinity).

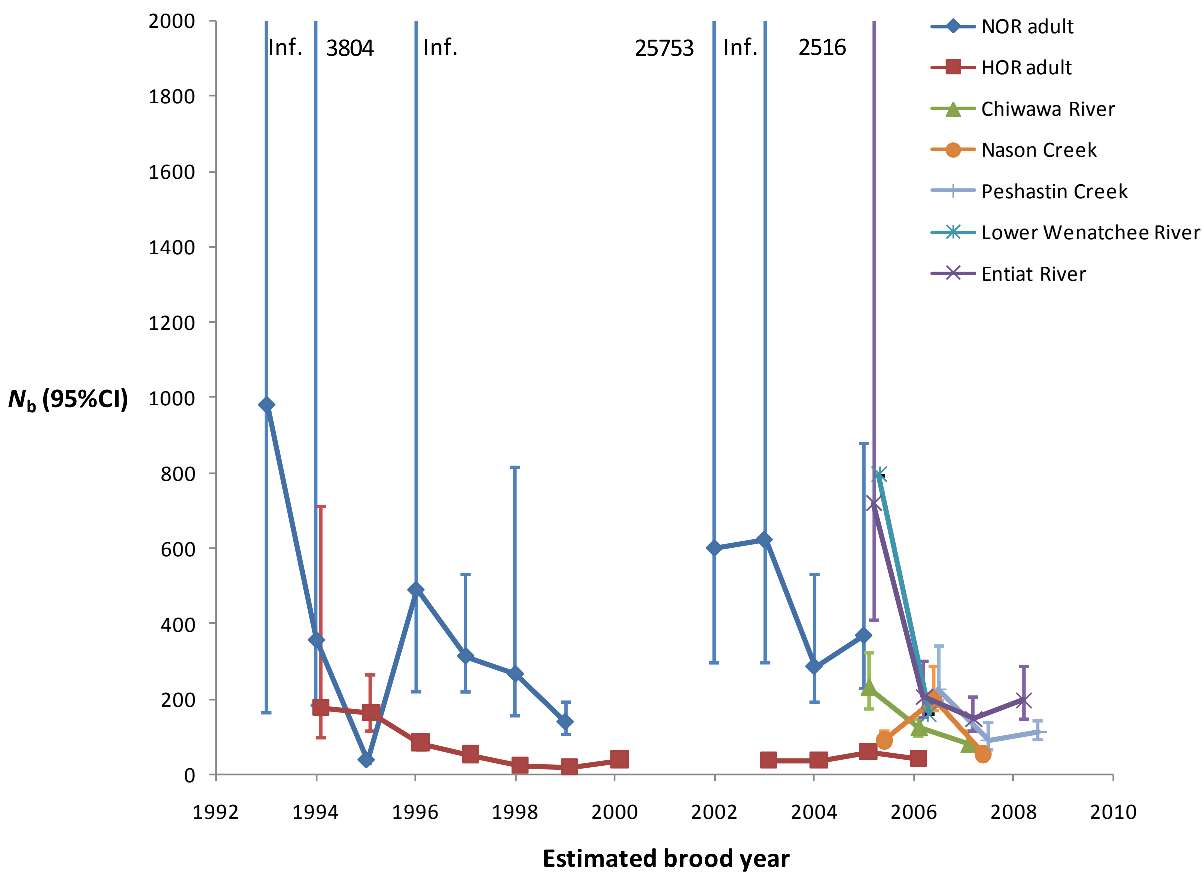


Figure 10. Estimates of N_b for collections of hatchery-produced (HOR) and natural origin (NOR) Wenatchee River summer steelhead grouped by brood year rather than spawn year. Brood year was estimated using scale-based age data. Error bars that extend past the top of the chart are all bounded by infinity.

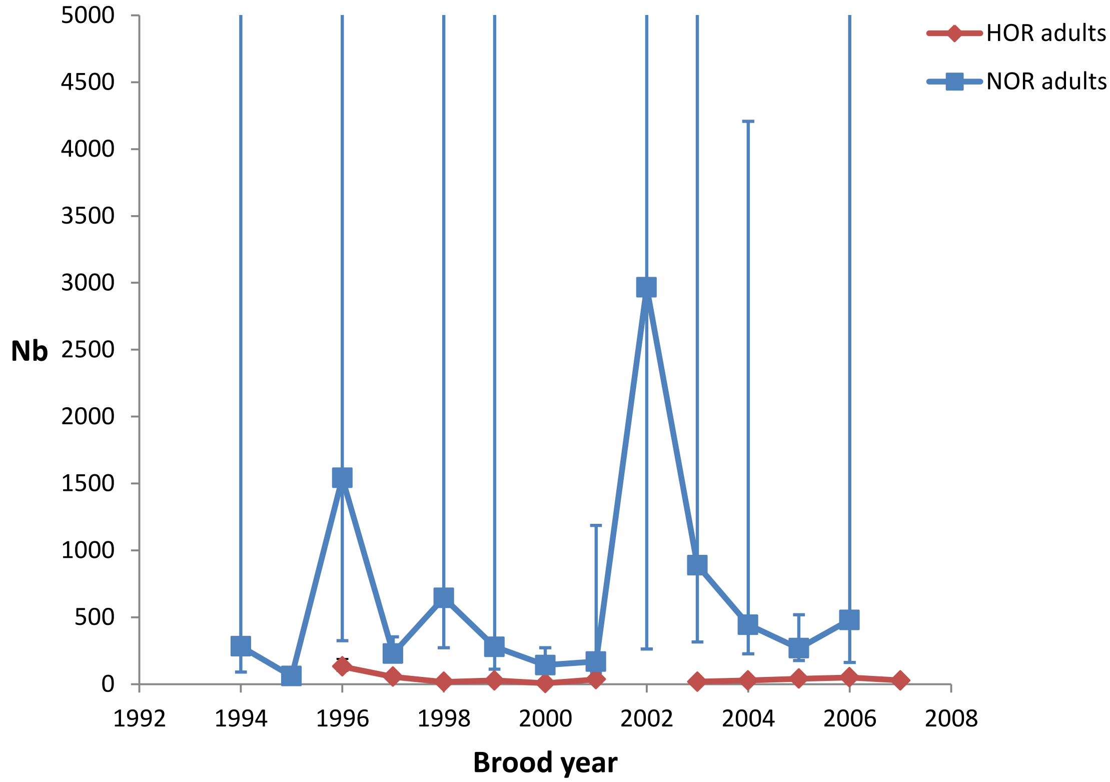


Figure 11. Estimates of N_b for combined annual adult hatchery-produced (HOR) and natural origin (NOR) steelhead and for HOR adults alone. The temporal patterns are similar, though estimates from combined collections are larger than those from HOR collections alone.

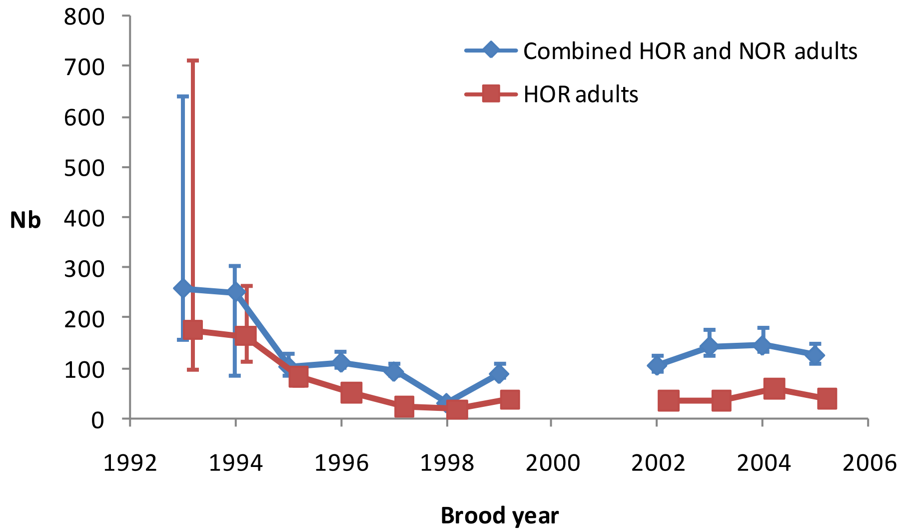


Figure 12. N_b/N ratios for hatchery-produced (HOR) and natural origin (NOR) adult Wenatchee River summer steelhead grouped by spawn year. The average N_b/N ratios are not different, though in later years NOR adults appear to have lower N_b/N ratios.

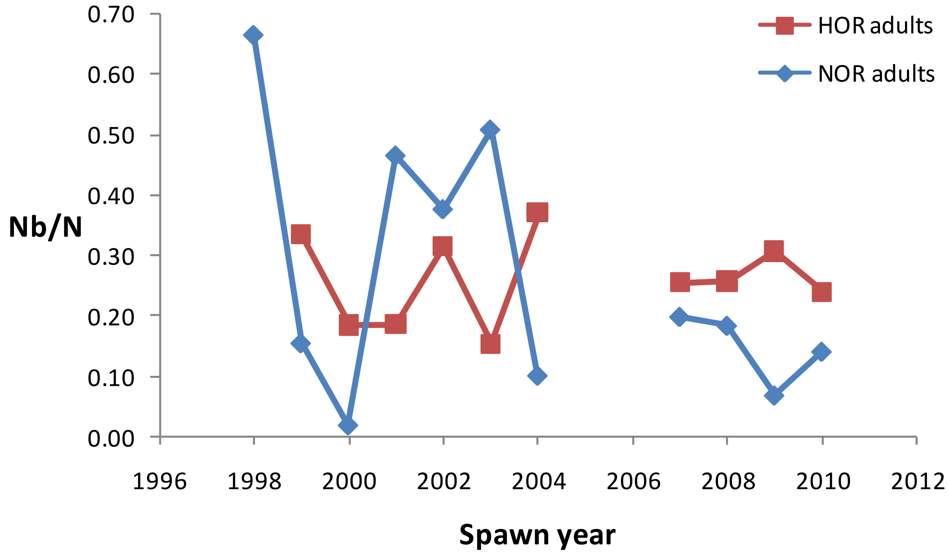
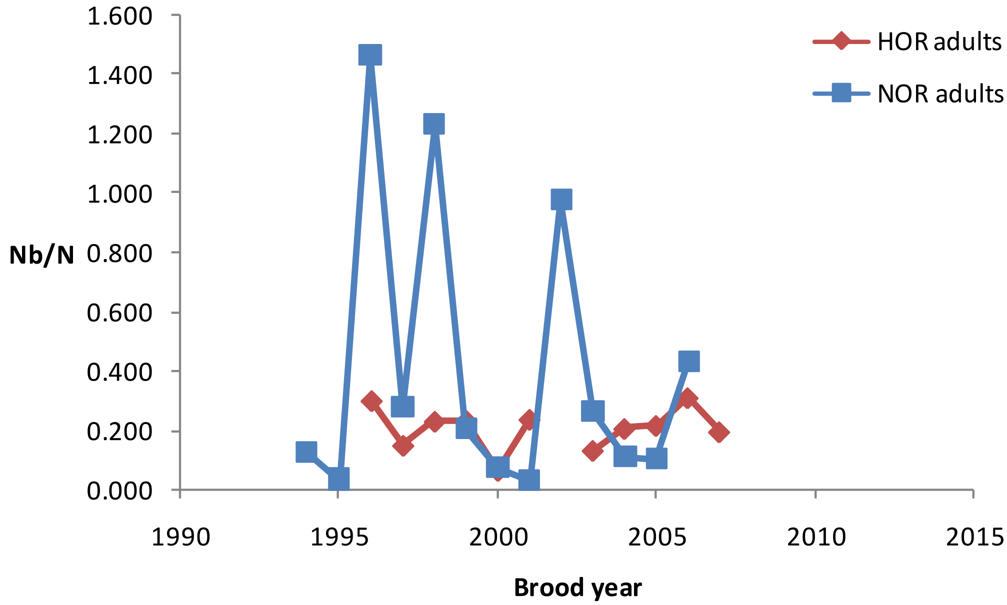


Figure 13. N_b/N ratios for hatchery-produced (HOR) and natural origin (NOR) adult Wenatchee River summer steelhead collections with individuals grouped in brood years rather than spawn years. Individual brood year was estimated using scale-based age data.



Tables

Table 1. Samples of adult steelhead collected for Wenatchee Program broodstock and used for genetic monitoring and evaluation.

Origin	Sampling Location	Year spawned	WDFW Collection code	Samples (N)	Unused Samples[a]
Hatchery	Dryden/Tumwater Dams	1998	98AE	32	4
		1999	98LJ	62	2
		2000	99NE	60	5
		2001	00DQ	99	1
		2002	01MS	64	
		2003	02NP	89	
		2004	03KW	61	
		2007	06CW	64	1
		2008	08AG	56	
		2009	09AV	74	
		2010	10FE	76	1
			Total	737	14
Natural	Dryden/Tumwater Dams	1998	98AF	30	5
		1999	99AA	51	1
		2000	99ND	33	3
		2001	00DP	50	
		2002	01MR	95	
		2003	02NO	50	
		2004	03KV	71	3
		2007	06CX	74	
		2008	08AF	74	1
		2009	09AU	82	2
		2010	10FD	90	2
			Total	700	17

[a]Samples were not used if they had incomplete (≤ 80% or 95 of 119 loci) or duplicate genotypes.

Table 2. Samples of natural origin juvenile steelhead and rainbow trout collected from four Wenatchee basin rivers or creeks and the Entiat River.

Sampling Location	Collection Year	WDFW Collection Code	Samples (N)	Unused samples[a]
Chiwawa River	2007	07AO	127	5
	2008	08CG	143	1
	2009	09NF	35	2
Entiat River	2007	07AL	134	4
	2008	08CI	82	4
	2009	09NC	74	1
	2010	10OX	82	1
Lower Wenatchee River	2007	07AM	139	5
	2008	08CE	98	2
Nason Creek	2007	07AN	81	4
	2008	08CF	133	6
	2009	09NG	103	2
Peshastin Creek	2008	08CH	142	2
	2009	09NE	34	1
	2010	10OY	94	1
		Total	1501	41

[a]Samples were not used if they were genetically identified as cutthroat trout or cutthroat/rainbow trout hybrids, or if they had incomplete (≤ 80% or 95 of 119 loci) or duplicate genotypes.

Table 3. List of 132 general use, diploid single nucleotide polymorphic (SNP) loci genotyped in Wenatchee River basin and Entiat River steelhead.

WDFW Name	Locus Name	Allele 1	Allele 2	Reference
AOmy005	Omy_aspAT-123	T	C	(Campbell et al. 2009)
AOmy014	Omy_e1-147	G	T	(Sprowles et al. 2006)
AOmy015	Omy_gdh-271	C	T	(Campbell et al. 2009)
AOmy016	Omy_GH1P1_2	C	T	(Aguilar and Garza 2008)
AOmy021	Omy_LDHB-2_e5	T	C	(Aguilar and Garza 2008)
AOmy023	Omy_MYC_2	T	C	(Aguilar and Garza 2008)
AOmy027	Omy_nkef-241	C	A	(Campbell et al. 2009)
AOmy028	Omy_nramp-146	G	A	(Campbell et al. 2009)
AOmy047	Omy_u07-79-166	G	T	WDFW - S. Young unpubl.
AOmy051	Omy_121713-115	T	A	(Abadía-Cardoso et al. 2011)
AOmy056	Omy_128693-455	T	C	(Abadía-Cardoso et al. 2011)
AOmy059	Omy_187760-385	A	T	(Abadía-Cardoso et al. 2011)
AOmy061	Omy_96222-125	T	C	(Abadía-Cardoso et al. 2011)
AOmy062	Omy_97077-73	T	A	(Abadía-Cardoso et al. 2011)
AOmy063	Omy_97660-230	C	G	(Abadía-Cardoso et al. 2011)
AOmy065	Omy_97954-618	C	T	(Abadía-Cardoso et al. 2011)
AOmy067	Omy_aromat-280	A	T	WSU - J. DeKoning unpubl.
AOmy068	Omy_arp-630	G	A	(Campbell et al. 2009)
AOmy071	Omy_cd59-206	C	T	WSU - J. DeKoning unpubl.
AOmy073	Omy_colla1-525	C	T	WSU - J. DeKoning unpubl.
AOmy079	Omy_g12-82	T	C	WSU - J. DeKoning unpubl.
AOmy081	Omy_gh-475	C	T	(Campbell et al. 2009)
AOmy082	Omy_gsdf-291	T	C	WSU - J. DeKoning unpubl.
AOmy089	Omy_hsp90BA-193	C	T	(Campbell and Narum 2009)
AOmy094	Omy_inos-97	C	A	WSU - J. DeKoning unpubl.
AOmy095	Omy_mapK3-103	A	T	CRITFC - N. Campbell unpubl.
AOmy096	Omy_mcsf-268	T	C	WSU - J. DeKoning unpubl.
AOmy100	Omy_nach-200	A	T	WSU - J. DeKoning unpubl.

AOmy107	Omy_Ots249-227	C	T	(Campbell et al. 2009)
AOmy108	Omy_oxct-85	A	T	WSU - J. DeKoning unpubl.
AOmy110	Omy_star-206	A	G	WSU - J. DeKoning unpubl.
AOmy111	Omy_stat3-273	G	Deletion	WSU - J. DeKoning unpubl.
AOmy113	Omy_tlr3-377	C	T	WSU - J. DeKoning unpubl.
AOmy117	Omy_u09-52-284	T	G	WDFW - S. Young unpubl.
AOmy118	Omy_u09-53-469	T	C	WDFW - S. Young unpubl.
AOmy120	Omy_u09-54.311	C	T	WDFW - S. Young unpubl.
AOmy123	Omy_u09-55-233	A	G	WDFW - S. Young unpubl.
AOmy125	Omy_u09-56-119	T	C	WDFW - S. Young unpubl.
AOmy129	Omy_BAMBI4.238	T	C	WDFW - S. Young unpubl.
AOmy132	Omy_G3PD_2.246	C	T	WDFW - S. Young unpubl.
AOmy134	Omy_Il-1b-028	T	C	WDFW - S. Young unpubl.
AOmy137	Omy_u09-61.043	A	T	WDFW - S. Young unpubl.
AOmy151	Omy_p53-262	T	A	CRITFC - N. Campbell unpubl.
AOmy173	BH2VHSVip10	C	T	Pascal & Hansen unpubl.
AOmy174	OMS00003	T	G	(Sánchez et al. 2009)
AOmy176	OMS00013	A	G	(Sánchez et al. 2009)
AOmy177	OMS00018	T	G	(Sánchez et al. 2009)
AOmy179	OMS00041	G	C	(Sánchez et al. 2009)
AOmy181	OMS00052	T	G	(Sánchez et al. 2009)
AOmy182	OMS00053	T	C	(Sánchez et al. 2009)
AOmy183	OMS00056	T	C	(Sánchez et al. 2009)
AOmy184	OMS00057	T	G	(Sánchez et al. 2009)
AOmy185	OMS00061	T	C	(Sánchez et al. 2009)
AOmy186	OMS00062	T	C	(Sánchez et al. 2009)
AOmy187	OMS00064	T	G	(Sánchez et al. 2009)
AOmy189	OMS00071	A	G	(Sánchez et al. 2009)
AOmy190	OMS00072	A	G	(Sánchez et al. 2009)
AOmy191	OMS00078	T	C	(Sánchez et al. 2009)
AOmy192	OMS00087	A	G	(Sánchez et al. 2009)

AOmy193	OMS00089	A	G	(Sánchez et al. 2009)
AOmy194	OMS00090	T	C	(Sánchez et al. 2009)
AOmy195	OMS00092	A	C	(Sánchez et al. 2009)
AOmy196	OMS00094	T	G	(Sánchez et al. 2009)
AOmy197	OMS00103	A	T	(Sánchez et al. 2009)
AOmy198	OMS00105	T	G	(Sánchez et al. 2009)
AOmy199	OMS00112	A	T	(Sánchez et al. 2009)
AOmy200	OMS00116	T	A	(Sánchez et al. 2009)
AOmy201	OMS00118	T	G	(Sánchez et al. 2009)
AOmy202	OMS00119	A	T	(Sánchez et al. 2009)
AOmy203	OMS00120	A	G	(Sánchez et al. 2009)
AOmy204	OMS00121	T	C	(Sánchez et al. 2009)
AOmy205	OMS00127	T	G	(Sánchez et al. 2009)
AOmy206	OMS00128	T	G	(Sánchez et al. 2009)
AOmy207	OMS00132	A	T	(Sánchez et al. 2009)
AOmy208	OMS00133	A	G	(Sánchez et al. 2009)
AOmy209	OMS00134	A	G	(Sánchez et al. 2009)
AOmy210	OMS00153	T	G	(Sánchez et al. 2009)
AOmy211	OMS00154	A	T	(Sánchez et al. 2009)
AOmy212	OMS00156	A	T	(Sánchez et al. 2009)
AOmy213	OMS00164	T	G	(Sánchez et al. 2009)
AOmy215	OMS00175	T	C	(Sánchez et al. 2009)
AOmy216	OMS00176	T	G	(Sánchez et al. 2009)
AOmy218	OMS00180	T	G	(Sánchez et al. 2009)
AOmy220	Omy_1004	A	T	(Hansen et al. 2011)
AOmy221	Omy_101554-306	T	C	(Abadía-Cardoso et al. 2011)
AOmy222	Omy_101832-195	A	C	(Abadía-Cardoso et al. 2011)
AOmy223	Omy_101993-189	A	T	(Abadía-Cardoso et al. 2011)
AOmy225	Omy_102505-102	A	G	(Abadía-Cardoso et al. 2011)
AOmy226	Omy_102867-443	T	G	(Abadía-Cardoso et al. 2011)
AOmy227	Omy_103705-558	T	C	(Abadía-Cardoso et al. 2011)

AOmy228	Omy_104519-624	T	C	(Abadía-Cardoso et al. 2011)
AOmy229	Omy_104569-114	A	C	(Abadía-Cardoso et al. 2011)
AOmy230	Omy_105075-162	T	G	(Abadía-Cardoso et al. 2011)
AOmy231	Omy_105385-406	T	C	(Abadía-Cardoso et al. 2011)
AOmy232	Omy_105714-265	C	T	(Abadía-Cardoso et al. 2011)
AOmy233	Omy_107031-704	C	T	(Abadía-Cardoso et al. 2011)
AOmy234	Omy_107285-69	C	G	(Abadía-Cardoso et al. 2011)
AOmy235	Omy_107336-170	C	G	(Abadía-Cardoso et al. 2011)
AOmy238	Omy_108007-193	A	G	(Abadía-Cardoso et al. 2011)
AOmy239	Omy_109243-222	A	C	(Abadía-Cardoso et al. 2011)
AOmy240	Omy_109525-403	A	G	(Abadía-Cardoso et al. 2011)
AOmy241	Omy_110064-419	T	G	(Abadía-Cardoso et al. 2011)
AOmy242	Omy_110078-294	A	G	(Abadía-Cardoso et al. 2011)
AOmy243	Omy_110362-585	G	A	(Abadía-Cardoso et al. 2011)
AOmy244	Omy_110689-148	A	C	(Abadía-Cardoso et al. 2011)
AOmy245	Omy_111005-159	C	T	(Abadía-Cardoso et al. 2011)
AOmy246	Omy_111084-526	A	C	(Abadía-Cardoso et al. 2011)
AOmy247	Omy_111383-51	C	T	(Abadía-Cardoso et al. 2011)
AOmy248	Omy_111666-301	T	A	(Abadía-Cardoso et al. 2011)
AOmy249	Omy_112301-202	T	G	(Abadía-Cardoso et al. 2011)
AOmy250	Omy_112820-82	G	A	(Abadía-Cardoso et al. 2011)
AOmy252	Omy_114976-223	T	G	(Abadía-Cardoso et al. 2011)
AOmy253	Omy_116733-349	C	T	(Abadía-Cardoso et al. 2011)
AOmy254	Omy_116938-264	A	G	(Abadía-Cardoso et al. 2011)
AOmy255	Omy_117259-96	T	C	(Abadía-Cardoso et al. 2011)
AOmy256	Omy_117286-374	A	T	(Abadía-Cardoso et al. 2011)
AOmy257	Omy_117370-400	A	G	(Abadía-Cardoso et al. 2011)
AOmy258	Omy_117540-259	T	G	(Abadía-Cardoso et al. 2011)
AOmy260	Omy_117815-81	C	T	(Abadía-Cardoso et al. 2011)
AOmy261	Omy_118175-396	T	A	(Abadía-Cardoso et al. 2011)
AOmy262	Omy_118205-116	A	G	(Abadía-Cardoso et al. 2011)

AOmy263	Omy_118654-91	A	G	(Abadía-Cardoso et al. 2011)
AOmy265	Omy_120255-332	A	T	(Abadía-Cardoso et al. 2011)
AOmy266	Omy_128996-481	T	G	(Abadía-Cardoso et al. 2011)
AOmy267	Omy_129870-756	C	T	(Abadía-Cardoso et al. 2011)
AOmy268	Omy_131460-646	C	T	(Abadía-Cardoso et al. 2011)
AOmy269	Omy_98683-165	A	C	(Abadía-Cardoso et al. 2011)
AOmy270	Omy_cyp17-153	C	T	WSU - J. DeKoning unpubl.
AOmy271	Omy_ftzf1-217	A	T	WSU - J. DeKoning unpubl.
AOmy272	Omy_GHSR-121	T	C	CRITFC - N. Campbell unpubl.
AOmy273	Omy_metA-161	T	G	CRITFC - N. Campbell unpubl.
AOmy274	Omy_UBA3b	A	T	(Hansen et al. 2011)

Primer and probe sequences for unpublished loci available by request.

Table 4. List of 20 species identification single nucleotide polymorphic (SNP) loci genotyped in Wenatchee River basin and Entiat River steelhead.

		Expected genotype			
WDFW Name	Locus Name	*O. mykiss*	*O. clarkii clarkii*	*O. clarkii lewisi*	Reference
ASpI001	Ocl_Okerca	T	C	C	(McGlauflin et al. 2010)
ASpI002	Ocl_Oku202	A	C	C	(McGlauflin et al. 2010)
ASpI003	Ocl_Oku211	G	T	T	(McGlauflin et al. 2010)
ASpI004	Ocl_Oku216	C	C	A	(McGlauflin et al. 2010)
ASpI005	Ocl_Oku217	C	C	A	(McGlauflin et al. 2010)
ASpI006	Ocl_SsaHM5	A	A	G	(McGlauflin et al. 2010)
ASpI007	Ocl_u800	T	C	C	(McGlauflin et al. 2010)
ASpI008	Ocl_u801	A	T	T	(McGlauflin et al. 2010)
ASpI009	Ocl_u802	C	C	T	(McGlauflin et al. 2010)
ASpI010	Ocl_u803	C	T	T	(McGlauflin et al. 2010)
ASpI011	Ocl_u804	G	G	C	(McGlauflin et al. 2010)
ASpI012	Omy_B9_228	A	A	C	(Finger et al. 2009)
ASpI013	Omy_CTDL1_243	C	A	A	(Finger et al. 2009)
ASpI014	Omy_F5_136	C	G	G	(Finger et al. 2009)
ASpI016	Omy_myclarp404-111	T	G	G	CRITFC - S. Narum - unpubl.
ASpI017	Omy_myclgh1043-156	C	T	T	CRITFC - S. Narum - unpubl.
ASpI018	Omy_Omyclmk436-96	A	C	C	CRITFC - S. Narum - unpubl.
ASpI019	Omy_RAG11_280	T	A	A	(Sprowles et al. 2006)
ASpI020	Omy_URO_302	T	C	C	(Finger et al. 2009)
ASpI021	Omy_BAC-F5.238	C	G	G	WDFW - S. Young unpubl.

Primer and probe sequences for unpublished loci available by request.

Table 5. Pairwise F_{ST} estimates for collections from Wenatchee River tributaries and the Entiat River (below diagonal) and associated bootstrap estimated *P*-values (above diagonal).

		Chiwawa River			Nason Creek			Peshastin Creek			Lower Wenatchee River		Entiat River			
Population	Year	2007	2008	2009	2007	2008	2009	2008	2009	2010	2007	2008	2007	2008	2009	2010
Chiwawa	2007		**0.000**	**0.003**	**0.000**	**0.000**	**0.000**	**0.000**	**0.002**	**0.000**	**0.001**	**0.001**	**0.000**	**0.001**	**0.000**	**0.000**
River	2008	0.004		**0.004**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
	2009	0.004	0.003		**0.000**	**0.001**	0.061	**0.000**	**0.001**	**0.000**	0.086	**0.050**	**0.022**	0.108	**0.005**	**0.045**
Nason	2007	0.011	0.010	0.007		**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Creek	2008	0.007	0.007	0.005	0.009		**0.003**	**0.000**	**0.002**	**0.000**	0.079	**0.000**	**0.001**	**0.000**	**0.000**	**0.000**
	2009	0.007	0.007	0.003	0.014	0.006		**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Peshastin	2008	0.010	0.011	0.008	0.013	0.010	0.013		**0.001**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Creek	2009	0.005	0.005	0.006	0.010	0.007	0.008	0.003		**0.002**	**0.002**	**0.047**	**0.028**	**0.004**	**0.005**	**0.001**
	2010	0.010	0.011	0.008	0.015	0.008	0.011	0.003	0.003		**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Lower Wenatchee	2007	0.003	0.003	0.000	0.005	0.008	0.007	0.009	0.010	0.008		0.112	**0.020**	**0.012**	**0.002**	**0.017**
River	2008	0.002	0.005	0.002	0.003	0.004	0.005	0.007	0.009	0.006	0.000		**0.049**	0.459	**0.047**	**0.002**
Entiat	2007	0.005	0.006	0.002	0.005	0.006	0.005	0.005	0.007	0.006	0.001	0.002		0.451	0.173	**0.000**
River	2008	0.004	0.004	0.000	0.007	0.005	0.007	0.008	0.009	0.011	0.002	0.001	0.000		0.644	**0.002**
	2009	0.005	0.006	0.002	0.003	-0.001	0.003	0.002	0.003	0.004	0.003	0.002	0.002	0.000		**0.028**
	2010	0.005	0.006	0.003	0.006	0.004	0.006	0.006	0.008	0.009	0.002	0.003	0.003	0.003	0.002	

P-values in bold were significant at α = 0.05 after correcting for multiple tests using false discovery rate.

Appendix F

NPDES Hatchery Effluent Monitoring, 2013

NPDES MONITORING FOR WDFW FACILITIES

All WDFW hatcheries monitor their discharge in accordance with the National Pollutant Discharge Elimination System (NPDES) permit. This permit is administered in Washington by the Washington Department of Ecology under agreement with the United States Environmental Protection Agency. The permit was renewed effective 1 August 2010 and will expire 1 August 2015.

Facilities are exempted from sampling during any month in which pounds of fish on hand fall below 20,000 lbs and pounds of feed used fall below 5,000 lbs, with the exception of offline settling basin discharges, which are to be monitored once per month when ponds are in use and discharging to receiving waters.

Sampling at permitted facilities includes the following parameters:

<FLOW	Measured in millions of gallons per day (MGD) discharge.
<SS EFF	Average net settleable solids in the hatchery effluent, measured in ml/L.
<TSS COMP	Average net total suspended solids, composite sample (6x/day) of the hatchery effluent, measured in mg/L.
<TSS MAX	Maximum daily net total suspended solids, composite sample (6x/day) of the hatchery effluent, measured in mg/L.
<SS PA	Maximum settleable solids discharge from the pollution abatement pond, measured in ml/L.
<SS %	Removal of settleable solids within the pollution abatement pond from inlet to outlet, measured as a percent. No longer required under permit effective 1 June 2000.
<TSS PA	Maximum total suspended solids effluent grab from the pollution abatement pond discharge, measured in mg/L.
<TSS %	Removal of suspended solids within the pollution abatement pond from inlet to outlet, measured as a percent. No longer required under permit effective 1 June 2000.
<SS DD	Settleable solids discharged during drawdown for fish release. One sample per pond drawdown, measured in ml/L.
<TRC	Total residual chlorine discharge after rearing vessel disinfection and after neutralization with sodium thiosulfate. One sample per disinfection, measured in ug/L.

In addition, at Similkameen Hatchery only, the following sampling was conducted at the request of Ecology, but is not required under NPDES permit:

<SS IW	Settleable solids influent grab taken as wastes are pumped into the pollution abatement pond, measured in mg/L. No longer monitored as of January 2008.
<TSS IW	Total suspended solids influent grab as wastes are pumped into the pollution abatement pond, measured in mg/L. No longer monitored as of January 2008.

Eastbank Hatchery
NPDES Permit Number WAG13-5011

		FLOW	SS EFF	TSS COMP	TSS MAX	FLOW PA	SS PA	SS %	TSS PA	TSS %	lbs of Fish	lbs of Feed
2013	JAN	29.08	0	0	0	7,500	0.01		21.6		51,662	8,985
	FEB	28.43	0	0.2	0.4	10,000	0.01		41.8		76,438	22,447
	MAR	28.43	0	0.4	0.4	15,000	0.01		16.4		94,931	10,308
	APR	15.51	0	0	0	3,000	0.01		4		27,907	551
	MAY	15.51	0	0.8	0.8	7,500	0.01		7		16,006	1,268
	JUN	23.26	0	0.6	0.6	7,500	0.01		28.4		12,204	2,413
	JUL	2843	0	0.2	0.2	7,500	0.01		8		10,968	5,095
	AUG	31.03	0	0.1	0.2	8,000	0.01		1		19,291	6,914
	SEP	31.03	0	2.2	2.2	10,000	0.01		8.4		30,556	8,854
	OCT	24.56	0	0	0	15,000	0.01		14		38,832	11,294
	NOV	24.56	0	0	0	15,000	0.01		12.8		46,539	10,413
	DEC	24.56	0	0.2	0.2	15,000	0.01		5.6		43,320	8,105

Wells Hatchery
NPDES Permit Number WAG13-5009

		FLOW	SS EFF	TSS COMP	TSS MAX	FLOW PA	SS PA	SS %	TSS PA	TSS %	lbs of Fish	lbs of Feed	SS DD	TSS DD
2013	JAN	17.04	0	0	0	**	**		**		66,372	9,428		
	FEB	18.38	0	0	0	**	**		**		80,475	13,591		
	MAR	22.67	0	-0.2	-0.2	**	**		**		95,921	17,989		
	APR	20.41	0	1.9	2.2	720	0		2.6		102,059	13,844		
	MAY	13.98	0	-1	-1	271	0		5.8		50,952	6,059	0.02	3
	JUN	3.73	0	0.2	0.2	**	**		**		5,045	3,054		
	JUL	4.89	0	0.8	0.8	**	**		**		8,930	4,026		
	AUG	7.56	0	4.2	4.2	271	0.2		9		18,600	6,197		
	SEP	8.23	0	1.2	1.2	271	0.2		3.2		30,303	13,570		
	OCT	8.76	0	0	0	271	0.2		4.6		44,125	14,344		
	NOV	7.75	0	0.8	0.8	**	**		**		52,563	13,827		
	DEC	13.57	0	-2	-2	**	**		**		72,856	15,022		

** PA pond - No discharge this month

Chiwawa Ponds - Chiwawa River
NPDES Permit Number WAG13-5015

		FLOW	SS EFF	TSS COMP	TSS MAX	lbs of Fish	lbs of Feed	SS DD	TSS DD
2013	JAN	4.53	0	0.4	0.4	16,647	324		
	FEB	4.3	0	0.4	0.4	16,220	378		
	MAR	3.9	0	-0.4	-0.4	15,680	2,551		
	APR	8.4	0	0.4	1.2	18,577	1,978		
	MAY	4.3	0.3	*13.6	13.6	4,147	352		
	JUN	No Monitoring				0	0		
	JUL	No Monitoring				0	0		
	AUG	No Monitoring				0	0		
	SEP	4.46	0	2.4	2.4	9,208	308		
	OCT	4.32	0	1.2	1.8	11,179	1,541		
	NOV	4.57	0	-0.4	-0.4	11,150	722		
	DEC	4.4	0	-0.6	-0.6	11,579	438		

*One violation reported.

Chiwawa Ponds - Wenatchee River
NPDES Permit Number WAG13-5015

		FLOW	SS EFF	TSS COMP	TSS MAX	lbs of Fish	lbs of Feed	SS DD	TSS DD
2013	JAN	5.93	0	0.2	0.2	13,017	1,324		
	FEB	5.14	0	0.4	0.4	16,943	1,974		
	MAR	1.89	0	0	0	16,174	3,951		
	APR	2.9	0	-0.2	0.2	17,779	1,564		
	MAY	3.8	0.03	4.8	4.8	16,348	88		
	JUN	No Monitoring				0	0		
	JUL	No Monitoring				0	0		
	AUG	No Monitoring				0	0		
	SEP	No Monitoring				0	0		
	OCT	No Monitoring				0	0		
	NOV	3.59	0	0	0	10,388	2,548		
	DEC	6.03	0	-0.8	-0.8	11,437	1,916		

Carlton Acclimation Pond
NPDES Permit Number WAG13-5013

		FLOW	SS EFF	TSS COMP	TSS MAX	lbs of Fish	lbs of Feed	SS DD	TSS DD
2013	JAN	No Monitoring				0	0		
	FEB	No Monitoring				0	0		
	MAR	10.08	0	0.8	0.8	33,000	4,200		
	APR	10.08	0	0.1	0.2	35,000	4,500	0.5	2.6
	MAY	No Monitoring				0	0		
	JUN	No Monitoring				0	0		
	JUL	No Monitoring				0	0		
	AUG	No Monitoring				0	0		
	SEP	No Monitoring				0	0		
	OCT	No Monitoring				0	0		
	NOV	No Monitoring				0	0		
	DEC	No Monitoring				0	0		

Methow Hatchery
NPDES Permit Number WAG13-5000

		FLOW	SS EFF	TSS COMP	TSS MAX	FLOW PA	SS PA	SS %	TSS PA	TSS %	lbs of Fish	lbs of Feed	SS DD	TSS DD
2013	JAN	8.38	0	0	0	14,400	0.1		3.6		23,300	2,600		
	FEB	9.1	0	-0.2	-0.2	14,400	0.1		0		25,863	3,700		
	MAR	9.1	0	-0.4	-0.4	14,400	0.1		2.2		28,900	4,500		
	APR	8.38	0	-1	-1	14,400	0.1		12.4		24,000	3,100	0.05	3.8
	MAY	5.47	0	-2.2	-2.2	14,400	0.1		2.5		1,666	300		
	JUN	5.47	0	0	0	14,400	0.1		4.6		2,100	500		
	JUL	5.76	0	0	0	14,400	0.1		0.2		3,200	760		
	AUG	5.76	0	0.1	0.2	14,400	0.1		0.8		4,200	1,000		
	SEP	5.47	0	-0.6	-0.6	14,400	0.1		0.2		5,600	1,350		
	OCT	5.76	0	-0.2	-0.2	14,400	0.1		1.8		6,600	1,450		
	NOV	5.76	0	-0.4	-0.4	14,100	0.1		1		7,000	1,600		
	DEC	5.74	0	-0.2	-0.2	14,400	0.1		0		6,600	1,450		

Similkameen Hatchery
NPDES Permit Number WAG13-5007

		FLOW	SS EFF	TSS COMP	TSS MAX	FLOW PA	SS IW	TSS IW	lbs of Fish	lbs of Feed	SS DD	TSS DD
2013	JAN	5.7	0	0.6	0.8				22,645	0		
	FEB	5.7	0	0.4	0.4				24,306	660		
	MAR	11.52	0	-0.2	-0.2				26,635	6,556		
	APR	11.5	-0.08	-5.2	-5.2				7,539	3,608		
	MAY	5.7	-0.02	-70.4	-70.4				618	0	0.01	58.4
	JUN	No Monitoring							0	0		
	JUL	No Monitoring							0	0		
	AUG	No Monitoring							0	0		
	SEP	No Monitoring							0	0		
	OCT	6.62	0	1.2	1.2				5,096	88		
	NOV	6.62	0	0.2	0.2				4,530	330		
	DEC	6.62	0	0.2	0.2				4,429	0		

Chelan Hatchery
NPDES Permit Number WAG13-5006

		FLOW	SS EFF	TSS COMP	TSS MAX	FLOW PA	SS PA	SS %	TSS PA	TSS %	lbs of Fish	lbs of Feed
2013	JAN	4.23	0.05	-0.8	-0.8	68,000	0.05		3		18,119	4,425
	FEB	5.7	0.05	0.8	0.8	68,000	0.05		1		20,623	10,662
	MAR	8.4	0.05	2	2	68,000	0.05		5.4		37,046	16,149
	APR	8	0.04	-1.8	-1.8	68,000	0.05		5.4		39,000	7,336
	MAY	11.7	0.05	0.4	0.4	68,000	0.05		2		15,563	5,365
	JUN	10.5	0.05	-0.8	-0.8	68,000	0.05		2.4		8,900	6,672
	JUL	9.7	0.05	-0.6	-0.6	0	0.05		21		20,602	7,700
	AUG	10.2	0.05	2	2	0	0.05		3		35,184	10,205
	SEP	10.1	0.05	0.6	0.6	0	0.05		2.2		38,184	9,142
	OCT	9	0.05	0.3	0.6	68,000	0.05		5.4		20,137	5,105
	NOV	5	0.05	1.6	1.6	68,000	0.05		7.4		5,607	1,968
	DEC	6	0.05	-0.6	-0.6	68,000	0.05		2.8		10,039	4,711

Chelan Falls Hatchery
NPDES Permit Number WAG13-7019

		FLOW	SS EFF	TSS COMP	TSS MAX	FLOW PA	SS PA	SS %	TSS PA	TSS %	lbs of Fish	lbs of Feed
2013	JAN	12.8	0.05	-0.8	-0.8	857	0.05		2.6		36,096	7,157
	FEB	12.8	0.05	-0.6	-0.6	857	0.05		11		44,728	16,059
	MAR	12.8	0.05	0	0	857	0.05		14.6		50,450	12,224
	APR	No Monitoring									0	0
	MAY	No Monitoring									0	0
	JUN	No Monitoring									0	0
	JUL	No Monitoring									0	0
	AUG	No Monitoring									0	0
	SEP	No Monitoring									0	0
	OCT	No Monitoring									0	0
	NOV	7	0.04	0.6	0.6	**	**		**		20,580	1,310
	DEC	7	0.04	-1	-1	3000	0.05		0.2		21,586	3,990

**PA pond - No discharge this month

Dryden Acclimation Pond
NPDES Permit Number WAG13-5014

		FLOW	SS EFF	TSS COMP	TSS MAX	lbs of Fish	lbs of Feed	SS DD	TSS DD
2013	JAN	No Monitoring				0	0		
	FEB	No Monitoring				0	0		
	MAR	9.68	0	0	0	63,414	0		
	APR	17.04	-0.01	0.7	3.2	60,822	8,352	0.01	0.8
	MAY	No Monitoring				0	0		
	JUN	No Monitoring				0	0		
	JUL	No Monitoring				0	0		
	AUG	No Monitoring				0	0		
	SEP	No Monitoring				0	0		
	OCT	No Monitoring				0	0		
	NOV	No Monitoring				0	0		
	DEC	No Monitoring				0	0		

Priest Rapids
NPDES Permit Number WAG13-7013

		FLOW	SS EFF	TSS COMP	TSS MAX	lbs of Fish	lbs of Feed	SS DD	TSS DD
2013	JAN	13.8	0	0.4	0.6	7,000	59		
	FEB	23.1	0	1	1	9,784	1,924		
	MAR	26.4	0	-0.2	-0.2	21,536	9,638		
	APR	37.37	0	0.4	0.4	36,291	15,383		
	MAY	48.75	0	1.6	1.6	90,610	34,515		
	JUN	48.63	0	-0.6	-0.6	146,567	25,727	0	4.04
	JUL	No Monitoring				0	0		
	AUG	No Monitoring				0	0		
	SEP	25.85	0			15,255	0		
	OCT	No Monitoring				0	0		
	NOV	No Monitoring				0	0		
	DEC	23.83	0	-0.1	0	9,170	0		

Appendix G

Steelhead Stock Assessment at Priest Rapids Dam, 2011-2012

Priest Rapids Dam 2011-2012 Adult Upper Columbia River Steelhead Run-Cycle Stock Assessment Report

Introduction

Upper Columbia River (UCR) steelhead stock assessment sampling at Priest Rapids Dam (PRD) is authorized through the Endangered Species Act (ESA) Section 10 Permit 1395 (NMFS 2003). Permit authorizations include interception and biological sampling of up to 10 percent of the UCR steelhead passing PRD to determine upriver population size, estimate hatchery to wild ratios, determine age class contribution, and evaluate the need for managing hatchery steelhead consistent with ESA recovery objectives, which include fully seeding spawning habitat with naturally produced UCR steelhead supplemented with artificially propagated enhancement steelhead (NMFS 2003).

Stock Assessment

The 2011 steelhead sampling at Priest Rapids Dam began 12 July and concluded 15 November. Sampling consisted of operating the Priest Rapids Off Ladder Trap (OLAFT), located on the left bank Priest Rapids Dam, eight hours per day, on Tuesdays and Thursdays, for a total of 37 sampling days. Steelhead were trapped, handled, and released in accordance with Section 2.1 and 2.2.1 of the National Marine Fisheries Service (NMFS) Biological Opinion for ESA Permit 1395 (NMFS 2003). The cumulative sample rate attained during 2011 totaled 13.1%.

The Washington Department of Fish and Wildlife (WDFW) sampled 2,716 steelhead from the 2011/2012 run-cycle passing PRD, totaling 20,806 steelhead, for an overall sampling rate of 13.1%. Of the 2,716 steelhead sampled, 2,091 (77%) were hatchery origin and 643 (23%) were wild origin. The estimated 2011-2012 run-cycle total wild steelhead return was 4,896, representing 181.9% of the 1986-2010 average and about 106.9% of the most recent five-year average (Table 1).

Based on external marks and external and internal tags, 2,091 hatchery origin steelhead were sampled at Priest Rapids Dam during the 2011 return cycle and included 19.1% Wenatchee hatchery-origin steelhead and 60.4% "above Wells Dam" hatchery origin steelhead[1/] (Table 2), while 10.1% of the hatchery origin steelhead sampled could not be assigned to a specific hatchery program. Ringold FH origin steelhead represented about 5.6% of the sample (Table 2).

1/- Defined as "above Wells Dam" because hatchery origin, adipose-clipped steelhead released into the Methow and Okanogan rivers from the Wells FH and Winthrop NFH have the same marks and are indistinguishable from one another.

Table 1. Priest Rapids Dam adult steelhead returns and stock composition, 1974-2010.

Run-cycle[1/]	Hatchery	Wild	Wild percent	Total run
1974				2,950
1975				2,560
1976				9,490
1977				9,630
1978				4,510
1979				8,710
1980				8,290
1981				9,110
1982				10,770
1983				32,000
1984				26,200
1985				34,010
1986	20,022	2,342	10.5	22,364
1987	9,955	4,058	29.0	14,013
1988	7,530	2,670	26.2	10,200
1989	8,033	2,685	25.1	10,718
1990	6,252	1,585	20.2	7,837
1991	11,169	2,799	20.0	13,968
1992	12,102	1,618	11.8	13,720
1993	4,538	890	16.4	5,428
1994	5,880	855	12.7	6,735
1995	3,377	993	22.7	4,370
1996	7,757	843	9.8	8,600
1997	8,157	785	8.8	8,942
1998	4,919	928	15.9	5,847
1999	6,903	1,374	16.6	8,277
2000	9,023	2,341	20.6	11,364
2001	24,362	5,715	19.0	30,077
2002	12,884	2,983	18.8	15,867
2003	14,890	2,837	16.0	17,729
2004	15,670	2,985	16.0	18,655
2005	10,352	3,127	23.2	13,479
2006	8,738	1,677	16.1	10,415
2007	12,160	3,097	20.3	15,257
2008	13,528	3,030	18.3	16,558
2009	32,557	7,439	18.6	39,996
2010	18,784	7,647	28.9	26,431
2011	15,910	4,896	23.5	20,806
1986-2010 average	**11,582**	**2,692**	**18.5**	**13,921**
2006-2010 average	**17,153**	**4,578**	**20.4**	**21,731**

[1/] A return cycle is the combined total of steelhead passing PRD from 1 June – 30 November during year (x), plus steelhead passing PRD between 15 April and 31 May on year (x+1).

Table 2. Origin classification of steelhead sampled at Priest Rapids Dam, 12 July – 15 November 2011.

Steelhead origin																					
Wild			Hatchery																		
Wild			Wenatchee						Above Wells				Ringold FH			Unk. Hat.					
Criteria			VIE						Criteria				Criteria			Criteria			Total	Total	Total
NS	NM	Total	LTGR	RTGR	RTOR	RTPK	RTRD	Total	AD	LTYL	RTYL	Total	AD	RV	Total	SD	NM	Total	Wild	Hatchery	Total
x	x	625	x					158	x			1,264	x	x	153	x	x	275	625	2,091	2,716
				x				109		x		0									
					x			0			x	0									
						x		132													
							x	0													
Total		**625**						**399**				**1,264**			**153**			**275**	**625**	**2,091**	**2,716**
% Hatchery								**19.1**				**60.4**			**7.3**			**13.2**		**100.0**	
% Total		**23.0%**						**14.8**				**46.5**			**5.6**			**10.1**	**23.0**	**77.0**	**100.0**

Reconciliation of salt water age of wild and hatchery steelhead sampled at Priest Rapids Dam during 2011 was accomplished through scale sample analysis. Salt-age analysis of the 2011 UCR steelhead run-cycle provides an estimated hatchery-origin return dominated by 1- salt and 2-salt age composition of 58.2% and 41.7%, respectively (Table 3). Natural origin steelhead salt ages were 44.0% and 55.4% for salt ages 1 and 2, respectively. Three-salt age fish represented only 0.3% of the combined hatchery/wild sample (Table 3).

Table 3. Salt-water age composition of 2011 - 2012 return cycle Upper Columbia River steelhead sampled at Priest Rapids Dam, corrected by scale age/origin determination.

	Origin					
	Hatchery		Wild		Combined	
Salt-age	***N***	**%**	***N***	**%**	***N***	**%**
1-salt	592	58.2	275	44.0	867	52.8
2-salt	425	41.7	346	55.4	771	46.9
3-salt	1	0.1	4	0.6	5	0.3
4-salt	-	-	-	-	-	-
Total	**1,018**	**100**	**625**	**100**	**1,643**	**100**

Freshwater residency of naturally produced Upper Columbia River steelhead present in the 2011-2012 run cycle were dominated by age-2 freshwater fish (76.8%), and was slightly higher than the 1986-2010 average of 74.6% (Table 4).

Table 4. 2011 return year freshwater age of wild Upper Columbia River steelhead sampled at Priest Rapids Dam during steelhead stock assessment activities, compared to July – October 1986-2010 average.

Freshwater age	**2011-2012 run cycle**		**1986-2010 proportion**	
	N	**%**	***N***	**%**
1.x	30	5.1	362	8.7
2.x	455	76.8	3,103	74.5
3.x	101	17.1	671	16.1
4.x	6	1.0	27	0.6
5.x	-	-	2	<0.1
Total	**592**	**100**	**4,165**	**100**

Wild and hatchery origin steelhead exhibited similar saltwater growth in the 2011 run-cycle. Wild 1 and 2-salt adults were slightly larger than their hatchery cohorts (Table 5). Age 1-salt hatchery and age 1 and 2-salt wild steelhead observed in the 2011-2012 adult run-cycle return past PRD were comparable in size to the 1986-2010 run-cycle average (Table 5).

Table 5. Average fork length of 1-salt and 2-salt, Upper Columbia River steelhead sampled at Priest Rapids Dam during July – November 2011 and the period between 1986-2010.

Salt age	Average fork length (cm)			
	2011-2012 run cycle		1986-2010 run cycle	
	Wild	Hatchery	Wild	Hatchery
x.1	59.3	57.7	60.2	59.2
x.2	71.3	70.0	72.9	72.0

Appendix H

Wenatchee Sockeye and Summer Chinook Spawning Ground Surveys, 2013

PUBLIC UTILITY DISTRICT NUMBER 1 OF CHELAN COUNTY
Natural Resource Division
Fish and Wildlife Department
327 N. Wenatchee Ave., Wenatchee WA 98801 (509) 663-8121

March 27, 2014

To: HCP Hatchery Committee

From: Lance Keller and Catherine Willard

Subject: 2013 Wenatchee Sockeye and Summer Chinook Spawning Ground Surveys and Mark/Recapture Based Sockeye Escapement Estimates to Tributaries

Introduction

In 2013, the Chelan County Public Utility District (District) conducted intensive spawning ground surveys of summer/fall (late run)[1] Chinook salmon (*Oncorhyncus tshawytscha*) and sockeye salmon (*O. nerka*) in the Wenatchee Sub-basin of the Columbia River, upstream of Rock Island Dam. Summer/fall Chinook spawn in the entire mainstem of the Wenatchee River, from the mouth to the lake (Figure 1; Table 1). Sockeye spawn in the White and Little Wenatchee rivers (Figure 2). Additionally, the District estimated sockeye escapement to tributaries based on mark/recapture methodology. The purpose of this document is to report the abundance, distribution, and timing of spawning activity based on 2013 spawning ground surveys and mark/recapture methodology (for sockeye); this information is used to evaluate the effectiveness of the District's hatchery program.

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[1] The majority of Chinook that ascend the mid-Columbia River as adults after July spawn between October and November in the mainstem of the Columbia, Wenatchee, Methow, Similkameen and Okanogan rivers. These fish have been called "summer" and "fall" Chinook based on their migration timing past the dams. Their life histories are identical (Mullan 1987), and should be termed "late-run" to separate them from earlier running "spring" Chinook that have a different life history. For consistency with previous year's reports, only the earlier segment of the late-run (those that ascend Rock Island Dam between June 24 and September 1; "summers") will be focused on in this report.

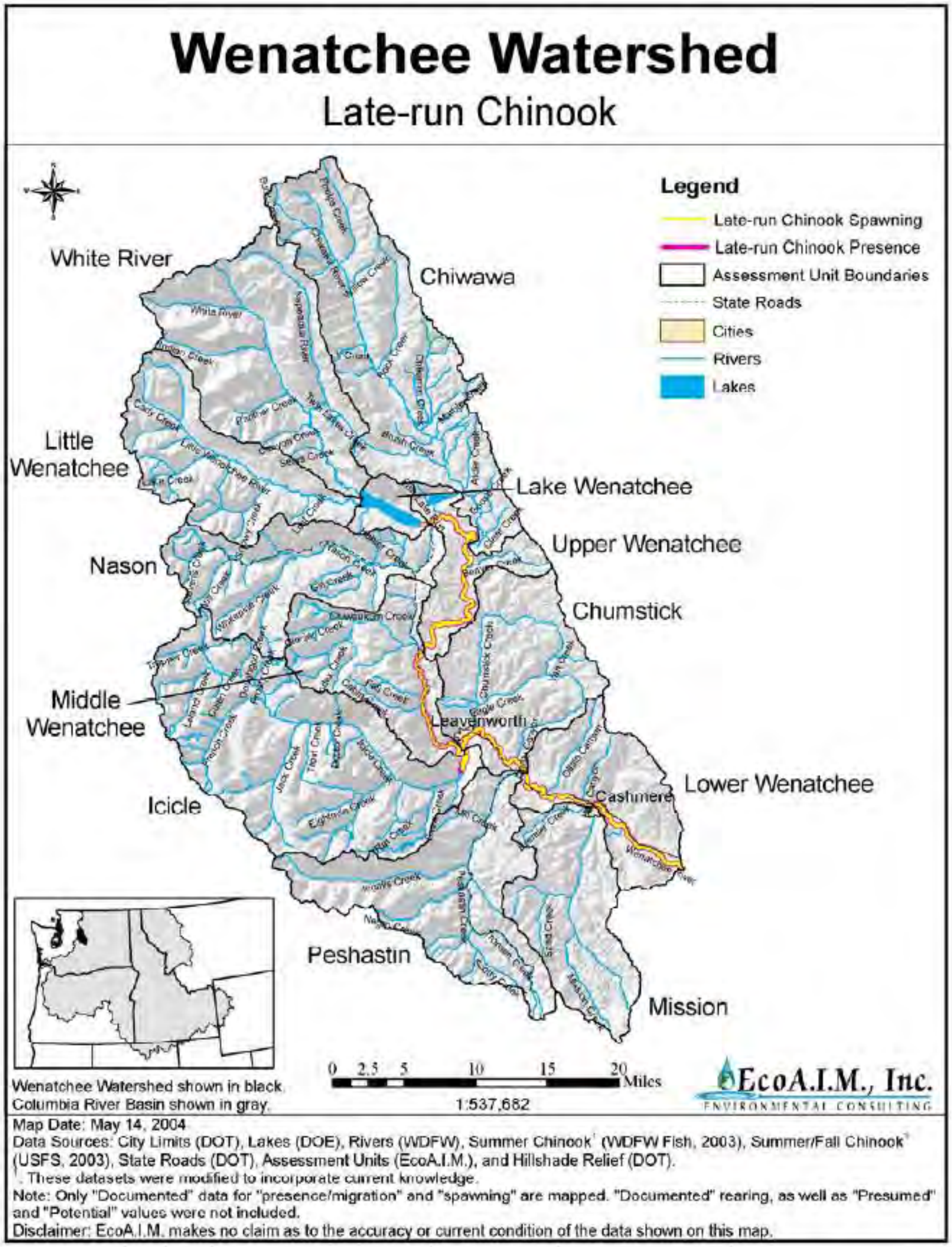

Figure 1. Map of the Wenatchee River Basin with spawning and migrational areas of late-run (summer/fall Chinook) areas highlighted (copied from the Wenatchee Sub basin Plan, NWPCC 2004).

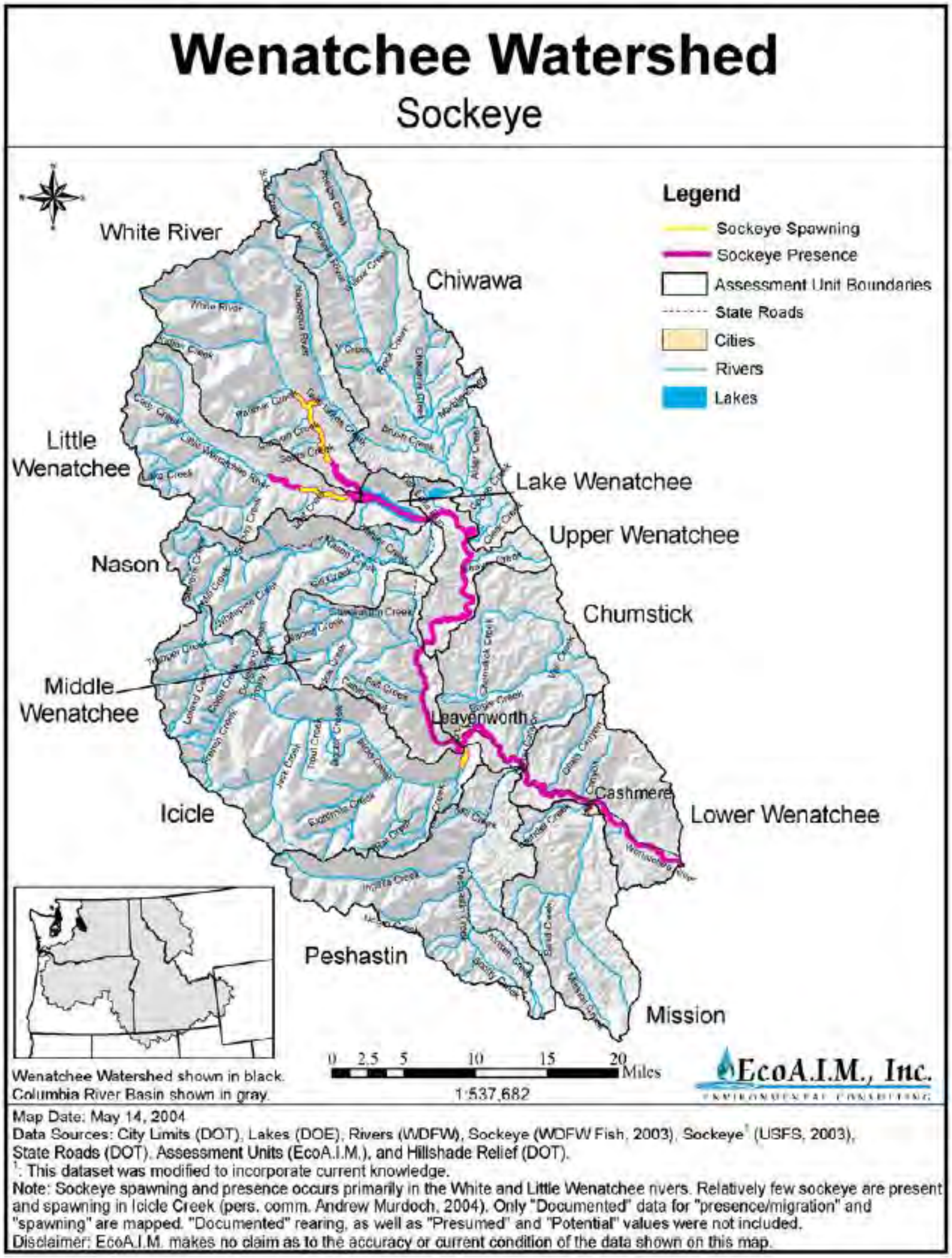

Figure 2. Map of the Wenatchee River Basin with spawning and migrational areas for sockeye highlighted (copied from the Wenatchee Sub basin Plan, NWPCC 2004).

Methods

In 2013, the study methodology was the same as used in 2012. In 2008, the summer Chinook spawning surveys were modified to incorporate additional mapping index areas in all ten river reach strata. Additionally, summer Chinook naïve counts were also performed in all river reach strata by the District. Previously, mapping index counts focused on six of the ten reaches and naïve counts were conducted solely by WDFW.

Chinook Spawning Ground Surveys

Chinook spawning ground surveys were conducted by foot, raft, or canoe. The most appropriate survey method was chosen for a given stream reach based on stream size, flow, and density of spawners. Because of the broad stream width and high spawner densities, individual summer Chinook redds were not flagged. Each reach was surveyed approximately once per week.

In 2013, summer Chinook spawning ground surveys occurred from September 16 to November 1.

Table 1. Designated survey reaches for spawning ground areas on the Wenatchee, Little Wenatchee, White, and Nepeequa rivers for all species.

Survey Section	River Mile
Wenatchee River-Summer Chinook	
Mouth to Sleepy Hollow Bridge	0 – 3.5
Sleepy Hollow Bridge to Lower Cashmere Bridge	3.5 – 9.5
Lower Cashmere Bridge to Dryden Dam	9.5 - 17.5
Dryden Dam to Peshastin Bridge	17.5 – 20.0
Peshastin Bridge to Leavenworth Bridge	20.0 – 23.9
Leavenworth Bridge to Icicle Road Bridge	23.9 – 26.4
Icicle Road Bridge to Tumwater Dam	26.4 – 30.9
Tumwater Dam to Tumwater Bridge	30.9 – 35.6
Tumwater Bridge to Chiwawa River	35.6 – 48.4
Chiwawa River to Lake Wenatchee	48.4 – 54.2
Little Wenatchee River-Sockeye	
Mouth to Old Fish Weir	0 – 2.7
Old Fish Weir to Lost Creek	2.7 – 5.2
Lost Creek to Rainey Creek	5.2 – 9.2
Rainey Creek to End	9.2 – End
White River-Sockeye	
Mouth to Sears Creek Bridge	0 – 6.4
Sears Creek Bridge to Napeequa River	6.4 – 11.0
Napeequa River to Grasshopper Meadows	11.0 – 12.9
Grasshopper Meadows to Falls	12.9 – 14.3
Napeequa River-Sockeye	
Mouth to End	0 - End

Peak and total redd count methodologies were used during the summer Chinook surveys in 2013 (see Appendix F of Murdoch and Peven (2005) for more detail). A peak count was conducted by counting all visible redds (new and old) observed within a reach on each survey. The objective of the peak redd count methodology was to capture the apex of spawning activity over an entire spawning season. This apex occurs at different times between reaches during the season, i.e. spawning begins sooner in the upstream reaches compared to the downstream reaches. The sum of all of the apex counts for the entire river was the peak redd count for the year. Peak counts provided an index of spawning and have been used historically (Attachment 1).

Two different approaches were used to estimate the total number of redds within the Wenatchee River. The first method used map counts to expand peak counts. Under this approach, a total redd count was conducted by counting or mapping only new or recently constructed redds within an area. Each new redd was mapped on aerial photos and enumerated. The objective of the total redd count methodology was to capture 1) "early" redds that may fade over time due to siltation or algae growth, and 2) redds that become disfigured by superimposition (when new redds are constructed on top of previously existing redds).

Since it was not feasible to map all new redds within the entire river, an expansion was used to estimate the total count for the entire Wenatchee River. To account for the different spawning substrate types in the main stem Wenatchee River, the river was delineated into ten distinct reaches in consultation with WDFW (Table 2). Within each of these reaches, index areas were identified as being representative areas of spawning activity. Peak counts were performed within each total reach (referred to as non-index areas), while mapping new redds only occurred within the index areas. An expansion was developed based on the ratio of mapped to peak counts for each reach (i.e., each reach had its own expansion factor), and the sum of the expanded counts was the estimate of the total redd counts. Additional details of how total redd counts were calculated are provided below.

a. Calculate an index peak expansion factor (*IP*) by dividing the peak number of redds in the index by the total number of redds (map count) in the index area.

$$IP = n_{peak} / n_{total}$$

b. Expand the non-index area peak redd counts by the *IP* to estimate the total number of redds in the entire reach (reach total; *RT*).

$$RT_{peak} = n_{peak} / IP$$

c. Estimate the total number of redds (total redds; *TR*) by summing the reach totals.

$$TR_{peak} = \sum RT$$

The second approach relied on a "naïve" count to expand redd numbers in reaches that did not have map counts. As noted above, the reaches with map counts were referred to as index reaches and those that were not mapped were called non-index reaches. Near the end of the spawning period (early November), one team of observers counted all visible redds within all non-index reaches. A separate, independent team counted all visible redds within the index reaches (these were the naïve counts). Surveys within the index and non-index areas occurred within one day of each other near the end of the spawning period. The naïve counts were divided by the total map count to estimate an index expansion factor. This factor was then applied to the total visible count in the non-index areas to estimate the total number of redds within each reach. The sum of the expanded counts was the estimate of the total redd count for the river. Additional details of how total numbers of redds are estimated using this approach are provided below.

a. Calculate an index expansion factor (*IF*) by dividing the number of visible redds in the index by the total number of redds (map counts) in the index area.

$$IF = n_{visible} / n_{total}$$

b. Expand the non-index area redd counts by the proportion of visible redds in the index to estimate the total number of redds in the entire reach (reach total; *RT*).

$$RT_{visible} = n_{non-index} / IF$$

c. Estimate the total number of redds (total redds; *TR*) by summing the reach totals.

$$TR_{visible} = \sum RT$$

The total redd count methods are believed to provide a more accurate indication of total spawning than the peak redd count methodology, because the peak count methodology only accounts for visible redds each week during the survey season. For example, summer Chinook redds that were visible during the first week of spawning may not be visible during the third week; those redds would be missed in the third and subsequent weeks' redd counts. Using the total count methodology, the redds in the first week would be mapped and accounted for in subsequent weeks, even though they may fade at some point during the future surveys.

Table 2. Index (Mapping) Areas on the Wenatchee River for 2013.

Reach	Reach description	Distance (miles)	Mapping index area within reach
1	Sleepy Hollow Br to River Mouth	3.5	Sleepy Hollow Br to River Bend
2	Cashmere Br to Sleepy Hollow Br	6	Cashmere Br 2 to Old Monitor Br.
3	Dryden Dam to Cashmere Br	8	Dryden Dam to Williams Canyon
4	Peshastin Br to Dryden Dam	2.5	Peshastin Br to Dryden Dam
5	Leavenworth Br to Peshastin Br	3.9	Leavenworth Br to Irrigation Flume
6	Icicle Rd Br to Leavenworth Br	2.5	Icicle Mouth to Boat Takeout
7	Tumwater Dam to Icicle Rd Br	4.5	Penstock Br to Icicle Rd Br
8	Tumwater Br to Tumwater Dam	4.7	Tumwater Br to Swiftwater Campground
9	Old Plain Br to Tumwater Br	12.8	RR Tunnel to Swing Pool
10	Lake Wenatchee to Old Plain Br	5.8	Bridge to Swamp

Sockeye Spawning Abundance

In 2013, sockeye abundance was enumerated using two methods: (1) on-the-ground surveys using an "area-under-the-curve" (AUC) approach and (2) a PIT-tag-based mark recapture study.

AUC Method:

Sockeye spawning ground surveys began August 20 and ended October 7. Spawning areas in the Little Wenatchee and Napeequa (Table 1) were surveyed at least once per week. Both the Little Wenatchee and White rivers have falls that are migration barriers to sockeye, and spawning is known to occur only within the first few miles of the Napeequa River, a tributary to the White River.

The AUC method was based on the number of live spawners counted. Using AUC, the number of fish observed in a survey was plotted against the day of the year and the number of fish-days was estimated using an algorithm. The number of fish spawning was then estimated by dividing the cumulative fish-days by the estimated mean number of days that the average spawner was alive in the survey area (survey- or stream-life). This was then multiplied by a correction factor for fish visibility (observer efficiency; Hillborn et al. 1999).

Hillborn et al. (1999) outlined what they termed as the most commonly used form of AUC, *trapezoidal approximation*:

$$AUC = \sum_{i=2}^{n} (t_i - t_{i-1}) \frac{(x_i + x_{i-1})}{2}$$

where t_i is the day of the year and x_i is the number of salmon observed for the ith survey. Attempts were made to initiate surveys before the presence of fish; however, when the first or last survey was not zero, then the above algorithm was not valid and Hillborn et al. (1999) recommend using the rules that the Alaska Department of Fish and Game use:

$$AUC_{first} = (x_i s)/2$$

where s is the survey life. Survey attempts should also be made until all salmon die, but when this was not possible, then the final survey should be calculated as:

$$AUC_{last} = (x_{last} s)/2$$

Then total escapement (E) is estimated as:

$$\hat{E} = \frac{AUC}{s} v$$

where v is a correction for observer efficiency. Since survey life has not been empirically estimated for the Wenatchee system, we used 11 days based on Perrin and Irvine (1990) and Hyatt et al. (2006).

Mark Recapture Method:

The White River in-stream array was only operational for ten days during September; therefore, a mark/recapture based spawner escapement estimate was not calculated for the White River. Detection efficiency of the in-stream array was calculated for the Little Wenatchee River in 2013. The in-stream arrays include a series of upstream and downstream coils (Figure 3). Combined, these coils represented the upstream and downstream detection arrays, respectively. Overall detection efficiency P_{all} of the arrays was calculated based on observed detection probabilities of individual arrays:

$$P_{all} = 1 - (1 - P_{array\,1})(1 - P_{array\,2})$$

where the probability of missing a fish on both the upstream P_{array1} and downstream P_{array2} arrays were combined for an overall efficiency P_{all} (Connolly et al. 2008).

Adult sockeye salmon were tagged at adult fishways within the Columbia River and at Tumwater Dam. Additionally, adult returns that were PIT tagged as juveniles were used in the analyses. Total passage of adult sockeye salmon through Tumwater Dam was obtained from Columbia River Data Access in Real Time (DART 2013). Resulting tag files were queried in PITAGIS (2013), providing detection histories for each study fish.

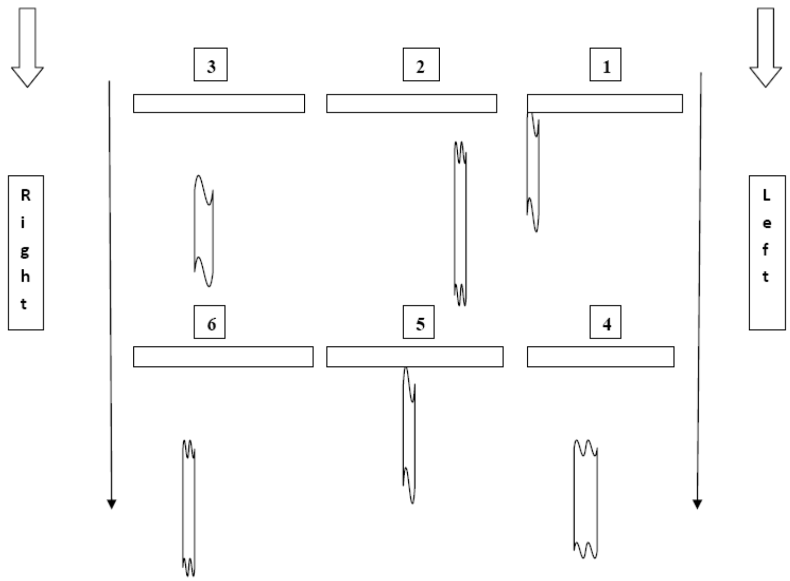

Figure 3. Schematic of a PIT array configuration.

Resulting data from passage at Tumwater Dam, mark and recapture using PITs, and detection efficiency estimates can provide estimation of escapement to spawning tributaries. Basic assumptions include: (1) the study population is “closed,” i.e., no individuals die or emigrate between the initial mark and subsequent recaptures; (2) tags are not lost and detections are correctly identified; (3) all individuals have the same probability of being detected, and (4) the number of recapture events are proportional to the total population. Lastly, it was assumed that PIT-tagging efforts at Tumwater have negligible influence on fish behavior and tagged individuals behave similarly to untagged individuals. The resulting escapement rate, adjusted for detection efficiency, was then applied to the total population as such:

$$Escapement = \left(\frac{\left(\frac{Obs_{LWN}}{Eff_{LWN}} + \frac{Obs_{WTL}}{Eff_{WTL}} \right)}{PITs_{TUM}} \right) \times Counts_{TUM}$$

where the PIT detections (*Obs*) at the Little Wenatchee (*LWN*) were adjusted for detection efficiency (*Eff*), compared to the number released (*PITs*) at Tumwater Dam (*TUM*), and the resulting proportion was applied to the population observed (*Counts*) passing Tumwater Dam.

Results

Summer Chinook

Peak Counts

The cumulative peak summer Chinook redd count was 2,917 in 2013, based on District ground surveys along the Wenatchee River (Table 3). Spawning activity began the third week of September and peaked during middle of October.

Table 3. Summary of summer Chinook redd peak counts, total redd estimates (TR) and spawner densities by reach in the Wenatchee River, 2013. Expansion factors were rounded to two decimal places (0.00) prior to calculating reach totals.

Reach	Peak Count	CCPUD Estimates		CCPUD Naïve Estimates	
		RT_{Peak}	$Density_{Peak}$ (redds/mile)	$RT_{Visible}$	$Density_{Visible}$ (redds/mile)
1	11	11	3	10	3
2	161	159	27	173	29
3	253	311	39	296	37
4	28	36	14	36	14
5	102	102	26	105	27
6	1,027	1,090	436	1,077	431
7	135	164	36	160	36
8	189	223	47	219	47
9	550	578	45	746	32
10	461	523	90	408	70
Total	***2,917***	***3,198***	***76***	***3,230***	***73***

Total Counts

The total number of redds in the Wenatchee River was 3,198 (RT_{peak}), using data from District surveys and the peak expansion factor. The District also estimated 3,230 redds (RT_{visble}) based on their naïve surveys (Table 3). All survey methods (peak and visible) indicated that redd densities were highest in Reach 6 and lowest in Reach 1 (Table 3; Figure 4), consistent with the previous four years. The historical summer Chinook peak counts (1996-2013) for the Wenatchee River basin are summarized in Attachment 1.

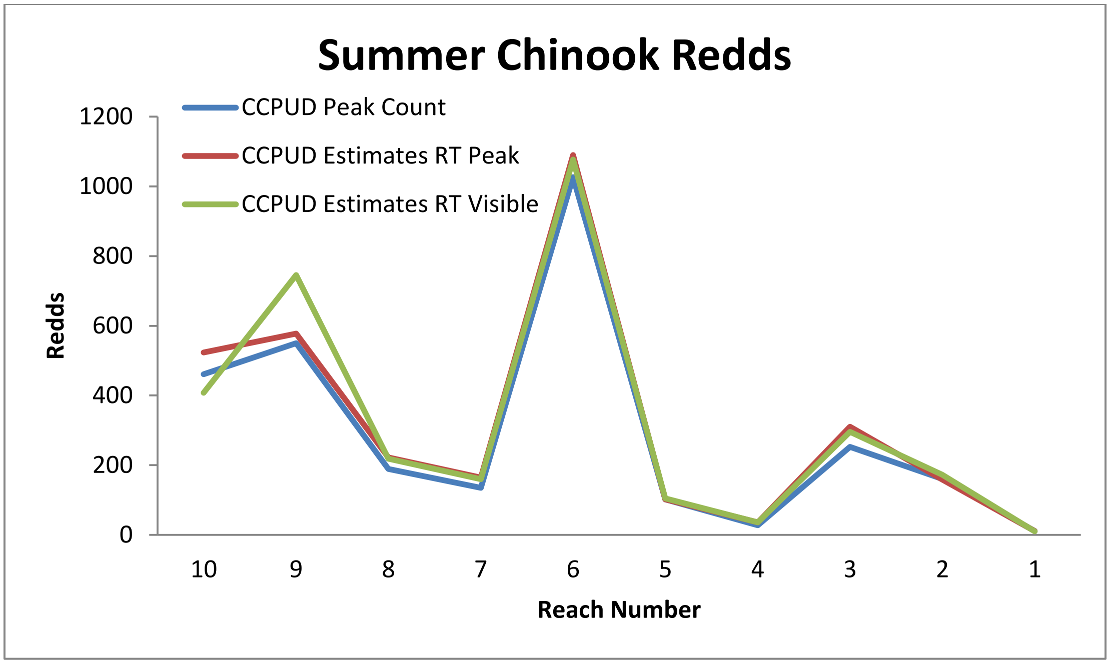

Figure 4. Alternative estimates of reach totals (RT) for summer Chinook redds in the Wenatchee River in 2013 [RT_{peak}=District peak counts expanded by peak expansion method and RT_{visble} =District naïve counts expanded by naïve expansion factor].

Sockeye Salmon

Sockeye AUC Method

Live fish counts

Fish counts were conducted for sockeye from August 27 through October 7. Peak spawning occurred in the Little Wenatchee (1,226 spawners) and Napeequa (130 spawners) during the middle of September (Figure 5; Table 4).

Escapement

The total estimated spawning escapement of sockeye to the Little Wenatchee and Napeequa Rivers was 2,154 in 2013 (Table 4). The escapement estimate is based solely on tributary observations.

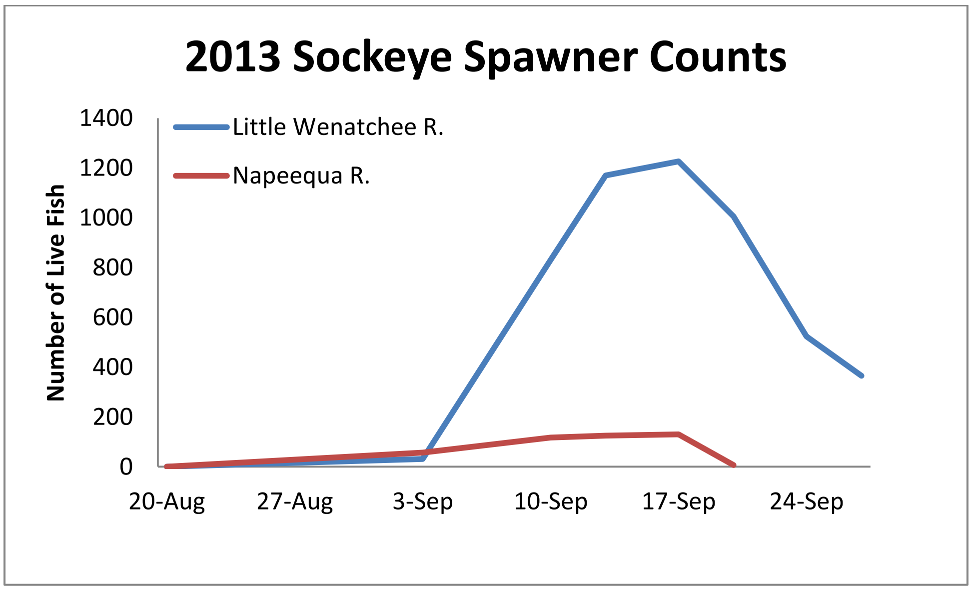

Figure 5. Approximate live counts and survey dates for sockeye salmon in the Little Wenatchee and Napeequa Rivers, 2013.

Table 4. Number of live fish and total spawning escapement estimates for sockeye salmon in the Wenatchee Basin, August through October, 2013.

River	Peak number of live fish	Escapement
Little Wenatchee	**1,226**	**1,890**
Napeequa	**130**	**264**
White	**N/A**[1]	**N/A**[1]
Total	***1,356***	***2,154***

[1] No AUC count was conducted on the White River in 2013.

Sockeye Mark Recapture Method

Fishway enumeration at Tumwater Dam indicated that 29,015 adult sockeye salmon passed the facility during the 2013 migration, which was a sufficient return to open a recreational fishery in Lake Wenatchee for 2013. PIT tags were implanted in 488 of these fish at Tumwater and 316 of these fish were PIT-tagged prior to passing Tumwater; 55 fish were subsequently detected at the Little Wenatchee PIT tag array (Table 5). Based on the recapture of PIT-tagged adult sockeye and assigned detection efficiency, total estimated escapement from Tumwater Dam to the Little Wenatchee River was 2,426 adult sockeye (Table 6).

In lieu of a mark/recapture based escapement estimate to the White River (due to complications with the White River PIT tag array), escapement to the White River was calculated using a linear regression derived from historical AUC spawning escapements in the Little Wenatchee and White Rivers from 2006 through 2013 (Figure 6). Escapement to the Little Wenatchee significantly explains 92% of the variation in escapement to the White River (p=< 0.0005). Estimated escapement in 2013 totaled 16,720 including 14,294 fish in the White River and 2,426 fish in the Little Wenatchee River, for a combined escapement rate of 0.576 percent of the population in 2013 (Table 6).

Figure 6. Wenatchee Sub-basin sockeye salmon tributary escapement (linear regression), 2006 to 2013.

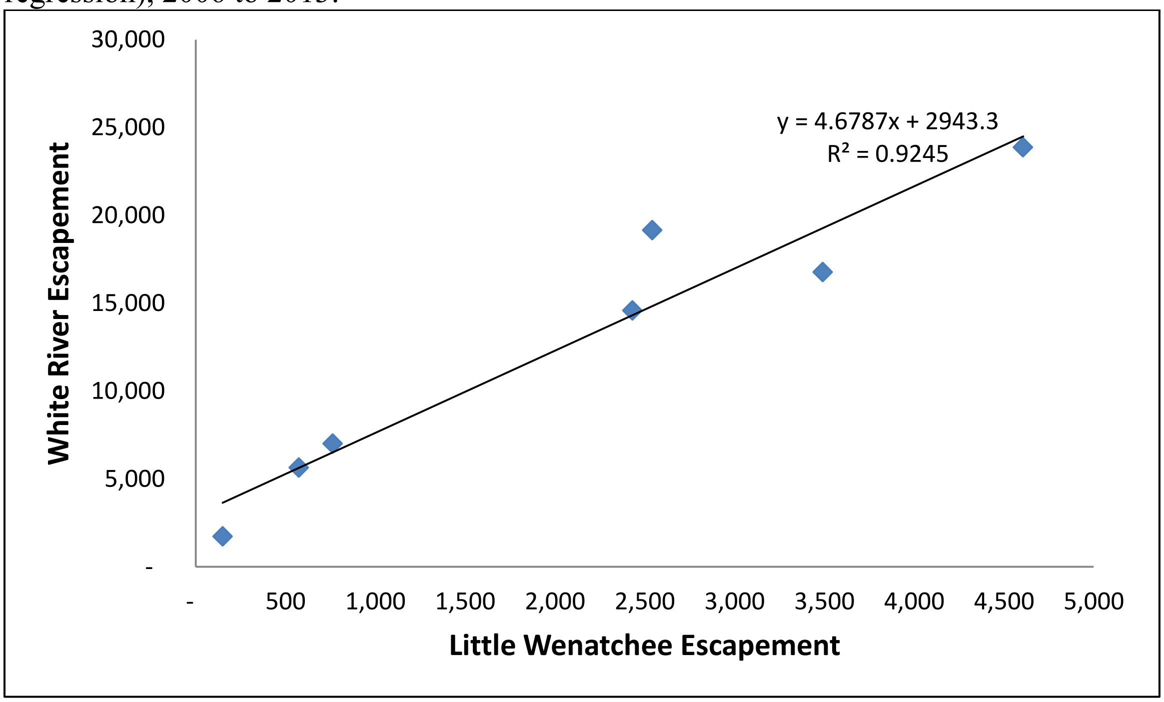

Table 5. Number of adult sockeye salmon PIT-tagged, released, and detected upstream of Tumwater Dam in 2009, 2010, 2011, 2012, and 2013 and mark/recapture based tributary escapement estimates.

Year	Number of PIT-tagged adults detected or tagged at Tumwater[1]	White River [2]		L. Wenatchee River [3]		Chiwawa R.	Nason Creek
		Observed	*Estimated*	Observed	*Estimated*	Observed	Observed
2009	1,085	381	*939*	38	*39*	37	7
2010	1,164	571	*635*	67	*67*	3	1
2011	484	40	*N/A*[5]	84	*0*	0	0
2012	1,154	410	*435*	74	*75*	0	0
2013	719	152[5]	*N/A*[5]	55	*67*	0	0

[1] Also includes fish detected downstream of release point (fallbacks).
[2] Based on a detection efficiency p_{all} = 0.406 in 2009 (assigned from 2010 data), p_{all} = 0.900 in 2010, and p_{all} = 0.943 in 2012.
[3] Based on a detection efficiency p_{all} = 0.971 in 2009, p_{all} = 1.000 in 2010, p_{all} = 0.987 in 2012, and p_{all} = 0.818 in 2013.
[4] Technical difficulties with the White R. PIT array prevented the calculation of detection efficiency and a mark recapture based escapement estimate.

Table 6. Estimated escapement of adult sockeye salmon to Little Wenatchee and White rivers based on mark-recapture events, in-stream detection efficiency, and adult enumeration at Tumwater Dam, 2009-2013.

Year	Tumwater count	Recreational harvest	Little Wenatchee	White River	Combined	Escapement
2009	16,034	2,229	576	13,876	14,452	0.901
2010	35,821	4,129	2,062	19,542	21,604	0.603
2011[1]	18,634	0	2,431	14,582	17,013	0.913
2012	66,520	12,107	4,607	23,866	28,473	0.428
2013[1]	29,015	6,262	2,426	14,294	16,720	0.576
Average	33,205	4,945	2,420	17,232	19,652	0.684

[1] Escapement was calculated using AUC counts for the Little Wenatchee R. and a linear regression relationship to the Little Wenatchee R. for the White R.

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Attachment 1

Historic peak redd counts in the Wenatchee River for summer/fall Chinook salmon. Prior to 1995, all counts based on highest count of multiple agencies surveys, which were usually aerial counts from fixed-wing aircraft. Since 1995, counts are ground counts based on Chelan PUD surveys.

Year	Highest Count	Year	Highest Count	Year	Highest Count
1960	502	1970	1333	1980	2024
1961	872	1971	1419	1981	1469
1962	1035	1972	1364	1982	1140
1963	1223	1973	1119	1983	723
1964	1300	1974	1155	1984	1332
1965	706	1975	925	1985	1058
1966	1260	1976	1106	1986	1322
1967	1593	1977	1365	1987	2955
1968	1776	1978	1956	1988	2102
1969	1354	1979	1698	1989	3331
1990	2479	2000	2022	2010	2553
1991	2180	2001	2857	2011	2583
1992	2328	2002	5419	2012	2301
1993	2334	2003	4281		
1994	2426	2004	3764		
1995	1872	2005	3327		
1996	1435	2006	7165		
1997	1388	2007	1857		
1998	1660	2008	2338		
1999	2188	2009	2667		

Appendix I

Genetic Diversity of Wenatchee Sockeye Salmon

Assessing the Genetic Diversity of Lake Wenatchee Sockeye Salmon And Evaluating The Effectiveness Of Its Supportive Hatchery Supplementation Program

Developed for

Chelan County PUD

and the

Habitat Conservation Plan's Hatchery Committee

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March 2008

Executive Summary

Nine spawning populations of sockeye (*Oncorhynchus nerka*) salmon have been identified in Washington, including stocks in the Lake Wenatchee basin (SaSI 5800) (Washington Department of Fisheries et al. 1993). Lake Wenatchee sockeye are classified as an Evolutionary Significant Unit (ESU), and consists of sockeye salmon that spawn primarily in tributaries above Lake Wenatchee (the White River, Napeequa River, and Little Wenatchee Rivers). Since 1990, the Wenatchee Sockeye Program has released juveniles into Lake Wenatchee to supplement natural production of sockeye salmon in the basin. The program's broodstock are predominantly natural-origin sockeye adults returning to the Wenatchee River captured at Tumwater Dam (Rkm 52.0), where a net-pen system is used to house both maturing adults and juveniles prior to release into Lake Wenatchee to over-winter.

Previous genetic studies have generally found a lack of concordance between population genetic relationships and their geographic distributions. These studies indicate that the nearest geographic neighbors of sockeye salmon populations are not necessarily the most genetically similar. Specifically for the Columbia River Basin, sockeye from Lake Wenatchee, Okanogan River, and Redfish Lake may be more closely related to a population from outside the Columbia River (depending on marker used) then to each other.

In this study we investigated the temporal and spatial genetic structure of Lake Wenatchee sockeye collections, without regard to sockeye populations outside of the Lake Wenatchee area. Our primary objective here was to determine if the Wenatchee Sockeye Program affected the natural Lake Wenatchee sockeye population. More specifically, we were tasked to determine if the genetic composition of Lake Wenatchee sockeye population had been altered by a supplementation program that was based on the artificial propagation of a small subset of that population. Using microsatellite DNA allele frequencies, we investigated population differentiation between temporally replicated collections of natural-origin Lake Wenatchee sockeye and program broodstock. We analyzed thirteen collections of Lake Wenatchee sockeye (Table 1), eight temporally replicated collections of natural-origin Lake Wenatchee sockeye (N=786) and five temporally replicated collections of Wenatchee Sockeye Program broodstock (N=248). Paired natural – broodstock collections were available from years 2000, 2001, 2004, 2006, and 2007.

Conclusions

We observed that allele frequency distributions were consistent over time, irrespective of collection origin, resulting in small and statistically insignificant measures of genetic differentiation among collections. We interpreted these results to indicate no year-to-year differences in allele frequencies among natural-origin or broodstock collections. Furthermore, there were no observed difference between pre- and post-supplementation collections. Therefore, we accepted our null hypothesis that the allele frequencies of the broodstock collections equaled the allele frequencies of the natural collections, which

equaled the allele frequency of the donor population. Given the small differences in genetic composition among collections, the genetic model for estimating N_e produced estimates with extremely large variances, preventing the observation of any trend in N_e.

Introduction

A report titled "Conceptual Approach to Monitoring and Evaluating the Chelan County Public Utility District Hatchery Programs" was prepared July 2005 by Andrew Murdoch and Chuck Peven for the Chelan PUD Habitat Conservation Plan's Hatchery Committee. This report outlined 10 objectives to be applied to various species assessing the impact (positive or negative) of hatchery operations mitigating the operation of Rock Island Dam. This current study pertains only to Lake Wenatchee sockeye and objective 3:

> *Determine if genetic diversity, population structure, and effective population size have changed in natural spawning populations as a result of the hatchery program. Additionally, determine if hatchery programs have caused changes in phenotypic characteristics of natural populations.*

In order to evaluate cause and effect of hatchery supplementation, WDFW Molecular Genetics Lab surveyed genetic variation of Lake Wenatchee sockeye. The conceptual approach for this project follows that of a parallel study regarding the Wenatchee River spring Chinook supplementation program (Blankenship et al. 2007). We determined the genetic diversity present in the Lake Wenatchee sockeye population by analyzing temporally replicated collections spanning 1989 – 2007, which included collections from before and following the inception of the Wenatchee Sockeye Program. Documenting the genetic composition of the Lake Wenatchee sockeye population is necessary to assess the effect of the hatchery program on the Lake Wenatchee population. In addition, this work provides a genetic baseline for future projects requiring genetic data. See study objectives below for specific details about how this project addresses Murdoch and Peven (2005) objective 3.

Lake Wenatchee Sockeye Salmon

Nine spawning populations of sockeye (*Oncorhynchus nerka*) salmon have been identified in Washington (Washington Department of Fisheries et al. 1993): 1) Baker

River, 2) Ozette Lake, 3) Lake Pleasant, 4) Quinault Lake, and 5) Okanogan River (classified as native stock); 6) Cedar River (classified as non-native stock); 7) Lake Wenatchee, classified as mixed stock); 8) Lake Washington/Lake Sammamish tributaries; and 9) Lake Washington beach spawners (classified as unknown origin). Chapman et al. (1995) listed four additional spawning aggregations of sockeye salmon that appear consistently in Columbia River tributaries: the Methow, Entiat, and Similkameen Rivers; and Icicle Creek in the Wenatchee River drainage.

Located in north central Washington, the Wenatchee River basin drains a portion of the eastern slope of the Cascade Mountains, including high mountainous regions of the Cascade crest. The headwater area of the Wenatchee River is Lake Wenatchee, a typical low productivity oligotrophic or ultra-oligotrophic sockeye salmon nursery lake (Allen and Meekin 1980, Mullan 1986, Chapman et al. 1995). Sockeye salmon bound for Lake Wenatchee enter the Columbia River in April and May and arrive at Lake Wenatchee in late July to early August (Chapman et al. 1995; Washington Department of Fisheries et al. 1993). The run timing of Lake Wenatchee sockeye salmon, classified as an Evolutionary Significant Unit (ESU), appears to have become earlier by 6 - 30 days during the past 70 years (Chapman et al. 1995; Quinn and Adams 1996). Additionally, scale pattern analysis suggests Wenatchee sockeye migrate past Bonneville Dam earlier than the sockeye bound for the Okanogan River (Fryer and Schwartzberg 1994). The Wenatchee population spawns from mid-September through October in the Little Wenatchee, White, and Napeequa Rivers above Lake Wenatchee (Washington Department of Fisheries et al. 1993), peaking in late September (Chapman et al. 1995). Limited beach spawning is believed to occur in Lake Wenatchee (L. Lavoy pers. com.; Mullan 1986), although Gangmark and Fulton (1952) reported two lakeshore seepage areas in Lake Wenatchee that were used by spawning sockeye salmon. Sockeye salmon fry enter Lake Wenatchee between March and May (Dawson et al. 1973), and typically rear in the lake for one year before leaving as smolts (Gustafson et al. 1997; Peven 1987).

Both the physical properties of the habitat and ecological/biological factors of the sockeye populations differ between the Lake Wenatchee ESU and the geographically proximate Okanogan ESU. For example: 1) Different limnology is encountered by sockeye salmon in Lakes Wenatchee and Osoyoos; 2) Lake Wenatchee sockeye predominantly return at ages four and five (a near absence of 3-year-olds), where a large percentage of 3-year-olds return to the Okanogan population; and 3) the apparent one month separation in juvenile outmigration-timing between Okanogan- and Wenatchee-origin fish (Gustafson et al. 1997 and references therein).

Sockeye Artificial Propagation In Lake Wenatchee

The construction of Grand Coulee Dam completely blocked fish passage to the upper Columbia River, and 85% of sockeye salmon passing Rock Island Dam between 1935 and 1936 were estimated to be from natural stocks bound for areas up-river to Grand Coulee Dam (Mullan 1986; Washington Department of Fisheries et al. 1938). To compensate for loss of habitat resulting from Grand Coulee Dam, the federal government initiated the Grand Coulee Fish-Maintenance Project (GCFMP) in 1939 to maintain fish runs in the Columbia River above Rock Island Dam. Between 1939 and 1943, all sockeye salmon entering the mid-Columbia River were trapped at Rock Island Dam, and over 32,000 mixed Lake Wenatchee, Okanogan River, and Arrow Lake adult sockeye salmon were released into Lake Wenatchee (Gustafson et al. 1997 Appendix Table D-2). In addition to adult relocation, between 1941 and 1969 over 52.8 million fry descended from original spawners collected at Rock Island and Bonneville Dams, were released into Lake Wenatchee (Gustafson et al. 1997 Appendix Table D-2).

No releases of artificially-reared sockeye salmon occurred in the Wenatchee watershed during the years 1970 to 1989 (Gustafson et al. 1997 Appendix Table D-2). Since 1990, the Wenatchee Sockeye Program has released juveniles into Lake Wenatchee to supplement natural production of sockeye salmon in the basin. Sockeye adults returning to the Wenatchee River are captured at Tumwater Dam (Rkm 52.0) and transferred to Lake Wenatchee net pens until mature. The Wenatchee Sockeye Program goals are 260 adults with an equal sex ratio, <10% hatchery-origin returns (identified by coded wire tags), and the adults removed for broodstock account for <10% of the run size. Fish are spawned at Lake Wenatchee and their gametes are taken to Rock Island Fish Hatchery

Complex (i.e., Eastbank) for fertilization and incubation. Fry are returned to the Lake Wenatchee net -pens after they are large enough to be coded wire tagged, and are housed in the pens until fall (one year after spawning), when they are liberated into the lake to over-winter. For brood years 1991 – 2004 an average of 218,683 (std. dev. = 71,090) pen-reared Lake Wenatchee-origin juvenile sockeye salmon have been released yearly into Lake Wenatchee.

Previous Genetic Studies

Protein (allozyme) variation – Surveying genetic variation at 12 allozyme loci, Utter et al. (1984) reported moderate population structure among 16 sockeye collections from southeast Alaska through the Columbia River Basin, including Okanogan and Wenatchee stocks, with an apparent genetic association between upper Fraser River and Columbia River sockeye salmon. Winans et al. (1996) surveyed variation at 55 allozyme loci for 25 sockeye salmon and two kokanee collections from 21 sites in Washington, Idaho, and British Columbia, and reported the lowest level of allozyme variability of any species of Pacific salmon and a highest level of inter-population differentiation. Furthermore, these authors reported that there was no clear relationship between geographic and genetic differentiation among the populations within there study. Other studies corroborate the results of Winans et al. (1996), finding a lack of discernible geographic patterning for sockeye salmon populations in British Columbia, Alaska, and Kamchatka (Varnavskaya et al. 1994, Wood et al. 1994, Wood 1995). These studies indicate that the nearest geographic neighbors of sockeye salmon populations are not necessarily the most genetically similar, which contrasts with the other Pacific salmon species that exhibit concordance between geographic and genetic differentiation (Utter et al. 1989, Winans et al. 1994, Shaklee et al. 1991). As part of the comprehensive status review of west coast sockeye salmon (Gustafson et al. 1997), NMFS biologists collected new allozyme genetic information for 17 sockeye salmon populations and one kokanee population in Washington and combined these data for analysis with the existing Pacific Northwest sockeye salmon and kokanee data from Winans et al. (1996). Results of the updated study were consistent with Winans et al. (1996), with no clear concordance between geographic and genetic distances. Sockeye salmon from Lake Wenatchee, Redfish Lake, Ozette Lake, and Lake Pleasant are very distinct from other collections in the study, and Columbia River populations were not necessarily most closely related to each other. Gustafson et al. (1997) also examined between-year variability within a collection location and found low levels of statistical significance among the five Lake Wenatchee collections included in the study (For 10 pair-wise comparisons using sum-G test, five were statistically significant). Lake Wenatchee brood year 1987 accounted for three of the significant comparisons, which were driven by unusually high frequencies of two allozyme alleles (ALAT*95 and ALAT*108) (Winans et al. 1996). Nevertheless, Gustafson et al. (1997) conclude that, in general, temporal variation at a locale was considerably less than between-locale variation.

Nucleic acid variation - Beacham et al. (1995) reported levels of variation in nuclear DNA of *O. nerka* using minisatellite probes. They analyzed 10 collections, including a sample from Lake Wenatchee. Cluster analysis showed the Lake Wenatchee sample was different from all the other collections, including those from the Columbia River. Using a similar molecular technique, Thorgaard et al. (1995) examined the use of multi-locus DNA fingerprinting (i.e., banding patterns) to discriminate among 14 sockeye salmon and kokanee populations. Dendrograms based on analysis of banding patterns produced different genetic affinity groups depending on the probes used. While none of the five DNA probes showed a close relationship between Lake Wenatchee and Okanogan River sockeye salmon, if information from all probes were combined, *O. nerka* from Redfish Lake, Wenatchee, and Okanogan were separate from kokanee of Oregon and Idaho and a sockeye salmon sample from the mid-Fraser River.

Study Objective

We documented temporal variation in genetic diversity (i.e., heterozygosity and allelic diversity), and investigated population differentiation between temporally replicated collections of natural-origin Lake Wenatchee sockeye and program broodstock, using microsatellite DNA allele frequencies. Temporally replicated collections from the same location can also be used to estimate effective population size (N_e). If populations are "ideal", the census size of a population is equal to the "genetic size" of the population.

Yet, numerous factors lower the "genetic size" below census, such as, non-equal sex ratios, changes in population size, and variance in the numbers of offspring produced from parent pairs. N_e is thought to be between 0.10 and 0.33 of the estimated census size (Bartley et al. 1992; RS Waples pers. comm.), although numerous observations differ from this general rule. N_e can be calculated directly from demographic data, or inferred from observed differences in genetic variance over time. Essentially, when calculated from genetic data, N_e is the estimated size of an "ideal" population that accounts for the genetic diversity changes observed, irrespective of abundance.

We will address the hypotheses associated with Objective 3 in Murdock and Peven (2005) using the following four specific tasks:

Task 1 - Document the observed genetic diversity.

Task 2 - Test for population differentiation among Lake Wenatchee collections and the associated supplementation program.

Task 2 was designed to address two hypotheses listed as part of Objective 3 in Murdoch and Peven (2005):

- Ho: Allele frequency $_{\text{Hatchery}}$ = Allele frequency $_{\text{Naturally produced}}$ = Allele frequency $_{\text{Donor pop}}$.
- Ho: Genetic distance between subpopulations $_{\text{Year x}}$ = Genetic distance between subpopulations $_{\text{Year y}}$

Murdoch and Peven (2005) proposed these two hypotheses to help evaluate supplementation programs through a "Conceptual Process" (Figure 5 in Murdoch and Peven 2005). There are two components to the first hypothesis, which must be considered separately for Lake Wenatchee sockeye. The first component involves comparisons between natural-origin populations from Lake Wenatchee to determine if there have been changes in allele frequencies through time starting with the donor population. Documenting a change does not necessarily indicate that the supplementation program has directly affected the natural-origin fish, as additional tests would be necessary to support that hypothesis. The intent of the second component is to determine if the hatchery produced populations have the same genetic composition as the naturally produced populations.

Task 3 - Calculate N_e using the temporal method for multiple samples from the same location to document trend.

Task 4 - Compare N_e estimates with trend in census size for Lake Wenatchee sockeye.

Methods and Materials

Sampling

Thirteen collections of Lake Wenatchee sockeye were analyzed, eight temporally replicated collections of natural Lake Wenatchee sockeye (N=786) and five temporally replicated collections of Wenatchee Sockeye Program broodstock (N=248) (Table 1). Paired natural – broodstock collections were available from years 2000, 2001, 2004, 2006, and 2007 (Table 1). All collections were made at Tumwater Dam on the Wenatchee River. Note that collections classified as broodstock were predominantly natural-origin sockeye. A majority of the genetic samples were from dried scales. The tissue collections from 2006 and 2007 were fin clips stored immediately in ethanol after collection. DNA was extracted from stored tissue using Nucleospin 96 Tissue following the manufacturer's standard protocol (Macherey-Nagel, Easton, PA, U.S.A.).

Laboratory Analysis

Polymerase chain reaction (PCR) amplification was performed using 17 fluorescently end-labeled microsatellite marker loci, *One* 2 (Scribner et al 1996) *One* 100, 101, 102, 105, 108, 110, 114, and 115 (Olsen et al. 2000), *Omm* 1130, 1135, 1139, 1142, 1070, and 1085 (Rexroad et al. 2001), *Ots* 3M (Banks et al. 1999) and *Ots* 103 (Small et al. 1998). PCR reaction volumes were 10 μL, with the reaction variables being 2 μL 5x PCR buffer (Promega), 0.6 μL $MgCl_2$ (1.5 mM) (Promega), 0.2 μL 10 mM dNTP mix (Promega), and 0.1 μL *Go Taq* DNA polymerase (Promega). Loci were amplified as part of multiplexed sets, so primer molarities and annealing temperatures varied. Multiplex one had an annealing temperature of 55°C, and used 0.09 Molar (M) *One* 108, 0.06 M *One* 110, and 0.11 M *One* 100. Multiplex two had an annealing temperature of 53°C, and used 0.08 M *One* 102, 0.1 M *One* 114, and 0.05 M *One* 115. Multiplex three had an annealing temperature of 55°C, and used 0.08 M *One* 105 and 0.07 M *Ots* 103. Multiplex four had an annealing temperature of 53°C, and used 0.09 M *Omm* 1135 and 0.08 M *Omm* 1139. Multiplex five had an annealing temperature of 60°C, and used 0.2 M *Omm* 1085, 0.09 M *Omm* 1070, and 0.05 M *Ots* 3M. Multiplex six had an annealing temperature of 48°C, and used 0.06 M *One* 2, 0.08 M *Omm* 1142, and 0.08 M *Omm* 1130. *One* 101 was run in isolation with a primer molarity of 0.06. Thermal cycling was conducted on either PTC200 (MJ Research) or GeneAmp 9700 thermal cyclers as follows: 94°C (2 min); 30 cycles of 94°C for 15 sec., 30 sec. annealing, and 72°C for 1 min.; a final 72°C extension and then a 10°C hold. PCR products were visualized by denaturing polyacrylamide gel electrophoresis on an ABI 3730 automated capillary analyzer (Applied Biosystems). Fragment analysis was completed using GeneMapper 3.7 (Applied Biosystems).

Genetic data analysis

Assessing within collection genetic diversity - Heterozygosity measurements were reported using Nei's (1987) unbiased gene diversity formula (i.e., expected heterozygosity) and Hedrick's (1983) formula for observed heterozygosity. Both tests were implemented using the microsatellite toolkit (Park 2001). For each locus and collection FSTAT version 2.9.3.2 (Goudet 1995) was used to assess Hardy-Weinberg equilibrium, where deviations from the neutral expectation of random associations among alleles were calculated using a randomization procedure. Alleles were randomized among individuals within collections (4160 randomizations for this dataset) and the F_{IS} (Weir and Cockerham 1984) calculated for the randomized datasets were compared to the observed F_{IS} to obtain an unbiased estimation of the probability that the null hypothesis was true. The 5% nominal level of statistical significance was adjusted for multiple tests (Rice 1989). Genotypic linkage disequilibrium was calculated following Weir (1979) using GENETIX version 4.05 (Belkhir et al. 1996). Statistical significance of linkage disequilibrium results was assessed using a permutation procedure implemented in GENETIX for each locus by locus combination within each collection.

Assessing among collection genetic differentiation - The temporal stability of allele frequencies was assessed by the randomization chi-square test implemented in FSTAT version 2.9.3.2 (Goudet 1995). Multi-locus genotypes were randomized between collections. The G-statistic for observed data was compared to G-statistic distributions from randomized datasets (i.e., null distribution of no differentiation between collections). Population differentiation was also investigated using pairwise estimates of F_{ST}. Multi-locus estimates of pairwise F_{ST}, estimated by a "weighted" analysis of variance (Weir and Cockerham, 1984), were calculated using GENETIX version 4.05 (Belkhir et al.1996). F_{ST} was used to quantify population structure, the deviation from statistical expectations (i.e., excess homozygosity) due to non-random mating between populations. To determine if the observed F_{ST} estimate was consistent with statistically expectations of no population structure, a permutation test was implemented in GENETIX (1000 permutations).

Effective population size (N_e) – Estimates of the effective population size were obtained using a multi-collection temporal method (Waples 1990a). The temporal method assumes that cohorts are used, but we did not decompose the collection year samples into their respective cohorts using age data. Therefore, N_e estimates that pertain to individual year classes of breeders are not valid; however the harmonic mean over all samples will estimate an N_e that pertains to the time period from which the collections are derived. Comparing samples from years *i* and *j*, Waples' (1990a) temporal method estimates the effective number of breeders ($\hat{N}_{b(i,j)}$) according to:

$$\hat{N}_{b(i,j)} = \frac{b}{2(\hat{F} - 1/\tilde{S}_{i,j})}$$

The standardized variance in allele frequency ($\hat{F}$) is calculated according to Pollack (1983). The parameter b is calculated analytically from age structure information and the number of years between samples (Tajima 1992). The age-at-maturity information required to calculate b was obtained from ecological data (Hillman et al. 2007). The harmonic mean of sample sizes from years *i* and *j* is $\tilde{S}_{i,j}$. The harmonic mean over all pairwise estimates of $\hat{N}_{b(i,j)}$ is $\tilde{N}_b$. SALMONNb (Waples et al. 2007) was used to calculate $\tilde{N}_b$.

Results and Discussion

In this section we combine our presentation and interpretations of the genetic analyses. Additionally, this section is organized based on the task list presented in the study plan.

Task 1 - Document the observed genetic diversity.

Substantial genetic diversity was observed over all Lake Wenatchee sockeye collections analyzed (Table 1), with heterozygosity estimates over all loci having a mean of 0.79. Genetic diversity was consistent with expected Hardy-Weinberg random mating genotypic proportions for all collections. The F_{IS} observed for each collection was not statistically significant given the distribution of F_{IS} generated using a randomization procedure. Additionally, there were no statistically significant associations observed between alleles across loci (i.e., linkage equilibrium) (data not shown). We concluded from these results that the genetic data from each collection was consistent with statistical expectations for random association of alleles within and between loci. In other words, each collection represents samples from a single gene pool (i.e., populations), and the genetic diversity observed has no detectable technical artifacts or evidence of natural selection.

Task 2 - Test for differentiation among Lake Wenatchee collections and the associated supplementation program.

We explicitly tested the hypothesis of no significant differentiation within natural-origin or broodstock collections from Lake Wenatchee using a randomization chi-square test. The null hypothesis for these tests was that the allele frequencies from two different populations were drawn from the same underlying distribution. We show the results for the pairwise comparisons among eight temporally replicated natural-origin collections from Lake Wenatchee (28 pairwise tests), and report all tests were non-significant (Table 2A). Similarly, for five temporally replicated broodstock collections, 10 of 10 pairwise tests were non-significant (Table 2B). We also tested if natural-origin and broodstock collections were differentiated from each other over time, and report that 40 of 40 tests were non-significant (Table 2C). The nominal level of statistical significance ($\alpha = 0.05$) was adjusted for multiple comparisons using strict Bonferroni correction (Rice 1989). Yet, there are perhaps slight differences between paired natural-broodstock collections. Note that the p-values for comparisons regarding 2006 and 2007 paired collections are lower than for comparisons regarding 2000, 2001, and 2004. The small sample sizes for broodstock collections in 2006 and 2007 may not have been random samples from the Lake Wenatchee sockeye population.

Given the consistencies observed for allele frequency distributions over time, metrics of population structure were expected to be small. This was the case, as the estimated F_{ST} over all thirteen collections was 0.0003. This observed value fell within the distribution of F_{ST} values expected if there were no population structure present (permutation test p-value 0.12). Analysis of the paired natural-broodstock collections corroborated this result. Pairwise estimates of F_{ST} were 0.000 for years 2000, 2001, 2004, and 2007, and 0.002 for 2006. All five estimates were non-significant. Essentially, all 13 sockeye collections could be considered samples from the same population. Given these results, it is valid to combine all collections for statistical analysis. Therefore, we did not calculate genetic distances among any collections, as it is inappropriate to estimate distances that are effectively zero.

Conclusions

We interpret these data to indicate that there appears to be no significant year-to-year differences in allele frequencies among natural-origin or broodstock collections, nor are there observed differences between collections pre- and post-supplementation. As a result, we accept the null hypothesis that the allele frequencies of the broodstock collections equal the allele frequencies of the natural collections, which equals the allele frequency of the donor population. Furthermore, the observed genetic variance that can be attributed to among collection differences was negligible.

Task 3 - Calculate N_e using the temporal method for multiple samples from the same location to document trend.

The fundamental parameter for inferring N_e using genetic data is the standardized variance in allele frequency ($\hat{F}$) (Pollack 1983). Methods estimate N_e from observed changes in $\hat{F}$ over temporally replicated collections from the same location. Yet, as previously shown, there were no statistically significant differences detected in allele frequencies. The underlying model for estimating N_e produced estimates with extremely large variances, given small temporal differences in $\hat{F}$, which rendered any trend in N_e unobservable. Table 3 shows N_e estimates calculated using temporally replicated natural collections.

Task 4 - Compare N_e estimates with trend in census size for Lake Wenatchee sockeye.

See Task 3

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Table 1 Lake Wenatchee sockeye collections analyzed. MNA is the mean number of alleles per locus, Hz is unbiased heterozygosity, Obs Hz is observed heterozygosity, and HW is the p-value of the null hypothesis of random association of alleles (i.e., Hardy – Weinberg equilibrium). For reference, the nominal level of statistical significance at $\alpha = 0.05$ is 0.0002 after correction for multiple tests.

Year	Collection Code	Tissue Type	Source	N	MNA	Hz	Obs Hz	HW
1989	89[1]	Scales	Natural	96	14.35	0.792	0.791	0.424
1990	90[1]	Scales	Natural	96	13.19	0.793	0.779	0.131
2000	00AAE	Scales	Broodstock	96	12.31	0.787	0.776	0.213
2000	00[1]	Scales	Natural	96	11.76	0.801	0.826	0.868
2001	01AAS	Scales	Broodstock	53	9.47	0.788	0.793	0.392
2001	01[1]	Scales	Natural	96	14.35	0.786	0.794	0.456
2002	02[1]	Scales	Natural	96	14.53	0.794	0.777	0.780
2004	04[1]	Scales	Natural	96	14.65	0.798	0.803	0.704
2004	04AAV	Scales	Broodstock	43	14.35	0.796	0.795	0.051
2006	06CN	Tissue	Broodstock	38	14.59	0.793	0.785	0.688
2006	06CO	Tissue	Natural	96	14.53	0.806	0.803	0.408
2007	07EE	Tissue	Broodstock	18	14.00	0.790	0.790	0.221
2007	07EF	Tissue	Natural	96	14.35	0.789	0.800	0.347

[1] Samples taken from scale cards provided by Jeff Fryer (CRITFC)

Table 2 Allelic differentiation for Lake Wenatchee sockeye collections. A single analysis tested (pairwise) the allelic differentiation between all thirteen collections; however p-values for G-statistics are partitioned in the table by A) natural-origin, B) broodstock, and C) natural versus broodstock. Underlined values are for paired natural-broodstock collections from the same year. For reference, the nominal level of statistical significance at α = 0.05 is 0.0006 after correction for multiple tests. No significant values were observed.

A) Natural-Origin Collections

	89	90	00	01	02	04	06CO	07EF
89		0.257	0.359	0.531	0.331	0.127	0.031	0.263
90			0.953	0.148	0.753	0.903	0.077	0.283
00				0.328	0.527	0.607	0.604	0.400
01					0.209	0.081	0.127	0.093
02						0.085	0.707	0.235
04							0.312	0.577
06CO								0.435
07EF								

B) Broodstock Collections

	00AAE	01AAS	04AAV	06CN	07EE
00AAE		0.189	0.090	0.008	0.058
01AAS			0.122	0.020	0.116
04AAV				0.008	0.031
06CN					0.326
07EE					

C) Natural vs. Broodstock

	89	90	00	01	02	04	06CO	07EF
00AAE	0.027	0.309	<u>0.572</u>	0.018	0.041	0.012	0.093	0.040
01AAS	0.115	0.471	0.160	<u>0.219</u>	0.519	0.049	0.654	0.133
04AAV	0.136	0.219	0.210	0.423	0.208	<u>0.328</u>	0.037	0.153
06CN	0.029	0.004	0.053	0.007	0.022	0.004	<u>0.019</u>	0.001
07EE	0.099	0.229	0.053	0.015	0.093	0.178	0.090	<u>0.037</u>

Table 3 Estimation of N_e for temporally replicated natural-original sockeye collections. Above the diagonal are pairwise estimates of N_e, where negative values mean sampling variance can account for genetic variance observed (i.e., genetic drift unnecessary). Below the diagonal are variances for pairwise estimates of N_e. Absent variance values (denoted by **-**) were too large for SalmonNb to display.

Collection	89	90	00	01	02	04	06CO	07EF
89		-3936.6	-1414	-2636.3	671.4	1871.1	1066.1	1951.2
90	2.59E+09		-1490.3	3649.1	-31144	-6808.4	817.6	93190.2
00	1.40E+09	4.45E+09		-592.2	-6842.2	-667.1	-1736.9	-1350.1
01	1.21E+09	1.47E+09	2.33E+09		977.1	6160.4	387.8	2531.5
02	1.91E+09	1.33E+09	1.16E+09	2.29E+09		1495.6	-848.5	3213.6
04	2.21E+09	3.62E+09	4.08E+09	1.27E+09	1.14E+09		896.6	2155.3
06CO	1.34E+09	1.39E+09	1.73E+09	**-**	4.51E+09	1.2E+09		3278.6
07EF	2.15E+09	1.51E+09	1.18E+09	1.68E+09	**-**	1.36E+09	2.65E+09	

Appendix J

Genetic Diversity of Chiwawa River Spring Chinook Salmon

Assessing the Genetic Diversity of Natural Chiwawa River Spring Chinook Salmon and Evaluating the Effectiveness of its Supportive Hatchery Supplementation Program

Developed for

Chelan County PUD

and the

Habitat Conservation Plan's Hatchery Committee

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Executive Summary

The main objective of this study was to determine the potential impacts of the Chiwawa River Supplementation Program on natural spring Chinook in the upper Wenatchee system. We did this by investigating population differentiation between temporally replicated Chiwawa River natural and hatchery samples from the Wenatchee River watershed using microsatellite DNA allele frequencies and the statistical assignment of individual fish to specific populations. Additionally, to assess the genetic effect of the hatchery program, we investigated the relationship between census and effective population sizes using collections obtained before and after the supplementation program. In this summary, we briefly describe the salient results contained within this report; however, each "Task" within the Results/Discussion section below contains extended coverage for each topic along with an expanded interpretation of each result.

Overall, we observed substantial genetic diversity within collections, with heterozygosities equal to roughly 80%, over thirteen microsatellite markers. Microsatellite allele frequencies among temporally replicated collections from the same population (i.e., location) were variable, resulting in significant genetic differentiation among these collections. However, these difference are likely the result of salmon life history in this area, as four-year-old Chinook comprise a majority of returns each year. That is, the genetic tests are detecting the differences of contributing parents from each cohort, rather than a hatchery effect.

Analysis of Chiwawa River Collections

To assess the multiple competing hypotheses regarding population differentiation within and among Chiwawa River collections, we found it necessary to organized the Chiwawa genetic data into three data sets: (1) fish origin (hatchery versus natural), (2) spawning location (hatchery broodstock versus in-river (natural) spawners), and (3) four "treatment" groups (1. hatchery-origin hatchery broodstock, 2. hatchery-origin natural spawner, 3. natural-origin natural spawner, and 4. natural-origin hatchery broodstock). We conducted separate analyses using each of the three data sets, with each analysis

touching on some aspect of the components necessary to move through the Conceptual Process outlined by Murdoch and Peven (2005).

Origin Dataset – We report that allele frequencies within and between natural- and hatchery-origin collections are significantly different, but there does not appear to be a robust signal indicating that the recent natural-origin collections have diverged greatly from the pre- or early post-supplementation collections. Genetic drift will occur in all populations, but does not appear to be a major factor affecting allele frequencies within the Chiwawa collections.

Spawning Location Dataset – There are significant allele frequency differences within and between hatchery broodstock and natural spawner collections. However, in recent years the allele frequency differences between the hatchery broodstock and natural spawner collections have declined. Furthermore, based on linkage disequilibrium, there is a genetic signal that is consistent with increasing homogenization of allele frequencies within hatchery broodstock collections, but a similar homogenization within the natural spawner collection is not apparent. These data suggest that there exists consistent year-to-year variation in allele frequencies among hatchery and natural spawning collections, but there is a trend toward homogenization of the allele frequencies of the natural- and hatchery-origin fish that compose the hatchery broodstock.

Four Treatment dataset – Although there are signals of allelic differentiation among Chiwawa River collections, there are no robust signs that these collections are substantially different from each other. We used two different analyses to measure the degree of genetic variation that exists among individuals and collections within the Chiwawa River. First, we conducted a principal component analysis using all Chiwawa samples with complete genotypes (i.e., no missing alleles from any locus). Although the first two principal component axes account for only 10.5% of the total molecular variance, a substantially greater portion of that variance is among individual fish, regardless of their identity, rather than among hatchery and natural collections. The variances in principal component scores among individuals are 11 and 13 times greater than the variance in scores among collections.

Secondly, using an Analysis of Molecular Variance (AMOVA), we were able to determine how best to group populations, with "best" being defined as that grouping that accounts for the greatest proportion of among group (i.e., population) variance. Furthermore, by partitioning molecular variance into different hierarchical components, we are able to determine what level accounts for the majority of the molecular variance. The AMOVA results clearly show that nearly all molecular variation, no matter how the data are organized, resides within a collection. The percentage of total molecular variance occurring within collections ranged from 99.68% to 99.74%. These results indicate that the significant differences among collections of Chiwawa fish account for less than one percent of the total molecular variance, and these differences cannot be attributed to fish origin or spawning location.

Effective Population Size (N_e)

The contemporary estimate of N_e calculated using genetic data combined for Chiwawa natural-origin spawners (NOS) and hatchery-origin spawners (HOS) Chinook is N_e=386.8, which is slightly larger than the pre-hatchery N_e we estimated using demographic data from 1989 – 1992. Additionally, the N_e /N ratio calculated using 386.8 for N_e and the arithmetic mean yearly census of NOS and HOS Chinook from 1989 – 2005 for N is 0.40. These results suggest the N_e has not declined during the period of Chiwawa Hatchery Supplementation Program operation.

Analysis Of Upper Wenatchee Tributary Collections

We compared genetic data for spring Chinook collected from the major spawning aggregates of the Wenatchee River. We observed significant differences in allele frequencies among temporally replicated collections within populations, and among populations within the upper Wenatchee. However, these differences account for a very small portion of the overall molecular variance, and these populations overall are very similar to each other. Of all the populations within the Wenatchee River, the White River appears to be the most distinct. Yet, this distinction is more a matter of detail than of large significance, as the median F_{ST} between White River collections and all other collections (except the Little Wenatchee collection; see Results/Discussion) is less than 1.5% among population variance. We consider the implications of these results in the Conclusion section that follows the Results/Discussion section. Additionally, there is no evidence that the Chiwawa River Supplementation Program has changed the allele frequencies in the Nason Creek and White River populations, despite the presence of hatchery-origin fish in both these systems.

Introduction

Murdoch and Peven (2005) outlined 10 objectives to assess the impact (positive or negative) of hatchery operations mitigating the operation of Rock Island Dam. Two objectives relate to monitoring the genetic integrity of populations:

Objective 3: Determine if genetic diversity, population structure, and effective population size have changed in natural spawning populations as a result of the hatchery program. Additionally, determine if hatchery programs have caused changes in phenotypic characteristics of natural populations.

Objective 5: Determine if the stray rate of hatchery fish is below the acceptable levels to maintain genetic variation between stocks.

This study addresses Objective 3 (above), and documents analyses and results WDFW completed for populations of spring Chinook (*Oncorhynchus tshawytscha*) in the Wenatchee River watershed. This study was not intended to specifically address Objective 5 (above); however, genetic data provide results relevant to Objective 5. The critical component of Objective 3 is to determine if hatchery supplementation has effected change. Furthermore, change in this context means altering census size and/or genetic marker allele frequencies; we did not attempt to measure changes in fitness. Perhaps a more meaningful rewording of Objective 3 is, "Did the hatchery supplementation program succeed at increasing the census size of a target population while leaving genetic integrity intact?" In order to evaluate cause and effect of hatchery supplementation, we surveyed and compared genetic variation in samples collected before and after potential effects from the Chiwawa Hatchery Supplementation Program. Samples were acquired from the primary spawning aggregates in the upper Wenatchee River watershed: Nason Creek, Little Wenatchee River, White River, and Chiwawa River. Hatchery samples were acquired from programs that could potentially affect genetic composition of Wenatchee stocks, the integrated Chiwawa River stock (local stock), Leavenworth National Fish Hatchery spring Chinook (Carson Stock – non local), and Entiat NFH (Carson Stock – non local). Additionally, the genetic markers used were the Genetic Analysis of Pacific Salmonids (GAPS) (Seeb et al. in review) standardized microsatellites, so all data from the Wenatchee study will be available for inclusion in the GAPS Chinook coastwide microsatellite baseline.

History of Artificial Propagation

Artificial propagation in the upper Columbia River began in 1899 when hatcheries were constructed on the Wenatchee and Methow rivers (Mullan 1987). These initial operations were small, with the Tumwater Hatchery on the Wenatchee River releasing several hundred thousand fry, and the Methow River hatchery producing few Chinook salmon before it was closed in 1913 (Craig and Suomela 1941, Nelson and Bodle 1990). The Leavenworth State Hatchery operated in the Wenatchee River Basin between 1913 and 1931 using eggs from non-native stocks (Willamette River spring-run and lower Columbia Chinook hatchery fall-run). These early attempts at hatchery production were largely unsuccessful for spring-run Chinook (WDF 1934). Between 1931 and 1939, no Chinook salmon hatcheries were in operation above Rock Island Dam (Rkm 730).

In 1938, the last salmon was allowed to pass upstream through the uncompleted Grand Coulee Dam (Rkm 959). To mitigate the loss of habitat, adult Chinook salmon were trapped, under the auspices of the Grand Coulee Fish Maintenance Project (GCFMP), at Rock Island Dam beginning in May 1939, and relocated into three of the remaining accessible tributaries to the upper Columbia River: the Wenatchee, Entiat, and Methow Rivers. GCFMP transfers continued through the autumn of 1943. Spring- and summer/fall-run fish were differentiated at Rock Island Dam based on a 9 July cutoff date for Chinook arrivals at Rock Island Dam (Fish and Hanavan 1948). Spring-run adults collected at Rock Island Dam (pre 9 July fish) were either transported to Nason Creek on the Wenatchee River to spawn naturally (1939-43), or to the newly constructed Leavenworth NFH (1940) for holding and subsequent spawning (1940-43). Eggs were incubated on site or transferred to the Entiat NFH (1941) and Winthrop NFH (1941). In 1944 spring-run adults were allowed to freely pass Rock Island Dam. The GCFMP did not differentiate among late-run stocks (post 9 July fish) passing Rock Island Dam. Late-run offspring reared at the Leavenworth NFH, Entiat NFH, and Winthrop NFHs were an amalgamation of summer and fall upper Columbia River populations (Fish and Hanavan 1948). Late-run fish were transplanted into the upper and lower Wenatchee, Methow, and Entiat Rivers.

After 1943, the Winthrop NFH continued to use local spring-run Chinook for hatchery production, while the other NFHs largely focused on summer-run Chinook salmon. Renewed emphasis on spring run production in the mid-1970s saw the inclusion of local and non-local eggs (Carson NFH stock, Klickitat River stock, and Cowlitz River stock) to the NFHs. In the early 1980s, imports of non-native eggs were reduced significantly, and thereafter the Leavenworth, Entiat, and Winthrop NFHs have relied on adults returning to their facilities for their egg needs (Chapman et al. 1995). Regarding late-run Chinook, due to the variety of methods employed to collect broodstock at dams, hatcheries, or the result of juvenile introductions into various areas, Chinook populations and runs (i.e., summer and fall) have been mixed considerably in the upper Columbia system over the past five decades (reviewed in Chapman et al. 1994).

Washington Department of Fish and Wildlife (WDFW) operates two facilities producing spring-run Chinook, the Methow Fish Hatchery (MFH) owned by Douglas County PUD that began operation in 1992 and Eastbank Fish Hatchery (EFH) owned by Chelan County PUD that began operation in 1989. Both programs were designed to implement supplementation (supportive breeding) programs for naturally spawning populations on the Methow and Wenatchee Rivers, respectively (Chapman et al. 1995). As part of the Rock Island Mitigation Agreement between Chelan County Public Utility District and the fishery management parties (RISPA 1989), a supplementation (supportive breeding) program was initiated in 1989 on the Chiwawa River to mitigate smolt mortality resulting from the operation of Rock Island Hydroelectric Project. EFH uses broodstock collected at a weir on the Chiwawa River, although in recent years hatchery fish have been collected at Tumwater Dam. Similarly, the MFHC uses returning adults collected at weirs on the Methow River and its tributaries, the Twisp and Chewuch Rivers (Chapman et al. 1995; Bugert 1998). Although low run size and trap efficiency has resulted in most broodstock being collected from the hatchery outfall or in some years Wells Dam, progeny produced from these programs are reared at and released from satellite sites on the tributaries where the adults were collected. Numerous other facilities have reared spring-run Chinook salmon on an intermittent basis.

Previous Genetic Studies – Population differentiation

Waples et al. (1991a) examined 21 polymorphic allozyme loci in samples from 44 populations of Chinook salmon in the Columbia River Basin. These authors reported three major clusters of Columbia River Basin Chinook salmon: 1) Snake River spring- and summer-run Chinook salmon, and mid and upper Columbia River spring-run Chinook salmon, 2) Willamette River spring-run Chinook salmon, 3) mid and upper Columbia River fall- and summer-run Chinook salmon, Snake River fall-run Chinook salmon, and lower Columbia River fall- and spring-run Chinook salmon. Utter et al. (1995) examined allele frequency variability at 36 allozyme loci in samples of 16 upper Columbia River Chinook populations. Utter et al. (1995) indicated that spring-run populations were distinct from summer- and fall-run populations, where the average genetic distance between spring-run and late-run Chinook were about eight times the average of genetic distances between samples within each group. Additionally, allele frequency differences among spring-run populations were considerably greater than that among summer- and fall-run populations in the upper Columbia River. Utter et al. (1995) also reported hatchery populations of spring-run Chinook salmon were genetically distinct from natural spring-run populations, but hatchery populations of fall-run Chinook salmon were not genetically distinct from natural fall-run populations.

As part of an evaluation of the relative reproductive success for the Chiwawa River supplementation program, Murdoch et al. (2006), used eleven microsatellite loci to assess population differentiation among spring Chinook salmon population samples in the upper Wenatchee River. Murdoch et al. (2006) reported a >99% accuracy of correctly identifying spring-run and fall-run Chinook from the Wenatchee River. They also reported slight, but significantly different genetic variation among wild spring populations and between wild and hatchery stocks. Yet, since the spring-run populations are genetically similar, identifying individuals genetically from the upper tributaries of the Wenatchee River was difficult. This result is exemplified in their individual assignment results, where < 8% of spring-run individuals, hatchery or wild, were correctly assigned using their criterion of an LOD (log of odds) score greater than 2. Murdoch et al. (2006) also reported contemporary natural spring Chinook show heterozygote deficit and low linkage disequilibrium (LD), while contemporary hatchery spring Chinook show heterozygote excess and high LD.

Williamson et al. (submitted) have continued the work of Murdoch et al. (2006) by analyzing Chiwawa River demographic data from 1989 – 2005 to estimate the proportions of recruits that were produced by Chinook with hatchery or wild origin. In an "ideal" population, the genetic size (i.e., effective size or N_e) and the census size are equal; however various demographic factors such as unequal sex ratios and variance in reproductive success among individuals reduces the genetic size below the census size. It is generally thought that the genetic size is approximately 10-33% the census size (Bartley et al. 1992; RS Waples pers. comm.), although values have been reported outside this range (Araki et al. 2007; Arden and Kapuscinski 2003; Heath et al. 2002). Despite being difficult to estimate, the effective population size in many respects is a more important parameter to know than census size, because N_e determines how genetic diversity is distributed within populations and how the forces of evolution (i.e., forces that change genetic diversity over time) will affect the genetic variation present.

Williamson et al. (submitted) used demographic data to 1) investigate the effect of unequal sex ratio on genetic diversity, 2) investigate the effect of variation in reproductive success on genetic diversity, 3) investigate the effect of fluctuations in population size on genetic diversity, and 4) estimate the effective population size, using the inbreeding method (Ryman and Laikre 1991). Most importantly, they use demographic data from 1989 – 2000 to assess the impact of the Chiwawa Hatchery Supplementation Program on the effective population size of natural-origin Chiwawa River spring Chinook. They estimate that the N_e of naturally spawning Chiwawa Chinook (i.e., both hatchery- and wild-origin fish on the spawning grounds) from 1989 –

1992 was N_e = 2683 and in 1997 – 2000 was N_e = 989. They compare spawning ground N_e to estimates calculated from combined broodstock and naturally spawning Chinook demographic data. The combined inbreeding N_e estimate from 1989 – 1992 was N_e = 147 and in 1997 – 2000 was N_e = 490. Williamson et al. (submitted) argue that since the combined N_e estimate is lower than the naturally spawning estimate, the supplementation program has had a negative impact on the Chiwawa River N_e.

Williamson et al. (submitted) also present genetic data for Chinook recovered on spawning grounds in upper Wenatchee River tributaries in 2004 and 2005. These genetic data are derived from the Murdoch et al. (2006) study. They compare samples collected from Chiwawa River (i.e., hatchery and wild), White River, Nason Creek, and Leavenworth Hatchery. Additionally, they include a 1994 Chiwawa River wild smolt sample for comparison with the 2004 brood year. Williamson et al. (submitted) report statistically significant genetic differentiation among Chiwawa River, White River and Nason Creek. Additionally, they report that the 1994 and 2004 Chiwawa River wild samples are not statistically different, but the 2004 Chiwawa wild and hatchery collections are statistically different.

Study Objectives

This study investigated within and among population genetic diversity to assess the effect of the Chiwawa Hatchery's supplemental program on the natural Chiwawa River spring Chinook population. Differences among temporal population samples, the census size, heterozygosity, and allelic diversity were documented. We investigated population differentiation between the Chiwawa River natural and hatchery samples, and among all temporally replicated samples from the Wenatchee River watershed using microsatellite DNA allele frequencies and the statistical assignment of individual fish to specific populations. To assess the genetic effect of the hatchery program, correlation between census and effective population sizes were investigated using temporally replicated samples obtained before and after the supplementation program operation. To address the hypotheses associated with Objective 3 in Murdock and Peven (2005) we developed eleven specific "Tasks" (Blankenship and Murdoch 2006), to which we analyzed specific genetic data. We present the results from these analyses specific to each individual Task.

Methods and Materials

Tissue collection and DNA extraction

We analyzed thirty-two population collections of adult spring Chinook salmon (*Oncorhynchus tshawytscha*) obtained from the Wenatchee River between 1989 and 2006 (Table 1). Nine collections of natural Chinook adults from the Chiwawa River (n=501), and nine collections of Chiwawa Hatchery Chinook (n=595) were collected at a weir located in the lower Chiwawa River. The 1993 and 1994 Chiwawa Hatchery samples are smolt samples from the 1991 and 1992 hatchery brood years, respectively. Additional samples were collected from upper Wenatchee River tributaries, White River, Little Wenatchee River, and Nason Creek. Six collections of natural White River Chinook (n=179), one collection from the Little Wenatchee (n=19), and six collections from Nason Creek (n=268) were obtained. Single collections were obtained for Chinook spawning in the mainstem Wenatchee River and Leavenworth National Fish Hatchery. An additional out-of-basin collection from Entiat River was also included in the analysis. Samples collected in 1992 or earlier are scale samples. All other samples were either fin clips or operculum punches, stored immediately in ethanol after collection. DNA was extracted from stored tissue using Nucleospin 96 Tissue following the manufacturer's standard protocol (Macherey-Nagel, Easton, PA, U.S.A.).

Laboratory analysis

We performed polymerase chain reaction (PCR) amplification on each fish sample using the 13 fluorescently end-labeled microsatellite marker loci standardized as part of the GAPS project (Seeb et al. in review). GAPS genetic loci are: *Ogo*2, *Ogo*4 (Olsen et al. 1998); *Oki*100 (unpublished); *Omm*1080 (Rexroad et al. 2001); *Ots*201b (unpublished); *Ots*208b, *Ots*211, *Ots*212, and *Ots*213 (Grieg et al. 2003); *Ots*3M, *Ots*9 (Banks et al.

1999); *Ots*G474 (Williamson et al. 2002); *Ssa*408 (Cairney et al. 2000). PCR reaction volumes were 10 µL, and contained 1 µL 10x PCR buffer (Promega), 1.0 µL $MgCl_2$ (1.5 mM final) (Promega), 0.2 µL 10 mM dNTP mix (Promega), and 0.1 units/mL Taq DNA polymerase (Promega). Loci were amplified as part of multiplexed sets, so primer molarities and annealing temperatures varied. Multiplex one had an annealing temperature of 50°C, and used 0.37 Molar (M) *Oki*100, 0.35 M *Ots*201b, and 0.20 M *Ots*208b, and 0.20 M *Ssa*408. Multiplex two had an annealing temperature of 63°C, and used 0.10 M *Ogo*2, and 0.25 M of a non-GAPS locus (*Ssa* 197). Multiplex three had an annealing temperature of 56°C, and used 0.18 M *Ogo*4, 0.18 M *Ots*213, and 0.16 M *Ots*G474. Multiplex four had an annealing temperature of 53°C, and used 0.26 M *Omm*1080, and 0.12 M *Ots*3M. Multiplex five had an annealing temperature of 60°C, and used 0.30 M *Ots*212, 0.20 M *Ots*211, and 0.10 M *Ots*9. Thermal cycling was conducted on either a PTC200 thermal cycler (MJ Research) or GeneAmp 9700 (Applied Biosystems) as follows: 95°C (2 min); 30 cycles of 95°C for 30 sec., 30 sec. annealing, and 72°C for 30 sec.; a final 72°C extension and then a 10°C hold. PCR products were visualized by electrophoresis on an ABI 3730 automated capillary analyzer (Applied Biosystems). Fragment analysis was completed using GeneMapper 3.7 (Applied Biosystems). Standardization of genetic data to GAPS allele standards was conducted following Seeb et al. (in review).

Genetic data analysis

Assessing within population genetic diversity - Heterozygosity measurements are reported using Nei's (1987) unbiased gene diversity formula (i.e., expected heterozygosity) and Hedrick's (1983) formula for observed heterozygosity. Both tests are implemented using the microsatellite toolkit (Park 2001). We used GENEPOP version 3.4 (Raymond and Rousset 1995) to assess Hardy-Weinberg equilibrium (HWE), where deviations from the neutral expectation of random associations among alleles are calculated using a Markov chain method (5000 iterations in this study) to obtain unbiased estimates of Fisher's exact test. Global estimates of F_{IS} according to Weir and Cockerham (1984) were calculated using GENEPOP version 3.4. Genotypic linkage disequilibrium was calculated following Weir (1979) using GENEPOP version 3.4.

Linkage results for population collections are reported as the proportion of pairwise (locus by locus) tests that are significant (alpha = 0.01). Linkage disequilibrium is considered statistically significant if more than 5% of the pairwise tests based on permutation are significant for a collection.

Within- and among-population genetic differentiation – The temporal stability of allele frequencies within populations, and pairwise differences in allele frequencies among populations were assessed using several different procedures. First, we tested for differences in allele frequencies among populations defined in Table 1 using a randomization chi-square test implemented in GENEPOP version 3.4 (Raymond and Rousset 1995). This procedure tests for differences between pairs of populations where alleles are randomized between the populations (i.e., genic test). The null hypothesis for this test is that the allele frequency distributions between two populations are the same. A low p-value should be interpreted as the allele frequency distributions being compared are unlikely to be samples drawn from the same underlying distribution.

Second, to graphically describe allele frequency differences among populations we conducted a nonmetric multidimensional scaling analysis using allele-sharing distance matrices from two different data sets. Pairwise allele-sharing distances are calculated as 1 – (mean over all loci of the sums of the minima of the relative frequencies of each allele common to a pair of populations). To calculate the allele-sharing distances for each pair of populations we used PowerMarker v3.25 (Liu and Muse 2005). Nonmetric multidimensional scaling is a technique designed to construct an n-dimensional "map" of populations, given a set of pairwise distances between populations (Manly 1986). The output from this analysis is a set of coordinates along n-axes, with the coordinates specific to the number of n-dimensions selected. To simplify our analysis we selected a 2-dimensional analysis to represent the relative positions of each population in a typical bivariate plot. The goodness of fit between the original allele-sharing distances and the pairwise distances between all populations along the 2-dimensional plot is measured by a "stress" statistic. Kruskal (in Rohlf 2002) developed a five-tier guide for evaluating stress levels, ranging from a perfect fit (stress=0) to a poor fit (stress=0.40). We conducted the nonmetric multidimensional scaling analysis for one data set containing Chiwawa natural- and hatchery-origin collections, and another data set containing Chiwawa broodstock and in-river spawner collections. We used the mdscale module in MATLAB R2006b (The Mathworks 2006) to generate the nonmetric multidimensional scaling coordinates.

We examined the geographic and temporal structure of populations in the upper Wenatchee (Chiwawa River, Nason Creek, and White River, only) using a series of analyses of molecular variance (AMOVAs). Here, we defined an AMOVA as an analysis of variance of allele frequencies, as originally designed by Cockerham (1969), but implemented in Arlequin v2.1 (Schneider et al. 2000). These analyses permit populations to be aggregated into groups, and molecular variance is then partitioned into within collections, among collections, but within groups, and among group components. With this approach, we were able to determine how best to group populations, with "best" being defined as that grouping that accounts for the greatest proportion of among group variance. Furthermore, by partitioning molecular variance into three different hierarchical components, we are able to determine what level accounts for the majority of the molecular variance.

Finally, we explored the partitioning of molecular variance between among-individuals and among-populations using a principal component analysis and multi-locus estimates of pairwise F_{ST}, estimated by a "weighted" analysis of variance (Weir and Cockerham, 1984). Principal component analysis is a data-reduction technique whereby the correlation structure among variables can be used to combine variables into a series of multivariate components, with each original variable receiving a weighted value for each component based on its correlation with that component. Here, we used a program written by Warheit in MATLAB R2006b (The Mathworks 2006) that treats each allele for each locus as a single variable (13 loci = 26 alleles or variables), and these 26 "variables" were arranged into 26 components, with each component accounting for a decreasing amount of molecular variance. Estimates of F_{ST} were calculated using GENETIX version 4.05 (Belkhir et al.1996). To determine if the F_{ST} estimates were statistically different from random (i.e., no structure), 1000 permutations were implemented in GENETIX version 4.05 (Belkhir et al.1996).

Effective population size (N_e) – Estimates of the effective population size were obtained using two methods, a multi-collection temporal method (Waples 1990), and a single-collection method (Waples 2006) using linkage disequilibrium data. The temporal method assumes that cohorts are used, but we did not decompose the collection year samples into their respective cohorts using age data. Therefore, N_e estimates that pertain to individual year classes of breeders are not valid; however the harmonic mean over all samples will estimate the contemporary N_e. Comparing samples from years *i* and *j*, Waples' (1990) temporal method estimates the effective number of breeders ($\hat{N}_{b(i,j)}$) according to:

$$\hat{N}_{b(i,j)} = \frac{b}{2(\hat{F} - 1/\hat{S}_{i,j})}$$

The standardized variance in allele frequency ($\hat{F}$) is calculated according to Pollack (1983). The parameter b is calculated analytically from age structure information and the number of years between samples (Tajima 1992). The age-at-maturity information required to calculate b was obtained from Murdoch et al. (2006) for this analysis. They observed for Chiwawa Hatchery Chinook that 8.6% matured at age 2, 4% at age 3, 87% at age 4, and 0.4% at age 5. For Chiwawa natural Chinook, Murdoch et al. (2006) observed that 1.8% matured at age 3, 81.6% at age 4, and 16.7% at age 5. The harmonic mean of sample sizes from years *i* and *j* is $\tilde{S}_{i,j}$. Over all pairwise comparisons the harmonic mean of all $\hat{N}_{b(i,j)}$ is $\tilde{N}_b$, the contemporary estimate of the effective population size (N_e). SALMONNb (Waples et al. 2007) was used to calculate $\tilde{N}_b$. As suggested by authors, alleles with a frequency below 0.05 were excluded from the analysis to reduce potential bias.

The method of Waples (2006) uses linkage disequilibrium (i.e., mean squared correlation of allele frequencies at different gene loci) as a means of estimating effective population size (N_e) from a single sample. While this method is biased in some cases where N_e /N ratio is less the 0.1 and the sample size is less than the true N_e, it has been shown to produce comparable results to the temporal method. Burrows' delta method is used to estimate LD, and a bias corrected estimate of N_e is calculated after eliminating alleles with frequency less than 0.05. This test was implemented using LDN_e (Do and Waples unpublished). In age-structured species, N_e estimates based on LD are best interpreted as the effective number of breeders (N_b) that produced the sample (Waples 2006). N_b should be multiplied by the mean generation length (i.e., 4 in this case) to obtain an overall estimate of N_e based on an N_b estimate. We analyzed collections categorized by spawning location (i.e., hatchery broodstock or in-river) and did not analyze collections categorized by origin (i.e., hatchery or natural). Waples' (2006) method estimates N_e from observed LD, therefore the corresponding N_e estimates for the hatchery collections would be low and the estimates for the natural collections would be high. Yet, since the supplementation program is integrated, and hatchery fish can spawn naturally, we feel it inappropriate to analyze the hatchery and natural samples as if they were separate, which would essentially partition all the LD into the hatchery samples.

Each collection has an N_b estimate and an associated confidence interval. If the confidence interval includes infinity, it means that sampling error accounts for all the LD observed (i.e., empirical LD is less than expected LD). The usual interpretation is that there is no evidence for any disequilibrium caused by genetic drift in a finite number of parents. Since the LD method estimates the number of breeders that contributed to the sample being analyzed, in order to calculate an N_e /N ratio, the appropriate census size must be used. The census size used to derive a ratio was the estimate four years prior to the collection analyzed using LD, which assumed a strict four-year-old lifecycle, although the observed proportion of four-year-olds was approximately 85% each year. The census numbers (Table 2) used to calculate the ratios for Chiwawa broodstock and in-river spawners were combined NOS (natural-origin spawners) and HOS (hatchery-origin spawners) census estimates.

Individual assignment – A population baseline file was constructed containing all 1704 individual Chinook from 34 population collections (Table 1; Chiwawa origin data set plus all samples from other populations). All individuals in the baseline had geneotypes that included nine or more loci. Individual Chinook were assigned to their most likely population of origin based on the partial Bayesian criteria of Rannala and Mountain (1997), using a "jack-knife" procedure, where each individual to be assigned was removed from the baseline prior to the calculation of population likelihoods. This procedure was implemented in a program written by Warheit in MATLAB R2006b (The Mathworks 2006). Two assignment criteria were used, 1) the population with the largest posterior probability for an individual was the "most-likely" population of origin (i.e., all individuals assigned to a collection), and 2) an assignment was consider valid only if the posterior probability was greater than or equal to 0.9. Please note that while the analysis used 34 population collections to assign Rannala and Mountain likelihoods for each individual, these likelihoods were aggregated based on "population" (i.e., Chiwawa, Nason, White, and so on) and posterior probabilities were calculated for population location, rather than individual collections.

Results and Discussion

In this section we combine our presentation and interpretations of the genetic analyses. Additionally, this section will be organized based on the task list presented in the study plan. Overall conclusions are provided following this section.

<u>Task 1:</u> Determine trend in census size for Chiwawa River spring Chinook.

Census data from 1989 – 2005 are provided in Table 2 for the Chiwawa Hatchery broodstock and spring Chinook present in the Chiwawa River. The demographic data for naturally spawning Chinook are based on redd sampling and carcass surveys, while broodstock data are based on Chiwawa hatchery records. As the supplementation program is integrated by design, we also present the proportion of natural-origin broodstock (pNOB) incorporated into the hatchery, in addition to the number of natural-origin (NOS) and hatchery-origin (HOS) spawners present in Chiwawa River. The census size fluctuated yearly, and a general reduction in census size was observed in the mid to late 1990's. This trend was apparent in both the broodstock and in the river. The arithmetic mean census size from 1989 – 2005 for the Chiwawa Hatchery (i.e., broodstock) was N=87.5 per year. The arithmetic mean census size from 1989 – 2005 for the Chiwawa River (i.e., NOS and HOS combined) was N=961.9 per year. For collection years when adult Chiwawa hatchery-origin fish would have been absent in the Chiwawa River (1989 – 1992), the arithmetic mean of natural Chiwawa Chinook census size is N=962.7. We will use this number as the baseline census size to assess if census size has changed. We used two different values for the contemporary census size in the Chiwawa River, NOS only and NOS + HOS. Additionally, we used collection years 2002 – 2005 for the contemporary NOS and HOS estimates, as these are the most recent data and the number of years included for estimation is the same as the pre-hatchery estimate above (i.e., four years). For NOS only, the arithmetic mean census size from 2002 – 2005 was N=536.0. For total census size (i.e., NOS and HOS combined), the arithmetic mean census size from 2002 – 2005 was N=1324.0. For the demographic data presented here, the contemporary census size is larger than the census estimate derived from the years prior to hatchery operation.

<u>Task 2:</u> Document the observed genetic diversity.

Genetic Diversity Categorized By Origin

For Chiwawa River collections categorized by origin (Table 1A), substantial genetic diversity was observed, with heterozygosity estimates over all loci, having a mean of 0.80. Genetic diversity was consistent with expected Hardy-Weinberg random mating genotypic proportions for ten of the eighteen collections. Eight of the nine Chiwawa natural collections were consistent with HWE, and two of nine Chiwawa Hatchery collections were consistent with HWE. F_{IS} is observed to be slight for all Chiwawa population collections, suggesting individuals within collections do not show excessive homozygosity.

The deviations from HWE observed were generally associated with hatchery collections. The two smolt collections (i.e., 1993 and 1994) showed significant deviations from HWE, which may be a function of non-random hatchery practices involving the contributing natural-origin parental broodstocks (i.e., 1991 and 1992 cohort). Deviations from HWE in the remaining hatchery collections may be the result of few individuals being represented in the broodstock (see below).

Additionally, linkage disequilibrium (LD) was also common for Chiwawa hatchery-origin collections and minimal for Chiwawa natural-origin collections. The random association of alleles between loci (i.e., linkage equilibrium) is expected under ideal conditions. LD is observed when particular genotypes are encountered more than expected by chance. Laboratory artifacts (e.g. null alleles) or physical linkage of loci on the same chromosome can cause LD, but the LD we observed was not associated with certain locus combinations, which you would expect if either artifacts or physical linkage were the cause of LD. LD was observed for seven of the nine hatchery-origin collections. As with the deviations from HWE, the high LD in the 1993 and 1994 hatchery-origin collections may be a result of non-random hatchery practices. The substantial LD observed in the hatchery-origin adult collections (collection years 2000, 2001, 2004, and 2006) might be the result of small parental broodstock sizes contributing to those returning adults. During the mid 1990's, the Chiwawa broodstock size was low, with zero individuals collected in 1995 and 1999; so fewer individuals would be contributing to the hatchery adult returns than the natural. This idea is corroborated by the lower LD observed for the 2005 hatchery-origin collection, which had a contributing parental broodstock size in 2001 (i.e., the major contributing parental generation) approximately eight times as large as the previous few collection years (Table 2). LD reappears in the 2006 Chiwawa hatchery-origin collection, which had a contributing parental broodstock size (i.e., for the most-part, the 2002 hatchery brood year) five times lower (Table 2) than that of the 2005 collection.

While seven of nine hatchery-origin collections showed significant LD, only one natural origin collection showed LD, and for this collection, only 10% of the loci-pairs were in disequilibrium (Table 1). The fact that LD predominated in the hatchery samples, suggests that variance in reproductive success (i.e., overrepresentation of particular parents) is higher in the hatchery-origin than in natural-origin collections.

Genetic Diversity Categorized By Spawning Location

For upper Wenatchee River collections categorized by spawning location (Table 1B), substantial genetic diversity was observed, with heterozygosity estimates over all loci, having a mean of 0.79 and ranging from a low of 0.69 (1993 White River) to 0.85 (1993 Little Wenatchee). Genetic diversity was consistent with HWE for nineteen of twenty-nine population collections. For the collections that departed from HWE, seven were from the Chiwawa River, one was from Leavenworth Hatchery, one was the Wenatchee mainstem collection of hatchery-origin – naturally spawning fish, and one was from the White River. F_{IS} is observed to be slight for all population collections except the 1993 White River collection (10% heterozygote deficit) (Table 1B). Collections deviating with HWE generally correlated with collections having high LD. Twelve population collections showed a proportion of pairwise linkage disequilibrium tests (across all loci) greater than 5% (Table 1B), eight of which were Chiwawa collections.

Starting in 1996, spawning location collections are composed of both natural- and hatchery-origin samples. The LD seen in the later spawning location collections may be caused by an admixing effect (i.e., mixing two populations), where random mating has not had the chance to freely associate alleles into genotypes. Interestingly, there appears to be a trend of reducing LD through time within the broodstock collections (Table 1B), which suggests that a "homogenizing" effect is taking place within the Chiwawa River. This observation is discussed more fully in Task 3 below.

<u>Task 3:</u> Test for population differentiation among collections within the Chiwawa River and associated supplementation program.

Introduction

Task 3 was designed to address two hypotheses listed as part of Objective 3 in Murdoch and Peven (2005):

- Ho: Allele frequency $_{\text{Hatchery}}$ = Allele frequency $_{\text{Naturally produced}}$ = Allele frequency $_{\text{Donor pop}}$.
- Ho: Genetic distance between subpopulations $_{\text{Year x}}$ = Genetic distance between subpopulations $_{\text{Year y}}$

Murdoch and Peven (2005) proposed these two hypotheses to help evaluate the Chiwawa supplementation program through the "Conceptual Process" (Figure 5 in Murdoch and Peven 2005; repeated here as Figure 1). There are two components to the first hypothesis, which must be considered separately. The first component involves comparisons between natural-origin populations in the Chiwawa to determine if there have been changes in allele frequencies or genetic distances, through time starting with the donor population. Documenting a change does not necessarily indicate that the supplementation program has directly affected the natural origin fish, as additional tests would be necessary to support that hypothesis. The intent of the second component is to determine if the hatchery produced populations have the same genetic composition as the naturally produced populations.

Although on the surface these two components and their associated comparisons may appear simple, from a hypothesis-testing perspective the analyses are complicated by the fact that natural-origin fish may have had hatchery-origin parents, and hatchery-origin fish may have had natural-origin parents. As such, we organized the Chiwawa genetic data into three data sets: (1) fish origin (hatchery versus natural), (2) spawning location (hatchery broodstock versus in-river (natural) spawners), and (3) four "treatment" groups (1. hatchery-origin hatchery broodstock, 2. hatchery-origin natural spawner, 3. natural-origin natural spawner, and 4. natural-origin hatchery broodstock). We conducted separate analyses using each of the three data sets, with each analysis touching on some aspect of the components necessary to move through the Conceptual Process (Figure 1).

Hatchery- Versus Natural-Origin

We address the following questions with the origin data set:

1. Are there changes in allele frequencies and allele sharing distances in the natural-origin collections from pre-supplementation to today?
2. Are there changes in allele frequencies and allele sharing distances in the hatchery-origin collections from early supplementation to today?
3. Are there significant differences in allele frequencies and large allele sharing distances between hatchery- and natural-origin adults from a collection year, and has this pattern changed through time?

Genic Differentiation Tests – We explicitly tested the hypothesis of no significant differentiation within natural- or hatchery-origin collections from the Chiwawa River using a randomization chi-square test. We show the results for the pairwise comparisons among natural-origin collections from the Chiwawa River populations in the first block of the second page of Table 3. Ten of the 36 (28%) pairwise comparisons have highly significant allele frequency differences, while only 12 of the 36 comparisons (33%) showed no significant differences. Eight of these 12 comparisons involved the 1996 collection, which included only eight samples and therefore provided little power to differentiate allele frequencies. If we exclude the 1996 collection, only 14% of the pairwise comparisons showed no significant differences, and here all but one of these comparisons involved the 1989 collection. The 1989 collection appeared to be the least differentiated collection in the natural-origin data set in that all pairwise comparisons were either not significant, or only mildly significant at the nominal critical value. No comparisons involving the 1989 collection were significant using a Bonferroni-corrected critical value, and 1989 is the only natural-origin collection in our data set that can be classified as "pre-supplementation."

We can interpret these results to indicate that although there appears to be significant year-to-year differences in allele frequencies among post-supplementation collections, the allele frequencies between each post-supplementation collection and the 1989 pre-supplementation collection are not greatly different. However, the level of differentiation does increase from the early post-supplementation years to the more recent years (2001, 2004-2006), although the statistical level of this significance never exceeds the Bonferroni-corrected critical value. Finally, sample sizes were also small for the 1989 collection (n = 36) and we cannot eliminate a reduction in power as a contributing factor for the lack of significance for these tests.

As with the hatchery-origin collections, most pairwise comparisons of allele frequencies between hatchery-origin samples were significant (Table 3, first page, upper block). Out of the 36 pairwise comparisons, all but three are significant at some level, and most comparisons are highly significant. Similar to the natural-origin analysis, the non-significant results were limited to comparisons involving the 1996, which included only eight samples.

As a result of this analysis *we reject the hypothesis that there was no significant differentiation among natural- or hatchery-origin collections from the Chiwawa River*. Furthermore, the allele frequencies of the hatchery-origin collections are significantly different from those of natural-origin collections (Table 3, first page, second block). For those fish collected in the same year, allele frequencies are significantly different between hatchery- and natural-origin collections, although in 2005 the level of significance was below the Bonferroni critical value (Table 3). The next step is to examine the pattern of allelic differentiation to discover first if there is a trend among the data, and second, if this trend suggests that the allele frequency differences among Chiwawa River natural-origin fish collections has been affected by the hatchery-origin fish.

Allele-sharing and Nonmetric Multidimensional Scaling – We constructed a pairwise allele-sharing distance matrix for all hatchery- and natural-origin collections from the Chiwawa River and subjected this matrix to a nonmetric multidimensional scaling analysis, restricting the analysis to two dimensions (Figure 2). The stress statistic for this analysis is 0.09, a value Kruskal (in Rohlf 2002) listed as a good to excellent fit between the actual allele-sharing distances and the Euclidean (straight-line) distances in the plot.

In other words, Figure 2 is a good visual representation of the allele sharing distance matrix; collections with a high percentage of alleles shared will be closer to each other than collections with a lower percentage of alleles shared.

With the exception of the two outlier years (1996 and 1998) the Chiwawa natural-origin collections form a tight cluster indicating an overall common set of shared alleles among these collections. Even if we ignore the 1996 and 1998 hatchery-origin collections, there appears to be a greater variance in shared alleles among the Chiwawa hatchery-origin collections than the natural-origin collections (Figure 2). In fact, the median percentage of alleles shared among the Chiwawa natural-origin collections is 76% compared with 69% alleles shared among the Chiwawa hatchery-origin collections.

Also, there appears to be a convergence in allele sharing distances (i.e., a decrease in allele frequency differences) between the hatchery- and natural-origin fish from the late 1980s/early 1990s to 2006. The series of red arrows in Figure 2 represent the progression of change in hatchery-origin allele sharing distances from 1996 (first adult hatchery origin fish in our analysis) to 2006 and this progression is decidedly in the direction of the natural-origin cluster. However, the most recent natural-origin collections (2001, 2004-2006) appear to have pulled closer to the hatchery-origin collections, compared with the 1989 natural-origin collection (note the close proximity of the 2000 and 1989 natural-origin collections). Nevertheless, the cluster of natural-origin collections adjacent to the hatchery-origin collections in Figure 2 also includes the 1993 natural-origin collection. Qualitatively, it appears that the initial hatchery-origin and natural-origin collections were more different from each other in terms of the percentage of shared alleles than are the most recent hatchery- and natural-origin collections. This may have been a result of a non-random sample of natural-origin fish that was used as broodstock in the initial years of the supplementation program (see discussion in Task 2 concerning deviations from HWE and linkage disequilibrium).

That being said, we do need to emphasize that Figure 2 is dominated by five outlier collections (two each from the 1996 and 1998 collections, and the 1994 smolt collection).

The 1996 and 1998 collections are characterized by small samples sizes, and the 1994 smolt collection has nearly all pairs of loci in linkage disequilibrium (Table 1). If we eliminate these five outlier groups, both the hatchery- and natural-origin collections form a relatively tight cluster. Excluding the five outliers, the median percentage of shared alleles among all pairwise combinations of Chiwawa hatchery versus Chiwawa natural collections is 76%. This compares with a median pairwise percentage of 79% among only Chiwawa natural-origin collections. That is, there are nearly as many alleles shared between the hatchery-origin and natural-origin collections as there are among the natural-origin collections themselves. There is also a narrowing of differences between natural- and hatchery-origin fish from the same collection years from 1993 (76% shared alleles) through 2006 (83% shared alleles).

If allelic differentiation among collections is a function of genetic drift, we would expect a positive correlation between the number of years between two collections and the allele sharing distance. That is, if genetic drift is the primary cause of allele frequency differences between two collections, the greater the number of years between the two collections the larger the allele-sharing distance. For both the natural- and hatchery-origin collections we examined the relationship between the number of years between a pair of collections and the collections' allele-sharing distance (Figure 3). Although the relationship between time interval and allele distance appears to be a positive function in the natural collections, the slope of the regression line is 0.0017, and is not significantly different from zero. Furthermore, the correlation coefficient (r^2) equals 0.1068, which means that the time interval between collections accounts for only 10% of the pairwise differences in allelic distance. The hatchery-origin collections do show a significantly positive slope (0.0037; $p = 0.0254$) and a regression coefficient nearly three times greater than that for the natural-origin collections. However, the correlation coefficient is still relatively small ($r^2 = 0.3290$), indicating that the time interval between collections accounts for one-third of the pairwise differences in allelic distance. The results suggest that if genetic drift is a factor in allelic differentiation between collections, it is only a minor factor, and appears to have affected the hatchery-origin collections more than the natural-origin collections.

If four-year-old fish dominate each collection year, we would expect a closer relationship among collections that are spaced at intervals of four years. The average percentage of alleles shared between two natural-origin collections that are separated by four years or a multiple of four years is 81%, compared with 78% for natural-origin collections separated by years that are not divisible by four. Likewise, for hatchery-origin collections the average percentage of alleles shared is 80% and 75% for collections separated by years divisible and not divisible by four, respectively. Although the percent differences described above are relatively small, they are consistent with the idea that allelic differences between collections are a function of year-to-year variability among different cohorts of four year-old fish.

Summary – The allele frequencies within and between natural- and hatchery-origin collections are significantly different, but there does not appear to be a robust signal indicating that the recent natural-origin collections have diverged greatly from the pre- or early post-supplementation collections. Genetic drift will occur in all populations, but does not appear to be a major factor with the Chiwawa collections. We propose that the differences among collections are a function of differences in allele frequencies among cohorts of the four year-old fish that dominate each collection.

Hatchery Broodstock Versus Natural (In-River) Spawners

We address the following questions with the spawner data set:

1. Are there changes in allele frequencies and allele sharing distances in the natural spawning collections from pre-supplementation to today?
2. Are there changes in allele frequencies and allele sharing distances in the hatchery broodstock collections from early supplementation to today?
3. Are there significant differences in allele frequencies and large allele sharing distances between hatchery and natural spawning adults from a collection year, and has this pattern changed through time?

Genic Differentiation Tests – For the most part there are significant differences in allele frequencies among collections for both the hatchery broodstock and natural spawners (Table 4), and these differences are consistent with the origin data set (Table 3). There are four collection years with paired samples (2001, 2004-2006) where we can compare allele frequency differences between the hatchery broodstock and natural spawners, within the same year. The 2001 hatchery broodstock and natural spawner collections have significantly different allele frequencies, but the level of significance decreased from 2001 to 2004, and become non-significant in 2005 and 2006 (Table 4). This indicates that by 2005, the hatchery broodstock and natural spawners collections were effectively sampling from the same population of fish. Additionally, the percentage of alleles shared between the hatchery broodstock and the natural spawners increased from 76% in 2001 to 86% in 2006 (allele sharing distance matrix, not shown). From this analysis, we conclude that although there are year-to-year differences in allele frequencies within the natural and hatchery spawner collections, *there appears to be a convergence of allele frequencies within collection-year, between the natural and hatchery spawner populations*.

Linkage Disequilibrium – Linkage disequilibrium is the correlation of alleles between two loci, and can occur for several reasons. If two loci are physically linked on the same chromosome, than alleles from each of these loci should be correlated. However, linkage between two loci can occur as a result of population bottlenecks, small population sizes, and natural selection. If any of these conditions had occurred or were occurring within the Chiwawa River system, we would expect to find substantial linkage disequilibrium in many or perhaps all Chiwawa collections. However, many Chiwawa collections, especially the natural-origin collections, do not show linkage disequilibrium (Table 1), and it would appear that the linkage disequilibrium within certain Chiwawa collections is not a function of the processes listed above. Linkage disequilibrium can also result if the collection is composed of an admixture. That is, if two or more reproductively isolated populations are combined into a single collection, the collection will show linkage disequilibrium. Each broodstock and natural spawning collection is composed of natural- and hatchery-origin fish. If these hatchery- and natural-origin fish are drawn from the same population, the spawning collections should not show substantial linkage disequilibrium. However, if the hatchery- and natural-origin fish are from different populations (i.e., full hatchery – natural integration has not been achieved), the spawning collections should show substantial linkage disequilibrium.

There are only three Chiwawa spawning collections that are not composed of both hatchery- and natural-origin samples: 1989 (natural-origin, natural spawner), 1993 (natural-origin, hatchery broodstock), and 2001 (natural-origin, natural spawner). Of the 10 spawning collections with both hatchery- and natural-origin fish, seven show significant linkage disequilibrium. Two of the three collections that did not show linkage disequilibrium are the 1996 and 1998 hatchery broodstock collections, which are composed of only seven natural- and six hatchery-origin fish, and two natural- and 19 hatchery-origin fish, respectively. Within the hatchery broodstock collections with linkage disequilibrium, the percent of loci pairs showing linkage decreased from 32% in 2000 to 13% in 2001 and 2004, to only 1% and 5% in 2005 and 2006, respectively (Table 1). If the homogenization of allele frequencies of natural- and hatchery-origin fish was increasing from 2000 to 2006, we would expect a decrease in linkage disequilibrium among the broodstock collections. This is what occurred within the hatchery broodstock collections, but did not occur within the natural spawner collections, where the percent of loci pairs showing linkage was 18% in 2004, 6% in 2005, and 10% in 2006 (Table 1). Furthermore, the 2001 natural spawner collection, with no hatchery-origin component showed linkage disequilibrium with 9% of loci pairs.

There is no correlation between percent of loci pairs showing linkage disequilibrium and percent of broodstock composed of hatchery-origin fish ($r^2 = 0.0045$). Furthermore, the natural spawner and hatchery broodstock collections were each composed of roughly the same average percentage of hatchery-origin fish (57% and 53%, respectively). If the decrease in linkage disequilibrium among the hatchery broodstock collections from 2000 to 2006 was a result of a homogenization of allele frequencies of natural- and hatchery-origin fish in the broodstock, the same degree of homogenization did not occur within the natural spawner collections. This would occur if natural- and hatchery-origin fish spawning within the river remain segregated, either by habitat or by fish behavior.

Summary – As with the origin data set, there are significant allele frequency differences within and between hatchery broodstock and natural spawner collections. However, in recent years the allele frequency differences between the hatchery broodstock and natural spawner collections has declined. Furthermore, based on linkage disequilibrium, there is a genetic signal that is consistent with increasing homogenization of allele frequencies within hatchery broodstock collections, but a similar homogenization within the natural spawner collection is not apparent. These data suggest that there exists consistent year-to-year variation in allele frequencies among hatchery and natural spawning collections, but there is a trend toward homogenization of the allele frequencies of the natural- and hatchery-origin fish that compose the hatchery broodstock.

Four Treatment Groups

Analyses of genetic differences between hatchery (broodstock) and natural spawner collections is confounded by the fact that each these two groups are composed of fish of natural- and hatchery-origin. To understand the effects of hatchery supplementation on *natural-origin fish that spawn naturally*, we needed to divide the Chiwawa data set into four mutually exclusive groups: (1) hatchery-origin hatchery broodstock, (2) hatchery-origin natural spawner, (3) natural-origin hatchery broodstock, and (4) natural-origin natural spawner, with each group consisting of multiple collection years, for a total of 25 different groups.

Allele-sharing and Nonmetric Multidimensional Scaling –As with previous analyses discussed above, we constructed a pairwise allele-sharing distance matrix for all collections from each of these treatment groups and subjected this matrix to a nonmetric multidimensional scaling analysis, restricting the analysis to two dimensions. Figure 4 shows that five outlier groups dominate the allele-sharing distances within this data set. These outlier groups are also present in Figure 2, as discussed above, and Figure 2 and 4 resemble each other because the same fish are included in each analysis. The difference between Figures 2 and 4 is that in Figure 4 the fish are grouped into collection year and the four treatment groups, rather than collection year and two treatment groups (hatchery- versus natural-origin).

Figure 4 does not provide useful resolution of the groups within the polygon, because the outlier groups dominate the allele sharing distances. We removed the five outlier groups from Figure 4, recalculated the allele sharing distances and subjected this new matrix to a multidimensional scaling analysis (Figure 5). Figure 5 shows separation among the 2001, 2004-2006 collections, but this separation does not necessarily indicate that within-year collections are more similar to each other than any collection is to a collection from another year. For example, the 2006 natural-origin natural spawner and the 2005 natural-origin hatchery broodstock collections share 81% alleles, while the 2006 natural-origin natural spawner and 2006 hatchery-origin hatchery broodstock collections share 75% alleles. There does not appear to be any discernable pattern of change in allele-sharing distance among the collections relevant to pre- or post-supplementation. Although the 1989 pre-supplementation natural-origin collection appears distinct (Figure 5), the 1993 natural-origin hatchery broodstock collection appears quite similar to the 2005 and 2006 natural-origin collections (Figure 5). The 1993 natural-origin hatchery broodstock collection, although not technically pre-supplementation, is composed of fish whose ancestry cannot be traced to any Chiwawa hatchery fish. Therefore, there is no clear pattern of allele sharing change from pre-supplementation to recent collections.

There does appear to be some change in the average percentage of alleles shared within the 2001 to 2006 collections, with an increase from 74% in 2001 and 2004 to 78% and 79% in 2005 and 2006, respectively. The results provided by this analysis are consistent with the results presented in the origin and spawner data sets. That is, there are allele frequency and allele sharing differences among the collections, but analyses do not strongly suggest that these differences are a function of the supplementation program. Furthermore, there is also a weak signal that the hatchery and natural collections within the most recent years are more similar to each other than in the previous years.

Overall Genetic Variance – Although there are signals of allelic differentiation among Chiwawa River collections, there are no robust signs that these collections are substantially different from each other. We used two different analyses to measure the degree of genetic variation that exists among individuals and collections within the Chiwawa River. First, we conducted a principal component analysis using all Chiwawa samples with complete genotypes (i.e., no missing alleles from any locus). Although the first two principal component axes account for only 10.5% of the total molecular variance, a substantially greater portion of that variance is among individual fish, regardless of their identity, rather than among hatchery and natural collections (Figure 6). The variances in principal component scores among individuals are 11 and 13 times greater than the variance in scores among collections, along the first and second axes, respectively.

Second, we conducted a series of analyses of molecular variance (AMOVA) to ascertain the percentage of molecular variance that could be attributed to differences among collections. We organized these analyses to test also for differences in the hierarchical structure of the data. That is, we tested for differences among collections using the following framework:

- No organizational structure – all 25 origin-spawner collections considered separately
- Origin-spawner collections organized into 10 collection year groups
- Origin-spawner collections organized into 2 breeding location groups (hatchery versus natural)
- Origin-spawner collections organized into 2 origin groups (hatchery versus natural)
- Origin-spawner collections organized into the 4 origin-spawner groups

It is clear from this analysis that nearly all molecular variation, no matter how the data are organized, resides within a collection (Table 5). The percentage of total molecular variance occurring within collections ranged from 99.68% to 99.74%. The among group variance component was limited to less than 0.26% and in all organizational structures, except “no structure,” the among group percentage was not significantly greater than zero. Furthermore, none of the organizational structures provided better resolution than “no structure” in terms of accounting for molecular variance within the data set. *These results indicate that if there are significant differences among collections of Chiwawa fish, these differences account for less than one percent of the total molecular variance, and these differences cannot be attributed to fish origin or spawning location.*

Summary and Conclusions

We reject the null hypothesis that the allele frequencies of the hatchery collections equal the allele frequencies of the natural collections, which equals the allele frequency of the donor population. Furthermore, because the allele-sharing distances are not consistent within and among collections years, we also reject the second stated hypothesis discussed above. However, there is an extremely small amount of genetic variance that can be attributed to among collection differences. The allelic differentiation that does exist among collections does not appear to be a function of fish origin, spawning location, genetic drift, or collection year. Figure 5 and related statistics does suggest that hatchery and natural collections in 2005 and 2006 are more similar to each other than previous years’ collections, and this would be expected in a successful integrated hatchery supplementation program.

Since each of these collection years are generally composed of four-year-old fish, the differentiation among these collections for the most part is differentiation among specific cohorts. The slightly greater percentage of alleles shared among collections that are separated in time by multiples of four years, compared with collections that are not separated in time as such, suggests that cohort differences may be the most important factor accounting for differences in allele frequencies among collections.

Task 4: Develop a model of genetic drift.

See Task 3

<u>Task 5:</u> Analyze spring Chinook population samples from the Chiwawa River and Chiwawa Hatchery from multiple generations.

See Task 3

<u>Task 6:</u> Analyze among population differences for upper Wenatchee spring Chinook.

Supplementation of the Chiwawa River spring Chinook population may affect populations within the Wenatchee River watershed other than the Chiwawa River stock. If the stray rate for Chiwawa hatchery-origin fish is greater than that for natural-origin fish, an increase in gene flow from the Chiwawa population into other populations may result. If this gene flow is high enough, Chiwawa River fish may alter the genetic structure of these other populations. Records from field observations indicate that hatchery-origin fish are present in all major spawning aggregates (A.R Murdoch, unpublished data), and these fish are successfully reproducing (Blankenship et al 2006). The intent of this task is to investigate if there have been changes to the genetic structure of the spring Chinook stocks within upper Wenatchee tributaries during the past 15-20 years, and if changes have occurred, are they a function of the Chiwawa River Supplementation Program? Therefore, we ask the following two questions:

1. Are allele frequencies within populations in the upper Wenatchee stable through time? That is, is there significant allelic differentiation among collections within upper Wenatchee populations?
2. Are the recent collections from the upper Wenatchee populations more similar to the Chiwawa population than earlier collections from the same populations?

For this task we analyzed natural spawning collections from the White River (natural-origin), Little Wenatchee River (natural-origin), Nason Creek (natural-origin), and

Wenatchee mainstem (hatchery-origin), and hatchery collections from Leavenworth NFH and Entiat River NFH (Table 1). We also included in the analysis the natural- and hatchery-origin collections from the Chiwawa River. There are no repeated collections from Leavenworth, Entiat, Little Wenatchee, and Wenatchee mainstem (Table 1), so for many of the analyses we have limited our discussion to the Chiwawa River, White River, and Nason Creek collections. Furthermore, genetic structure of the Little Wenatchee collection, which consisted of only 19 samples, was unexpectedly quite different from the other collections. For example, the F_{ST} statistic measures the percent of total molecular variation that can be attributed to differences between populations. The median F_{ST} for all pairwise combinations of collections from all populations, except Little Wenatchee (33 populations, 528 individual F_{ST} statistics) equals 0.010 (1%), with a range of 0.000 to 0.037 (Table 6). The median F_{ST} for the Little Wenatchee paired with all other collections (33 individual F_{ST} statistics) equals 0.106 (10.6%), with a range of 0.074 to 0.121. The ten-fold increase in the F_{ST} statistic indicates that either the Little Wenatchee spring Chinook is unique among the upper Wenatchee River stocks, or this 1993 collection is somehow aberrant. Therefore, we exclude the Little Wenatchee collection from many other analyses.

Population Differentiation – Table 3 provides the levels of significance for all pairwise genic differentiation tests. Most between-collection comparisons are highly significant, with no pattern of increasing or decreasing differentiation with time, and no differences when comparisons are made with Chiwawa hatchery- versus Chiwawa natural-origin fish. For example, excluding the outlier 1996 and 1998 Chiwawa hatchery- and natural-origin collections, Nason Creek showed highly significant allele frequency differences between the Chiwawa hatchery- and natural-origin collections at 100% and 86% of the comparisons, respectively. The same comparisons with the White River produced 100% and 93% highly significant allele frequency comparisons, respectively. Allele frequencies between Nason Creek and White River were likewise differentiated from each other.

The collection allele frequencies within the upper Wenatchee system are significantly different, and these differences do not appear to change as a function of time (Table 3). Nason Creek shows greater within-population year-to-year variation in allele frequencies than does the White River, with 47% of the pairwise comparisons showing highly significant differences, compared with only 13% for the White River. However, the 2005 and 2006 collections from the White River appear to be somewhat more differentiated from not only each other, but from the earlier collections from the White River.

Despite the high degree of temporal and spatial structure suggested by the genic differentiation tests, as described above for within-Chiwawa analysis (Task 3), most of the genetic variation within this data set occurs within populations, rather than between populations (Table 6). The F_{ST} values for most population comparisons are between 0.01 and 0.02, indicating 1% to 2% among-population variance, with the remaining 98% to 99% variance occurring within populations. The White River shows the highest median F_{ST} among the natural-origin collections, equal to 0.014, compared with 0.009 for both the Nason Creek and Chiwawa natural-origin collections. The median F_{ST} for the Chiwawa hatchery-origin collections (0.012) was higher than that for the Chiwawa natural-origin collections.

Table 7 summarizes the information from the F_{ST} analyses, under five different temporal and spatial scenarios. Under all scenarios, over 99% of the molecular variance is within populations. There is significantly greater spatial structure among populations ("Origin") in 2005 and 2006 than from 1989 to 1996. That is, there appears to be more spatial structure among the Chiwawa hatchery-origin, Chiwawa natural-origin, White River, and Nason Creek now, than in 1989 to 1996, despite the potential homogenizing and cumulative effect of hatchery strays. However, we stress that the amount of molecular variance associated with the among population differences, despite being significantly greater than 0.00%, is limited to only 0.43%.

Allele-sharing and Nonmetric Multidimensional Scaling – As in the Chiwawa River data discussed above, we constructed an allele-sharing distance matrix and then subjected that matrix to a multidimensional scaling analysis (Figure 7). Consistent with all previously discussed multidimensional scaling analyses, the 1996 and 1998 adult, and the 1994 smolt collections are outliers. There is clear separation between the White River collections and all other natural-origin and Chiwawa hatchery-origin collections, indicating that there are more alleles shared among the Nason Creek and Chiwawa collections, than with the White River collections. Furthermore, there is a slight separation between the Chiwawa natural-origin natural spawner collections and Nason Creek collections, suggesting different groups of shared alleles between these populations. There is more variation in the allele-sharing distances among collections involved with the Chiwawa hatchery (origin or broodstock) than any of the natural-origin collections, even if we exclude the 1994, 1996, and 1998 collections. This suggests that there is more year-to-year variation in the composition of hatchery-origin and hatchery broodstock than within natural-origin populations throughout the upper Wenatchee. All Wenatchee mainstem fish are hatchery-origin, and if these fish are from the Chiwawa Supplementation Program (rather than from Leavenworth), it is not unexpected that this collection would be plotted within the Chiwawa polygon (Figure 7).

Assignment of Individual to Populations – Finally, we conducted individual assignment tests whereby we assigned each individual fish to a population, based on a procedure developed by Rannala and Mountain (1997) (Table 8 and 9). Individual fish may be correctly assigned to the population from which they were collected, or incorrectly assigned to a different population. Incorrect assignments may occur if the fish is an actual migrant (i.e., source population different from population where collected), or because the genotype for that fish matches more closely with a population different from its source. If there are many individuals from a population incorrectly assigned to populations other than its source population, that original population is either unreal (i.e., an admixture), or there is considerable gene flow between that population and other populations. Furthermore, in assigning individuals to populations, we can either accept the assignment with the highest probability, regardless of how low that probability may be, or we can establish a more stringent criterion, such as to not accept an assignment unless the posterior probability is equal to or greater than 0.90. This value is roughly equal to having the likelihood of the most-likely population equal to 10 times that of the second most-likely population.

We provide a summary of the assignments in Tables 8 and 9. On average, nearly 50% of the fish are assigned incorrectly if we accept all assignments (Table 8), but the incorrect assignment rate drops to roughly 10% when we accept only those assignments with probabilities greater than 0.90. However, with this more stringent criterion, nearly 64% of the fish go unassigned. These results indicate that the allele frequency distributions for these populations are very similar, and it would be very difficult to assign an individual fish of unknown origin to the correct population. If all fish are assigned, there is a 50% chance, overall, of a correct assignment. If you accept only those assignment with the 0.90 criterion, nearly two-thirds of the fish would be unassigned, but there is a 90% chance of correctly assigning those fish that are indeed assigned.

Of all the populations in the data set, there are fewer errors associated with assigning fish to the White River. If all fish are assigned (Table 8), 72% of those fish assigned to the White River, are actually from the White River (115 fish out of a total of 159 fish assigned to the White River). This compares to a rate of only 52% and 53% for Nason Creek and Chiwawa natural-origin, respectively, and 60% for the Chiwawa hatchery-origin collections. With the 0.90 criterion (Table 9), 89% of the fish assigned to the White River, are actually from the White River, compared with 70% and 65% for Nason Creek and Chiwawa natural origin, respectively, and 81% for the Chiwawa hatchery origin.

When all fish are assigned, most of the incorrectly assigned fish from Nason Creek and White River are assigned to Chiwawa River, at roughly equal frequencies to the hatchery- and natural-origin populations. Incorrectly assigned fish to other populations occur at a slightly higher rate in Nason Creek than in the White River. However, when only those fish meeting the 0.90 criterion are assigned (Table 9), incorrectly assigned fish from Nason Creek are distributed among White and Chiwawa Rivers, as well as Leavenworth NFH, and the Entiat NFH. Mis-assignment to the Chiwawa hatchery-origin was the highest among the Nason Creek collections, equal to nearly 14%. This contrasts with the White River where mis-assignments do not exceed 7% anywhere, and there is a roughly even distribution of mis-assignments among Nason Creek and Chiwawa River collections.

Summary and Conclusions – There is little geographic or temporal structure among populations within the upper Wenatchee systems. Among population molecular variance is limited to 1% or less. The little variance that can be attributed to among populations indicates that the White River is more differentiated from the Chiwawa and Nason populations than these populations are from each other. Furthermore, although we cannot rule out a hatchery effect on the Nason Creek and White River populations, there is no indication there has been any temporal changes in allele frequencies within these populations that can be attributed directly to the Chiwawa River Supplementation Program. In fact, Table 7 weakly suggests that there is more differentiation among these populations now, than there was before or at the early stages of Chiwawa supplementation.

Therefore, returning to our two original questions, there are significant differences in allele frequencies among collections within populations, and among populations within the upper Wenatchee spring Chinook stocks. However, these differences account for a very small portion of the overall molecular variance, and these populations overall are very similar to each other. There is no evidence that the Chiwawa River Supplementation Program has changed the allele frequencies in the Nason Creek and White River populations, despite the presence of hatchery-origin fish in both these systems. Finally, of all the populations within the Wenatchee River, the White River appears to be the most distinct. Yet, this distinction is more a matter of detail than of large significance, as the median F_{ST} between White River collections and all other collections (except the Little Wenatchee) is less than 1.5% among population variance.

Task 7: **Calculate the inbreeding effective population size using demographic data for each sample year, and document the ratio of census to effective size.**

This analysis was completed by Williamson et al. (submitted).

Task 8: **Calculate LD N_b using genetic data for each sample year, and document the ratio of census to effective size.**

We report N_e estimated for the Chiwawa River collections based on the bias correction method of Waples (2006) implemented in LDNe (Do and Waples unpublished). N_e estimates based on LD are best interpreted as the effective number of breeders (N_b) that produced the sample (Waples 2006).

For collections categorized by spawning location (i.e., hatchery broodstock or natural), estimates of N_b are shown in Table 10. Considering the hatchery broodstock, N_b estimates range from 30.4 (1996) to 274.3 (2005). To obtain N_e /N ratios, the N_b estimate is multiplied by four (i.e., mean generation length) and divided by the total in river (i.e., NOS [natural-origin spawners] plus HOS [hatchery-origin spawners]) census data from four years prior (i.e., major cohort; see Table 2). The observed N_e /N ratios for the broodstock collections range from 11% to 54% of the census estimate, excluding the 2000 collection which is 106%. A ratio greater than one is possible under special circumstances, and certain artificial mating schemes within hatcheries can inflate N_e above N; yet, it is unknown if this is the case for this collection. While no direct comparisons are possible, the N_b estimates reported by Williamson et al. (submitted) for Chiwawa broodstock collections from 2000 – 2003 are similar in magnitude to our estimates. For Chiwawa natural spawner collections, the N_b estimates range from 5.2 (1989) to 231.5 (2005), with observed N_e /N ratios of 22% - 48% of the census estimate.

Task 9: Calculate N_b using the temporal method for multiple samples from the same location.

Estimates of effective number of breeders (N_b) derived from Waples' (1990) temporal method are shown in Tables 11-13. Eight collection years were used for the Chiwawa broodstock collections (Table 11). The harmonic mean of all pairwise estimates of N_b ($\tilde{N}_b$) was 269.4. This estimate is the contemporary N_e for Chiwawa broodstock collections. For the five collection years of Chiwawa in-river spawners (Table 12), the estimated $\tilde{N}_b$ = 224.2. This estimate is the contemporary N_e for Chiwawa River natural spawner collections. Since the Chiwawa Supplementation Program is integrated by design, we also performed another estimation of N_e using composite hatchery and natural samples. There are paired samples from 2004-2006. We combined genetic data for hatchery (HOS) and natural (NOS) origin fish from 2004 – 2006 to create a single Chiwawa River natural spawner sample for each year. The three composite samples from 2004 – 2006 were then analyzed using the temporal method (Table 13), resulting in a $\tilde{N}_b$ = 386.8. This estimate is the contemporary N_e for Chiwawa River.

Williamson et al. (submitted) estimated N_e using Waples' (1990) temporal method for Chinook captured in 2004 and 2005, and used age data to decompose brood years into consecutive cohorts from 2000 – 2003. They report for Chiwawa broodstock a $\tilde{N}_b$ = 50.4. This estimate is not similar to our Chiwawa broodstock estimate. However, if we analyze the hatchery-origin Chinook only, our estimate is $\tilde{N}_b$ = 80.1 for collection years 1989 – 2006 (data not shown). Williamson et al. (submitted) report for Chiwawa naturally spawning Chinook a $\tilde{N}_b$ = 242.7, which is slightly higher than our estimate for in-river spawners from 1989 – 2006, but lower than our estimate from combined NOS and HOS Chinook from 2004 – 2006 collection years.

Task 10: Use available data and the Ryman-Laikre and Wang-Ryman models to determine the expected change of N_e for natural spring Chinook salmon in the Wenatchee River due to hatchery operation.

N_e is generally thought to be between 0.10 and 0.33 of the estimated census size (Bartley et al. 1992; RS Waples pers. comm.). We used this range to generate an estimate of N_e for Chiwawa natural spawners prior to hatchery operation. For brood years 1989 – 1992, the arithmetic mean census size was N=962.7 (Table 2), resulting in an estimated N_e ranging from 96.3 – 317.7. The contemporary estimate of N_e calculated using genetic data for the Chiwawa in-river spawners is N_e=224.2 (Table 12), falling in the middle of the pre-hatchery range. The N_e /N ratio calculated using 224.2 and the arithmetic census of NOS Chinook from 1989 – 2005 is 0.42. A more appropriate contemporary N_e to compare with the pre-hatchery estimate (i.e., 96.3 – 317.7) is the combined NOS and HOS estimate from natural spawners, since the supplementation program is integrated. As discussed above, the contemporary estimate of N_e calculated using genetic data for Chiwawa NOS and HOS Chinook is N_e=386.8 (Table 13), which is slightly larger than the pre-hatchery range, suggesting the N_e has not declined during the period of hatchery operation. The N_e /N ratio calculated using 386.8 and the arithmetic census of NOS and HOS Chinook from 1989 – 2005 is 0.40. These results suggest the Chiwawa Hatchery Supplementation Program has not resulted in a smaller N_e for the natural spawners from the Chiwawa River.

Williamson et al. (submitted) argued that since their combined (i.e., broodstock and natural) N_e estimate was lower than the naturally spawning estimate, the supplementation program likely had a negative impact on the Chiwawa River N_e. We disagree with this interpretation of these data. Since the natural spawning component is mixed hatchery and natural ancestry, the N_e estimates from natural spawning data are the results that bear on possible hatchery impacts. The census data show the population declined in the mid 1990's and rebounded by 2000 (Table 2). This trend is reflected in the N_e results, as shown above, and Williamson et al. (submitted) clearly show in their Table 4 the N_e was lower in 2000 (N_e = 989) than it was in 1992 (N_e = 2683). Yet, the important comparison they make in our view was the natural spawning N_e versus the natural only component N_e (i.e., hypothetically excluding hatchery program). Williamson et al. (submitted) report the 1989 – 1992 N_e estimated from naturally spawning Chinook (i.e., NOS and HOS integrated) was essentially the same as the natural only component estimate, 2683 and 2776, respectively. This result is not surprising since no HOS fish were present between 1989 – 1992. They also report that the 1997 – 2000 N_e estimated from naturally spawning Chinook (i.e., NOS and HOS integrated) was N_e =989, while the natural-origin estimate of N_e in 1997 – 2000 was N_e = 629. Since the natural-origin estimate of 629 is lower than 989, the N_e estimate from all in-river spawners, we argue that their analysis of demographic data show the N_e estimated from naturally spawning Chinook (i.e., NOS and HOS integrated) is larger only if the hatchery Chinook in the river are ignored.

Task 11: Use individual assignment methods to determine the power of self-assignment for upper Wenatchee River tributaries.

See "Assignment of Individual to Populations" in Task 6

Conclusions

Has the Chiwawa Hatchery Supplementation Program succeeded at increasing the census size of the target population while leaving genetic integrity intact? This is an important question, as hatcheries can impact natural populations by reducing overall genetic diversity (Ryman and Laikre 1991), reducing the fitness of the natural populations through relaxation of selection or inadvertent positive selection of traits advantageous in the hatchery (Ford 2002; Lynch and O'Hely 2001), and by reducing the reproductive success of natural populations (McLean et al. 2003). The census data presented here show that the current natural spawning census size is similar to the pre-supplementation census size. Despite large numbers of hatchery-origin fish on the Chiwawa River spawning grounds, the genetic diversity of the natural-origin collections appear unaffected by the supplementation program; heterozygosities are high, and contemporary N_e is similar (perhaps slightly higher) than pre-supplementation N_e. We did find significant year-to-year differences in allele frequencies in both the origin and spawner datasets, but these differences do not appear to be related to fish origin, spawning area, or genetic drift. However, we do suggest that cohort differences may be the most important factor accounting for differences in allele frequencies among collections.

The main objective of this study was to determine the potential impacts of the hatchery program on natural spring Chinook in the upper Wenatchee system. We did this by analyzing temporally replicated collections from the Chiwawa River, and by comparing genetic diversity prior to the presumed effect of the Chiwawa Hatchery Supplementation Program, with contemporary collections. We report that the genetic diversity present in the Chiwawa River is unchanged (allowing for differences among cohorts) from 1989 – 2006, and the contemporary estimate of the effective population size (N_e) using genetic data is approximately the same as the N_e estimate extrapolated from 1989 – 1992 census data (i.e., pre-hatchery collection years). We observed substantial genetic diversity, with heterozygosities ~80% over thirteen microsatellite markers. Yet, temporal variation in allele frequencies was the norm among temporal collections from the same populations (i.e., location). The genetic differentiation of replicated collections from the same population is likely the result of salmon life history in this area, as four-year-old Chinook comprise a majority of returns each year. The genetic tests are detecting the differences of contributing parents for each cohort. An important point related to the temporal variation, is that the hatchery broodstock is composed in part of the natural origin Chinook from the Chiwawa River. When we compared the genetic data (within a collection year) for Chinook brought into the hatchery as broodstock with the Chinook that remained in the river (years 2001, 2004 – 2006), there was a trend of decreasing statistical differences in allele frequencies from 2001 to 2004, and no differences were detected for 2005 and 2006. While the replicated collections may have detectable differences in allele frequencies, those differences reflect actual differences in cohorts, not the result of hatchery operations, and the hatchery broodstock collection method captures the differences in returning Chiwawa River spring adults each year. We conclude from these results that the genetic diversity of natural spring Chiwawa Chinook has been maintained during the Chiwawa Hatchery Supplementation Program.

We observe slight, but statistically significant population differentiation between Chiwawa River, White River, and Nason Creek collections. Murdoch et al (2006) and Williamson et al. (submitted) also observed population differentiation between Chiwawa River, White River, and Nason Creek collections. Yet, 99.3% of the genetic variation observed was within samples, very little variance could be attributed to population differences (i.e., population structure). The AMOVA analysis and poor individual assignment results suggest the occurrence of gene flow among Wenatchee River locations or a very recent divergence of these groups. While Murdoch et al. 2006 did not perform an AMOVA analysis, their F_{ST} results provide comparable data to our among-population results. Murdoch et al. 2006 report F_{ST} ranging from 2%-3% for pairwise comparisons between of Chiwawa, White, and Nason River collections. Since F_{ST} is an estimate of among-sample variance, these results also imply a majority of the genetic variance (i.e., 97%-98%) resides within collections. To provide further context for the magnitude of these variance estimates, we present the among-group data from Murdoch et al. 2006 comparing summer-run and spring-run Chinook from the Wenatchee River. They report that approximately 91% of observed genetic variance is within-collection for comparisons between collections of summer- and spring-run Chinook. Ultimately, the information provided by this and other reports will be incorporated into the management process for Wenatchee River Chinook. However, we would like to emphasize that the application of these genetic data to management is more about the goals related to the distribution of genetic diversity in the future than specific data values reported. If Chinook are collected at Tumwater Dam instead of within the upper Wenatchee River tributaries, a vast majority of the genetic variation present in the basin would be captured, although any differences among tributaries would be mixed. Alternatively, management policies could be crafted to promote and maintain the among-group genetic diversity that genetic studies consistently observe to be non-zero within the Wenatchee River.

We agree with Murdoch et al. (2006) that it appears hatchery Chinook are not contributing to reproduction in proportion to their abundance. Additionally, if the total census size (i.e., NOS and HOS combined) within the Chiwawa River does not continue to increase, genetic diversity may decline within this system, given the smaller N_e within the hatchery-origin collections compared with the natural-origin collections.

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Williamson KS, Murdoch AR, and Ford MJ (submitted) Influence of supportive breeding on genetic diversity of hatchery and natural Wenatchee River spring Chinook salmon.

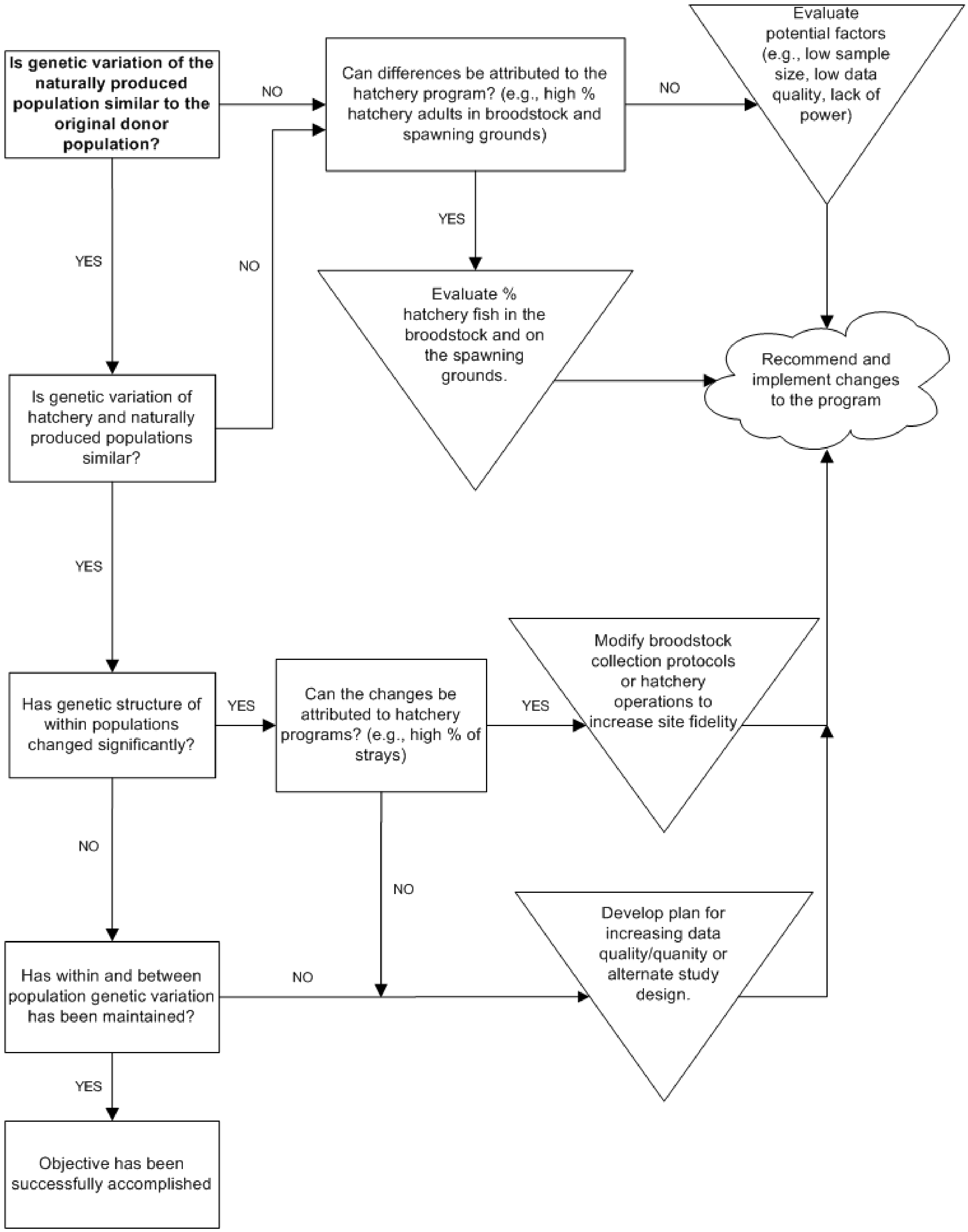

Figure 1. Conceptual process for evaluating potential changes in genetic variation in the Chiwawa naturally produced populations as a result of the supplementation hatchery programs (From Murdoch and Peven 2005).

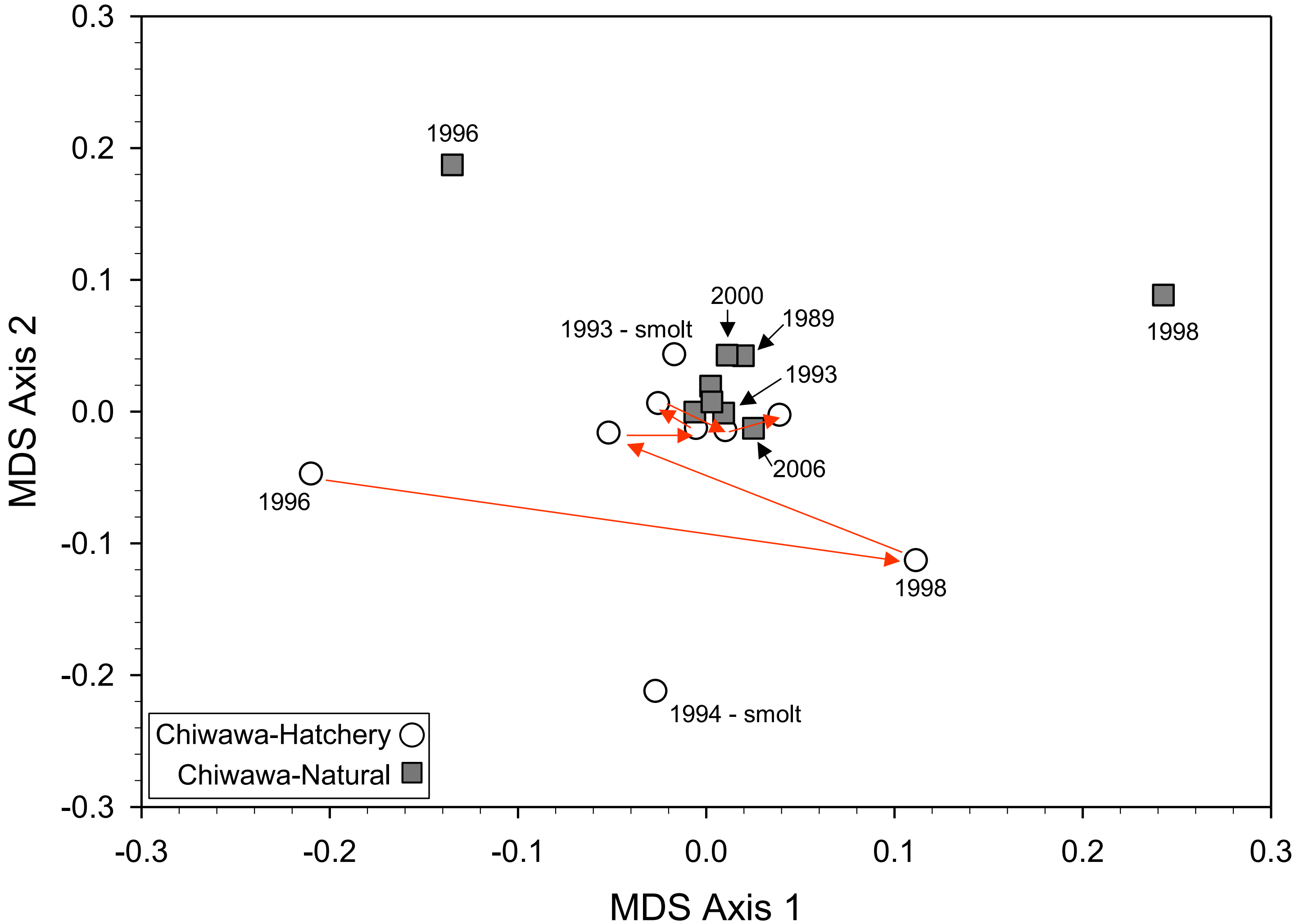

Figure 2. Multidimensional scaling plot from an allele-sharing distance matrix calculated from the Chiwawa data set organized by fish origin (i.e., hatchery versus natural). The red arrows connect consecutive hatchery-origin collections starting with the first adult collection (1996) and ending with the 2006 collection (see Table 1 for collection years).

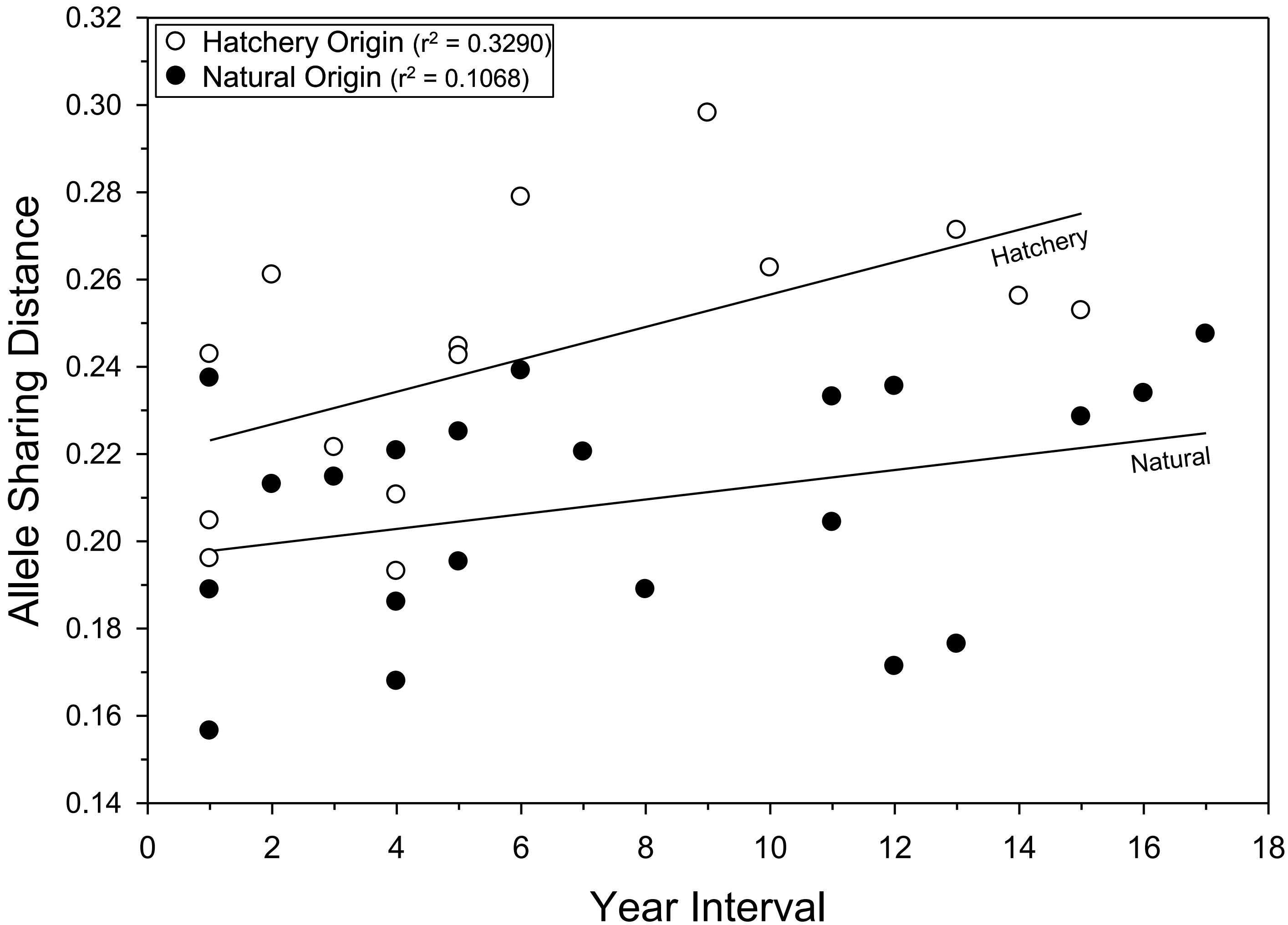

Figure 3. Relationships between the time interval in years and allele sharing distances, with each circle representing the pairwise relationship between two Chiwawa collections. Separate regression lines for the natural- and hatchery-origin collections. The slope for the natural-origin collection is not significantly different from zero (p=0.1483), while the slope for hatchery-origin collection is significantly greater than zero (p=0.0254) indicating a positive relationship between time interval and allele sharing distance.

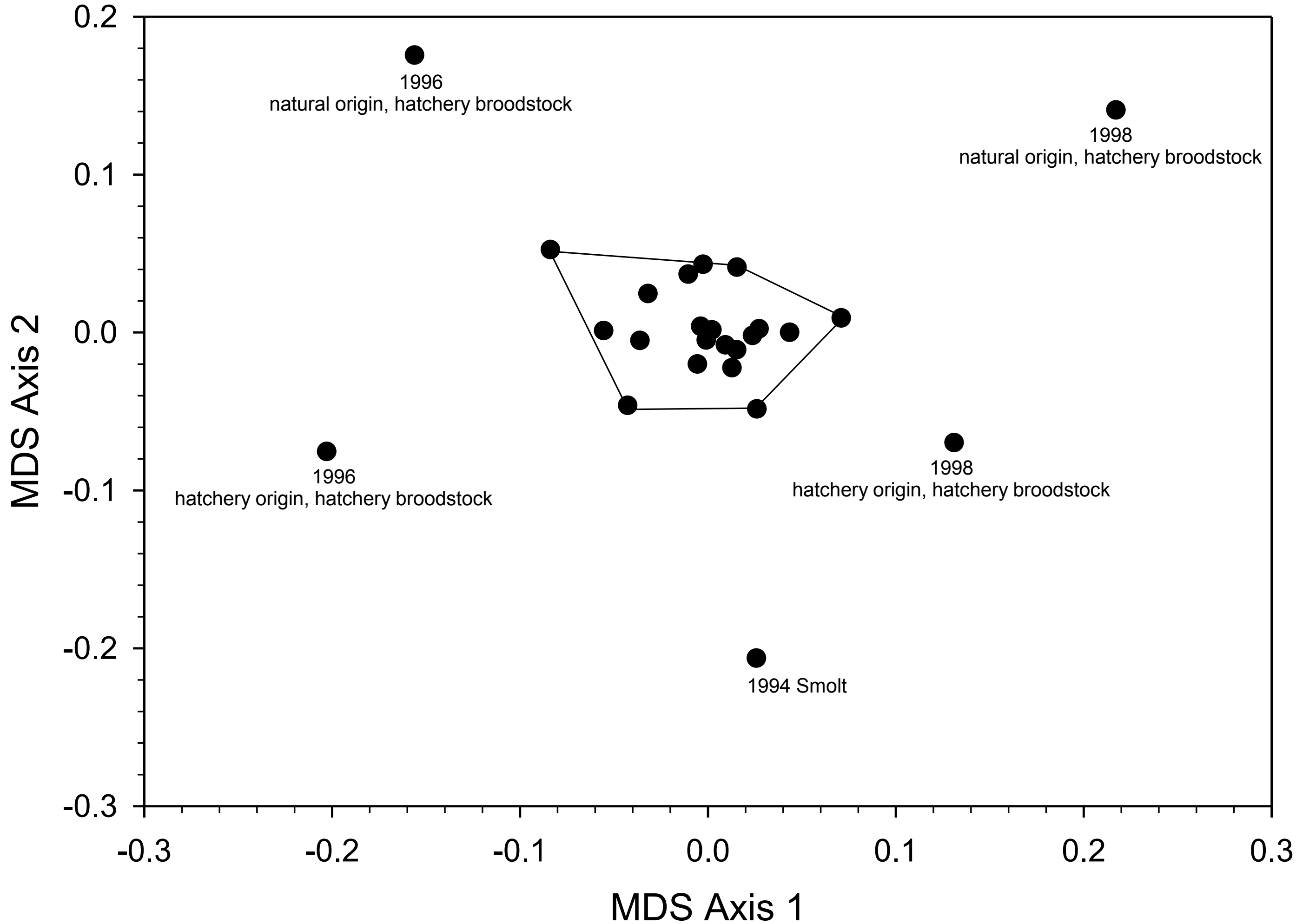

Figure 4. Multidimensional scaling plot from an allele-sharing distance matrix calculated from the Chiwawa data set organized by four treatment groups, as discussed in the text. Each circle represents a single collection within each of the four treatment groups, and the polygon encloses all groups that are not outliers. Each outlier group is specifically labeled.

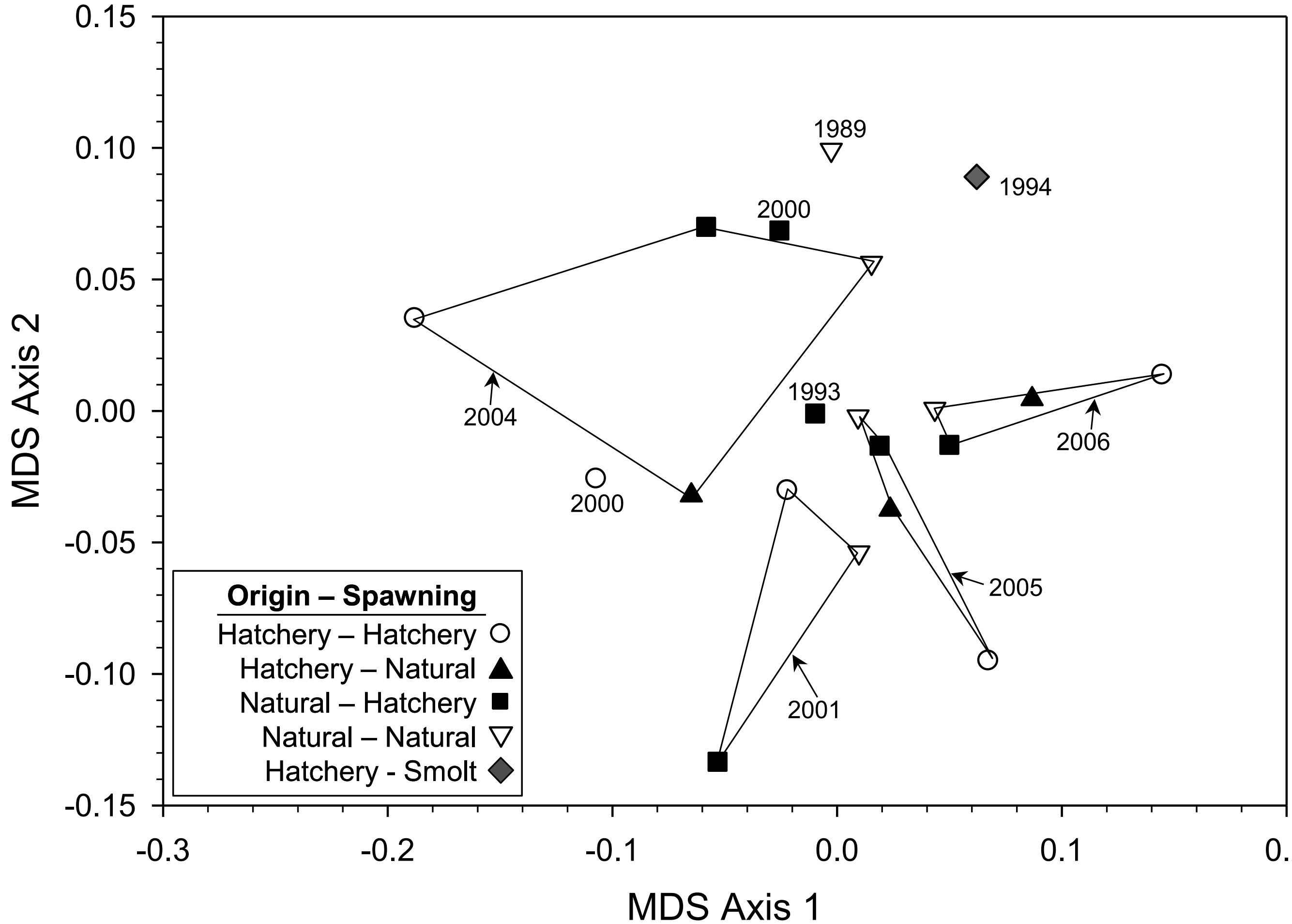

Figure 5. As in Figure 4, but allele-sharing distance matrix recalculated without the five outlier groups shown in Figure 4. Polygons group together treatment groups from the same collection year. Dates associated with symbols also refer to collection year. Collection years 2004-2006 included all four treatment groups, while collection year 2001 did not include a hatchery-origin natural spawner group. Legend is read as follows: Open circles refer to hatchery-origin hatchery spawner group, while filled box refers to natural-origin hatchery spawner group, and so on.

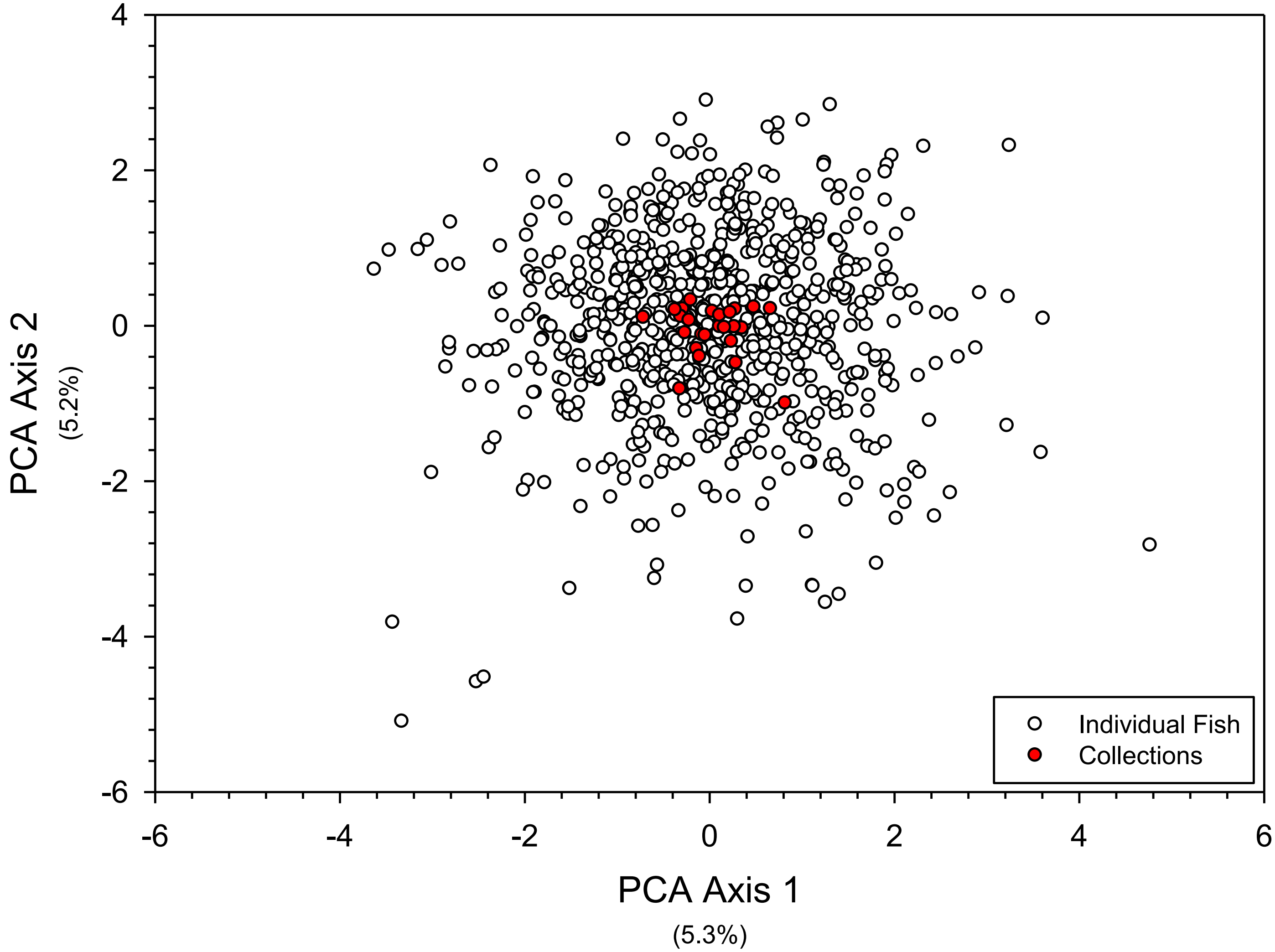

Figure 6. Principal component (PC) analysis of individual fish from the Chiwawa River. Only fish with complete microsatellite genotypes were included in the analysis (n = 757). Open circles are the PC scores for individual fish, and the filled circles are the centroids (bivariate means) for each of the 25 groups discussed in the text. PC axes 1 and 2 account for only 10.5% of the total molecular variance.

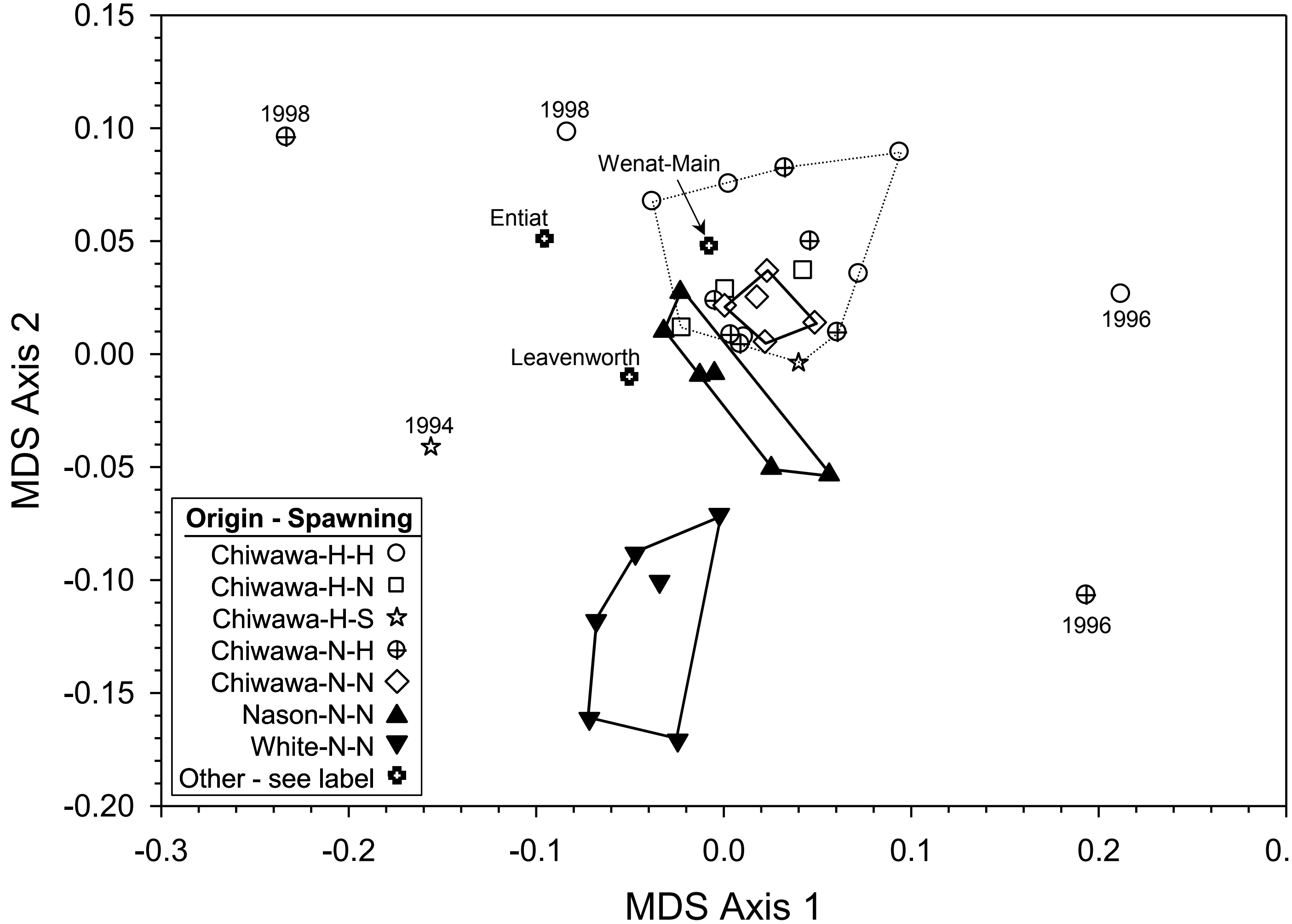

Figure 7. Multidimensional scaling plot from an allele-sharing distance matrix calculated from the Chiwawa origin data set and all other non-Chiwawa collections, except Little Wenatchee River. Legend is read with abbreviations beginning with origin and then spawning location. H=hatchery, N=natural, and S=smolts. Polygons with solid lines enclose the natural-origin natural spawner collections from each population (i.e., river). The polygon with the dotted lines enclose all Chiwawa collections, except for the five outlier collections, as discussed in text.

Table 1 Summary of within population genetic data. Chiwawa collection data are summarized in A) by origin of the sample (i.e., clipped vs. non-clipped). All collection data are summarized in B) by spawning location (i.e., hatchery broodstock or on spawning grounds). Hz is heterozygosity, HWE is the statistical significance of deviations from Hardy-Weinberg expectations (* = 0.05, ** = 0.01, and *** = 0.001), LD is the proportion of pairwise locus tests (across all populations) exhibiting linkage disequilibrium (bolded values are statistically significant), and the last column is mean number of alleles per locus.

Collection	Sample size	Gene Diversity	Observed Hz	HWE	F_{IS}	LD	Mean # Alleles
A) Origin							
1993 Chiwawa Hatchery	95	0.77	0.79	***	-0.02	**0.86**	14.00
1994 Chiwawa Hatchery	95	0.76	0.77	***	-0.01	**0.91**	11.38
1996 Chiwawa Hatchery	8	0.75	0.81	-	-0.01	0.00	8.23
1998 Chiwawa Hatchery	27	0.81	0.82	-	0.00	0.04	12.62
2000 Chiwawa Hatchery	43	0.75	0.78	***	-0.01	**0.19**	12.46
2001 Chiwawa Hatchery	69	0.77	0.80	***	-0.02	**0.14**	15.31
2004 Chiwawa Hatchery	72	0.77	0.77	***	0.01	**0.45**	15.92
2005 Chiwawa Hatchery	91	0.79	0.82	*	-0.03	**0.05**	16.15
2006 Chiwawa Hatchery	95	0.80	0.84	***	-0.05	**0.49**	15.85
1989 Chiwawa Natural	36	0.76	0.78	-	0.01	0.00	12.77
1993 Chiwawa Natural	62	0.78	0.81	-	-0.02	0.04	15.85
1996 Chiwawa Natural	8	0.72	0.78	-	-0.02	0.00	7.54
1998 Chiwawa Natural	10	0.78	0.84	-	0.00	0.00	8.23
2000 Chiwawa Natural	39	0.78	0.79	***	0.00	**0.10**	14.00
2001 Chiwawa Natural	75	0.78	0.80	-	-0.03	0.03	15.31
2004 Chiwawa Natural	85	0.78	0.77	-	0.02	0.01	15.77
2005 Chiwawa Natural	90	0.79	0.79	-	0.01	0.01	16.15
2006 Chiwawa Natural	96	0.80	0.81	-	-0.01	0.01	16.46

Table 1 Within population genetic data analysis summary continued.

Collection	Sample size	Gene Diversity	Observed Hz	HW	F_{IS}	LD	Mean # Alleles
B) Spawning Location							
1993 Chiwawa Broodstock	62	0.78	0.81	-	-0.02	0.00	15.85
1996 Chiwawa Broodstock	16	0.75	0.79	-	-0.02	0.00	10.92
1998 Chiwawa Broodstock	37	0.82	0.83	-	0.00	0.01	14.38
2000 Chiwawa Broodstock	82	0.78	0.78	***	0.00	**0.32**	15.62
2001 Chiwawa Broodstock	89	0.78	0.80	*	-0.02	**0.13**	15.77
2004 Chiwawa Broodstock	61	0.77	0.76	*	0.02	**0.13**	14.92
2005 Chiwawa Broodstock	75	0.79	0.78	*	0.02	0.01	15.85
2006 Chiwawa Broodstock	89	0.80	0.83	-	-0.03	**0.05**	16.46
1989 Chiwawa River	36	0.76	0.78	-	0.01	0.00	12.77
2001 Chiwawa River	55	0.78	0.80	-	-0.02	**0.09**	14.00
2004 Chiwawa River	96	0.78	0.78	*	0.01	**0.18**	17.23
2005 Chiwawa River	106	0.79	0.82	*	-0.02	**0.06**	16.69
2006 Chiwawa River	102	0.80	0.83	***	-0.03	**0.10**	16.77
1989 White River	48	0.75	0.75	-	0.01	0.01	12.85
1991 White River	19	0.76	0.76	-	0.03	0.00	10.92
1992 White River	22	0.75	0.79	-	-0.02	0.01	11.00
1993 White River	21	0.75	0.69	*	0.10	0.00	10.15
2005 White River	29	0.75	0.77	-	-0.01	0.03	12.23
2006 White River	40	0.76	0.76	-	0.01	0.04	13.38

Table 1 Within population genetic data analysis summary continued.

Collection	Sample size	Gene Diversity	Observed Hz	HW	F_{IS}	LD	Mean # Alleles
1993 Little Wenatchee R.	19	0.84	0.85	-	0.02	0.00	11.23
1993 Nason Creek	45	0.78	0.80	-	-0.01	0.01	13.77
2000 Nason Creek	51	0.76	0.78	-	-0.02	**0.13**	13.92
2001 Nason Creek	41	0.79	0.81	-	-0.01	**0.08**	14.23
2004 Nason Creek	38	0.76	0.76	-	0.02	0.03	13.23
2005 Nason Creek	45	0.78	0.82	-	-0.04	0.03	14.92
2006 Nason Creek	48	0.80	0.82	-	-0.01	0.00	15.77
2001 Wenatchee River	32	0.79	0.80	*	0.00	0.04	12.85
2000 Leavenworth NFH	73	0.80	0.82	*	-0.02	**0.15**	16.23
1997 Entiat NFH	37	0.81	0.83	-	-0.01	**0.06**	14.38

Table 2 Demographic data for Chiwawa Hatchery and Chiwawa natural spring Chinook salmon. BS is census size of hatchery broodstock, pNOB is the proportion of hatchery broodstock of natural origin, NOS is the census size of natural-origin spawners present in Chiwawa River, HOS is the census size of hatchery-origin spawners present in Chiwawa River, Total is NOS and HOS combined, and pNOS is the proportion of spawners present in Chiwawa River of natural origin.

	Hatchery		In River			
Brood Year	BS	pNOB	NOS	HOS	Total	pNOS
1989	28	1	1392	0	1392	1.00
1990	18	1	775	0	775	1.00
1991	32	1	585	0	585	1.00
1992	78	1	1099	0	1099	1.00
1993	94	1	677	491	1168	0.58
1994	11	0.64	190	90	280	0.68
1995	0	0	8	50	58	0.14
1996	18	0.44	131	51	182	0.72
1997	111	0.29	210	179	389	0.54
1998	47	0.28	134	45	178	0.75
1999	0	0	119	13	132	0.90
2000	30	0.3	378	310	688	0.55
2001	371	0.3	1280	2850	4130	0.31
2002	71	0.28	694	919	1613	0.43
2003	94	0.44	380	223	603	0.63
2004	215	0.39	820	788	1608	0.51
2005	270	0.33	250	1222	1472	0.17

Table 3 Levels of significance for pairwise tests of genic differentiation among all hatchery- and natural-origin collections used in this analysis. HS = highly significant (P < 0.000095; the Bonferroni corrected p-value for an alpha = 0.05); * = P < 0.05 (nominal critical value for most statistical test); - = P > 0.05 (not significant). A significant result between pairs of populations indicates that the allele frequencies between the pair are significantly different. Results are read by comparing the collections along the rows to collections along columns. The top block for each section is a symmetric matrix, as it compares collections within the same group.

		Chiwawa – Hatchery Origin								
		1993	**1994**	**1996**	**1998**	**2000**	**2001**	**2004**	**2005**	**2006**
Chiwawa – Hat. Origin	**1993**		HS	*	HS	HS	HS	HS	HS	HS
	1994	HS		HS	HS	HS	HS	HS	HS	HS
	1996	*	HS		*	-	*	-	-	*
	1998	HS	HS	*		HS	HS	HS	HS	HS
	2000	HS	HS	-	HS		HS	*	HS	HS
	2001	HS	HS	*	HS	HS		HS	*	HS
	2004	HS	HS	-	HS	*	HS		HS	HS
	2005	HS	HS	-	HS	HS	*	HS		HS
	2006	HS	HS	*	HS	HS	HS	HS	HS	
Chiwawa – Natural Origin	**1989**	HS	HS	-	HS	HS	*	HS	HS	HS
	1993	HS	HS	-	HS	HS	-	HS	*	HS
	1996	*	HS	-	*	-	-	-	-	-
	1998	HS	HS	-	-	HS	*	*	*	-
	2000	HS	HS	-	HS	HS	HS	*	HS	HS
	2001	HS	HS	-	HS	HS	HS	HS	*	HS
	2004	HS	HS	-	HS	HS	HS	HS	HS	HS
	2005	HS	HS	-	HS	HS	*	HS	*	HS
	2006	HS	HS	-	*	HS	HS	HS	HS	HS
Nason	**1996**	HS	HS	-	HS	HS	HS	HS	HS	HS
	2000	HS	HS	*	HS	HS	HS	HS	HS	HS
	2001	HS	HS	-	HS	HS	HS	HS	HS	HS
	2004	HS	HS	-	HS	HS	HS	HS	HS	HS
	2005	HS	HS	-	HS	HS	HS	HS	HS	HS
	2006	HS	HS	-	*	HS	HS	HS	HS	HS
White	**1989**	HS	HS	HS	HS	HS	HS	HS	HS	HS
	1991	HS	HS	-	HS	HS	HS	HS	HS	HS
	1992	HS	HS	*	HS	HS	HS	HS	HS	HS
	1993	HS	HS	*	HS	HS	HS	HS	HS	HS
	2005	HS	HS	-	HS	HS	HS	HS	HS	HS
	2006	HS	HS	HS	HS	HS	HS	HS	HS	HS
Other	**Wen-M**	HS	HS	*	HS	HS	*	*	-	HS
	Leaven	HS	HS	*	HS	HS	HS	HS	HS	HS
	Entiat	HS	HS	*	HS	HS	HS	HS	HS	HS

Table 3 (con't)

		Chiwawa – Natural Origin								
		1989	1993	1996	1998	2000	2001	2004	2005	2006
Chiwawa – Natural Origin	**1989**		-	-	-	-	*	*	*	*
	1993	-		-	*	*	*	HS	*	HS
	1996	-	-		-	-	-	-	-	-
	1998	-	*	-		*	*	HS	*	*
	2000	-	*	-	*		HS	-	HS	HS
	2001	*	*	-	*	HS		HS	*	HS
	2004	*	HS	-	HS	-	HS		HS	HS
	2005	*	*	-	*	HS	*	HS		*
	2006	*	HS	-	*	HS	HS	HS	*	
Nason	**1996**	*	*	-	*	*	HS	HS	HS	HS
	2000	HS	HS	HS	HS	HS	HS	HS	HS	HS
	2001	HS	*	-	*	HS	HS	HS	HS	HS
	2004	HS	HS	-	HS	HS	HS	HS	HS	HS
	2005	*	*	-	*	HS	HS	HS	HS	HS
	2006	HS	HS	-	-	HS	HS	HS	HS	HS
White	**1989**	HS	HS	*	HS	HS	HS	HS	HS	HS
	1991	HS	HS	*	-	HS	HS	HS	HS	HS
	1992	HS	HS	-	*	HS	HS	HS	HS	HS
	1993	HS	*	-	*	HS	HS	HS	HS	HS
	2005	HS	*	*	*	HS	HS	HS	*	HS
	2006	HS	HS	*	HS	HS	HS	HS	HS	HS
Other	**Wen-M**	*	-	-	-	*	*	HS	*	*
	Leaven	HS	HS	*	*	HS	HS	HS	HS	HS
	Entiat	HS	HS	*	HS	HS	HS	HS	HS	HS

Table 3 (con't)

		Nason					
		1996	2000	2001	2004	2005	2006
Nason	1996		HS	-	HS	-	*
	2000	HS		HS	HS	HS	HS
	2001	-	HS		*	-	*
	2004	HS	HS	*		*	HS
	2005	-	HS	-	*		-
	2006	*	HS	*	HS	-	
White	1989	HS	HS	HS	HS	HS	HS
	1991	*	HS	HS	HS	*	*
	1992	HS	HS	HS	HS	HS	HS
	1993	*	HS	HS	HS	HS	HS
	2005	*	HS	HS	HS	HS	HS
	2006	HS	HS	HS	HS	HS	HS
Other	Wen-M	HS	HS	HS	HS	*	HS
	Leaven	HS	HS	HS	HS	HS	HS
	Entiat	HS	HS	HS	HS	HS	HS

Table 3 (con't)

		White						Other		
		1989	1991	1992	1993	2005	2006	Wen-M 2001	Leaven 2000	Entiat 1997
White	1989		-	*	-	HS	HS	HS	HS	HS
	1991	-		-	-	*	*	*	HS	HS
	1992	*	-		-	*	*	HS	HS	HS
	1993	-	-	-		*	*	HS	HS	HS
	2005	HS	*	*	*		*	HS	HS	HS
	2006	HS	*	*	*	*		HS	HS	HS
Other	Wen-M	HS	*	HS	HS	HS	HS		HS	HS
	Leaven	HS	HS	HS	HS	HS	HS	HS		HS
	Entiat	HS	HS	HS	HS	HS	HS	HS	HS	

Table 4 Probabilities (above diagonal) and levels of significance (below diagonal) for pairwise tests of genic differentiation among all Chiwawa hatchery broodstock and Chiwawa natural spawner collections used in this analysis. HS = highly significant (P < 0.000476; the Bonferroni corrected p-value for an alpha = 0.05); * = P < 0.05 (nominal critical value for most statistical test); - = P > 0.05 (considered not significant). A significant result between pairs of populations indicates that the allele frequencies between the pair are significantly different. Pairwise comparisons between the hatchery broodstock and natural spawner collections from 2001, 2004, 2005, and 2006, respectively, are highlighted.

		Smolt		Hatchery Broodstock								Natural Spawners				
		1993	1994	1993	1996	1998	2000	2001	2004	2005	2006	1989	2001	2004	2005	2006
Smolt	1993		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	1994	HS		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hatchery Broodstock	1993	HS	HS		0.9155	0.0000	0.0073	0.3647	0.0003	0.0694	0.0000	0.2220	0.0039	0.0008	0.0095	0.0000
	1996	HS	HS	-		0.0151	0.8388	0.0452	0.4916	0.3189	0.0716	0.5591	0.0759	0.8101	0.2364	0.0786
	1998	HS	HS	HS	*		0.0000	0.0000	0.0000	0.0000	0.0043	0.0000	0.0000	0.0000	0.0000	0.0005
	2000	HS	HS	*	-	HS		0.0000	0.4720	0.0000	0.0000	0.0036	0.0000	0.0712	0.0000	0.0000
	2001	HS	HS	-	*	HS	HS		0.0000	0.0059	0.0000	0.0003	0.0000	0.0000	0.0126	0.0000
	2004	HS	HS	*	-	HS	-	HS		0.0000	0.0000	0.0001	0.0000	0.0012	0.0000	0.0000
	2005	HS	HS	-	-	HS	HS	*	HS		0.0005	0.0024	0.0137	0.0025	0.7782	0.0018
	2006	HS	HS	HS	-	*	HS	HS	HS	*		0.0000	0.0000	0.0000	0.0000	0.5770
Natural Spawners	1989	HS	HS	-	-	HS	*	*	HS	*	HS		0.0023	0.0317	0.0000	0.0003
	2001	HS	HS	*	-	HS	HS	HS	HS	*	HS	*		0.0000	0.2641	0.0000
	2004	HS	HS	*	-	HS	-	HS	*	*	HS	*	HS		0.0000	0.0000
	2005	HS	HS	*	-	HS	HS	*	HS	-	HS	HS	-	HS		0.0000
	2006	HS	HS	HS	-	*	HS	HS	HS	*	-	*	HS	HS	HS	

Table 5 Analysis of molecular variance (AMOVA) for the Chiwawa collections, showing the partition of molecular variance into (1) within collections, (2) among collections but within group, and (3) among group components. Each column in the table represents a separate analysis testing for differences under a different spatial or temporal hypothesis. The different analyses are grouped together in a single table for comparisons. The values within the table are percentages and the parenthetical values are P-values, or probabilities, associated with that percentage. P-values greater than 0.05 indicate that the percentage is not significantly different from zero. For example, when collections are organized by hatchery- versus natural-origin ("Origin" – fourth column), 0.11% of the molecular variance is attributed to among group (i.e., hatchery- versus natural-origin), which is not significantly different from zero. No collections (first column) indicates no organization or grouping among all collections, and the among-group percentage is equal to the F_{ST} for the entire data set.

	No Structure	Collection Year	Spawning Location	Origin	Origin-Spawning Location
Among Groups	0.26 (0.00)	0.20 (0.43)	0.05 (0.48)	0.11 (0.15)	0.11 (0.06)
Among collections - Within groups	-	0.08 (0.003)	0.24 (0.00)	0.21 (0.00)	0.18 (0.06)
Within collections	99.74 (0.00)	99.72 (0.00)	99.71 (0.00)	99.68 (0.00)	99.71 (0.00)

Table 6 F_{ST} values for all pairwise combinations of populations. Each F_{ST} is the median value for all pairwise combinations of collections within each population (the number of collections within each population is shown parenthetically next to each population name on each row). For example, the F_{ST} for the Chiwawa hatchery versus the White River (0.019) is the median value of 54 pairwise comparisons. The bold values along the center diagonal are the median F_{ST} values within each collection. For those populations with only one collection, the diagonal value was set at 0.000.

	Chiwawa-Hatchery	Chiwawa-Natural	Entiat	Leaven-worth	Nason	Wenatchee-main	White	Little Wenatchee
Chiwawa-Hatchery (9)	**0.013**	0.008	0.016	0.012	0.011	0.005	0.019	0.111
Chiwawa-Natural (9)		**0.003**	0.012	0.011	0.007	0.003	0.014	0.105
Entiat (1)			**0.000**	0.005	0.010	0.008	0.019	0.078
Leavenworth (1)				**0.000**	0.007	0.008	0.014	0.092
Nason (6)					**0.006**	0.008	0.015	0.099
Wenatchee-main (1)						**0.000**	0.012	0.098
White (6)							**0.005**	0.113
Little Wenatchee (1)								**0.000**

Table 7 As in Table 5, except data includes Chiwawa hatchery- and natural-origin, Nason Creek, and White River collections

	All Years	All Years	1989-1996	2005-2006	2005-2006
	No Structure	Origin	Origin	Origin	Collection Year
Among Groups	0.28 (0.00)	0.33 (0.00)	-0.07 (0.67)	0.43 (0.01)	-0.06 (0.57)
Among Collections - Within groups	-	0.04 (0.00)	0.22 (0.00)	0.25 (0.00)	0.64 (0.00)
Within Collections	99.72	99.63	99.85	99.32	99.41

Table 8 Individual assignment results reported are the numbers of individuals assigned to each population using the partial Bayesian criteria of Rannala and Mountain (1997) and a "jack-knife" procedure (see Methods). The population with the highest posterior probability is considered the stock of origin (i.e., no unassigned individuals). Individuals from each population are assigned to specific populations (along rows). Bold values indicate correct assignment back to population of origin. Individuals assigned to a population are read down columns. For example, of the 595 individuals from Chiwawa hatchery origin, 134 individuals were assigned to Chiwawa natural origin (reading across). Of the 511 individuals assigned to Chiwawa natural origin (reading down), 60 were from Nason Creek.

Population	**Total**	**Unassigned**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1) Chiwawa Hatchery	595	0	**371**	134	2	16	0	45	15	12
2) Chiwawa Natural	501	0	156	**269**	4	5	0	42	9	16
3) Entiat	37	0	4	5	**13**	8	0	6	1	0
4) Leavenworth	73	0	9	8	3	**33**	0	17	0	3
5) Little Wenatchee	19	0	0	0	0	0	**19**	0	0	0
6) Nason	268	0	49	60	5	11	0	**131**	1	11
7) Wenatchee Mainstem	32	0	12	9	0	1	0	2	**6**	2
8) White	179	0	22	26	0	2	0	13	1	**115**
TOTAL	1704	0	623	511	27	76	19	256	33	159

Table 9 As in Table 8, except the posterior probability from the partial Bayesian criteria of Rannala and Mountain (1997) must be 0.90 or greater, to be assigned to a population. Those individuals with posterior probabilities less than 0.90 are unassigned.

Aggregate	Total	Unassigned	1	2	3	4	5	6	7	8
1) Chiwawa Hatchery	595	332	**214**	31	1	4	0	10	3	0
2) Chiwawa Natural	501	375	30	**82**	0	1	0	5	2	6
3) Entiat	37	24	1	1	**5**	4	0	2	0	0
4) Leavenworth	73	51	0	1	1	**19**	0	1	0	0
5) Little Wenatchee	19	2	0	0	0	0	**17**	0	0	0
6) Nason	268	188	11	6	2	5	0	**53**	0	3
7) Wenatchee Mainstem	32	23	4	3	0	0	0	0	**2**	0
8) White	179	92	4	3	0	1	0	5	1	**73**
TOTAL	1704	1087	264	127	9	34	17	76	8	82

Table 10 Estimates of N_e based on bias correction method of Waples (2006) implemented in LDNe (Do and Waples unpublished). Collections are categorized by spawning location. Sample size is the harmonic mean of the sample size, 95% CI is the confidence interval calculated using Waples' (2006) equation 12, and Major Cohort assumes that each collection is 100% four-year-olds.

	Sample size	Estimated N_b	95% CI	Major Cohort	Census	N_e/N
1993 Chiwawa Broodstock	58.4	103.1	77.0 - 149.7	1989	1392	0.30
1996 Chiwawa Broodstock	15.5	30.4	19.6 - 58.1	1992	1099	0.11
1998 Chiwawa Broodstock	33.4	37.7	29.8 - 49.7	1994	280	0.54
2000 Chiwawa Broodstock	77.8	48.4	41.4 - 57.2	1996	182	1.06
2001 Chiwawa Broodstock	80.4	49.6	42.2 - 59.2	1997	389	0.51
2004 Chiwawa Broodstock	56.6	48.1	39.0 - 60.9	2000	688	0.28
2005 Chiwawa Broodstock	73	274.3	148.9 - 1131.8	2001	4130	0.27
2006 Chiwawa Broodstock	88.4	198.3	136.1 - 340.5	2002	1613	0.49
1989 Chiwawa River	26.6	5.2	3.9 - 6.3	1985		
2001 Chiwawa River	46.7	38.6	31.0 - 49.3	1997	389	0.40
2004 Chiwawa River	88.5	82.6	67.3 - 104.4	2000	688	0.48
2005 Chiwawa River	104.2	231.5	161.8 - 382.7	2001	4130	0.22
2006 Chiwawa River	101.1	107.3	87.2 - 136	2002	1613	0.27

Table 11 Summary of output from program SALMONNb and data for eight Chiwawa broodstock collections from Wenatchee River. For each pairwise comparison of samples *i* and *j*, $\tilde{S}$ is the harmonic mean sample size, *n* is the number of independent alleles used in the comparison, $\hat{N}_{b(i,j)}$ are the pairwise estimates of N_b, and Var [$\hat{N}_{b(i,j)}$] is the variance of $\hat{N}_{b(i,j)}$. $\tilde{N}_b$ is the harmonic mean of the $\hat{N}_{b(i,j)}$. Alleles with a frequency below 0.05 were excluded from the analysis to reduce potential bias.

Year	1993	1996	1998	2000	2001	2004	2005	2006
Pairwise $\tilde{S}$ (above diagonal) and *n* (below diagonal):								
1993	-	24.5	42.5	66.4	67.2	57.2	64.6	70.3
1996	82	-	21.2	25.8	26.0	24.4	25.6	26.4
1998	80	81	-	46.7	47.2	42.0	45.8	48.4
2000	80	82	84	-	78.6	65.2	75.1	82.7
2001	73	77	81	76	-	66.0	76.2	84.2
2004	77	81	75	76	78	-	63.5	69.0
2005	71	75	82	73	73	69	-	80.0
2006	81	80	84	75	74	75	72	-
Pairwise $\hat{N}_{b(i,j)}$ (above diagonal) and Var [$\hat{N}_{b(i,j)}$] (below diagonal):								
1993	-	-742.7	406.9	1240.8	-5432.0	829.8	808.9	729.0
1996	22491.2	-	110.4	-1786.5	765.9	162.8	824.7	382.7
1998	10910.4	67299.1	-	101.8	237.1	69.6	307.0	140.0
2000	6910.0	742895.8	19122.7	-	490.6	1498.2	706.9	201.6
2001	49318.3	21402.8	9754.2	6126.6	-	307.8	82.0	362.5
2004	8338.4	257267.7	24283.0	145043.4	7095.7	-	269.7	140.1
2005	31511.8	22242.5	10015.8	6596.6	114931.1	8240.4	-	599.6
2006	6223.8	43935.2	73518.7	10152.5	5885.3	12827.0	6370.8	-

$\widetilde{N}_b = 269.4$

Table 12 Summary of output from program SALMONNb and data for five Chiwawa in-river spawner collections from Wenatchee River. For each pairwise comparison of samples *i* and *j*, $\tilde{S}$ is the harmonic mean sample size, *n* is the number of independent alleles used in the comparison, $\hat{N}_{b(i,j)}$ are the pairwise estimates of N_b, and Var [$\hat{N}_{b(i,j)}$] is the variance of $\hat{N}_{b(i,j)}$. $\tilde{N}_b$ is the harmonic mean of the $\hat{N}_{b(i,j)}$. Alleles with a frequency below 0.05 were excluded from the analysis to reduce potential bias.

Year	1989	2001	2004	2005	2006
Pairwise $\tilde{S}$ (above diagonal) and *n* (below diagonal):					
1989	-	33.3	40.2	41.7	42.2
2001	72	-	60.5	63.9	63.3
2004	72	77	-	95.3	94.0
2005	69	72	75	-	102.5
2006	76	76	77	78	-
Pairwise $\hat{N}_{b(i,j)}$ (above diagonal) and Var [$\hat{N}_{b(i,j)}$] (below diagonal):					
1989	-	118.4	299.0	143.3	165.3
2001	40378.8	-	181.7	-1537.3	153.5
2004	10455.2	7265.5	-	387.1	329.4
2005	20923.6	68660.6	5040.7	-	356.8
2006	16227.2	8886.9	3802.0	4522.8	-
$\tilde{N}_b$ = 224.2					

Table 13 Summary of output from program SALMONNb and data for three brood years that combined Chiwawa natural- and hatchery-origin samples from Wenatchee River. For each pairwise comparison of samples *i* and *j*, $\tilde{S}$ is the harmonic mean sample size, *n* is the number of independent alleles used in the comparison, $\hat{N}_{b(i,j)}$ are the pairwise estimates of N_b, and Var [$\hat{N}_{b(i,j)}$] is the variance of $\hat{N}_{b(i,j)}$. $\tilde{N}_b$ is the harmonic mean of the $\hat{N}_{b(i,j)}$. Alleles with a frequency below 0.05 were excluded from the analysis to reduce potential bias.

Year	2004	2005	2006
Pairwise $\tilde{S}$ (above diagonal) and *n* (below diagonal):			
2004	-	162	164.3
2005	77	-	188.2
2006	76	75	-
Pairwise $\hat{N}_{b(i,j)}$ (above diagonal) and Var [$\hat{N}_{b(i,j)}$] (below diagonal):			
2004	-	611.3	210.8
2005	9351.5	-	727.5
2006	14965.5	8673.9	-

$\tilde{N}_b$ = 386.8

Appendix K

Genetic Diversity of Upper Columbia River Summer Chinook Salmon

Genetic Structure of upper Columbia River Summer Chinook and Evaluation of the Effects of Supplementation Programs

by

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Abstract

We investigated genetic relationships among temporally replicated collections of summer Chinook from the Wenatchee River, Methow River, and Okanogan River in the upper Columbia River basin. Samples from the Eastbank Hatchery – Wenatchee stock, Eastbank Hatchery – MEOK stock, and Wells Hatchery were also included in the analysis. Samples of natural- and hatchery-origin summer Chinook were analyzed and compared to determine if the supplementation program has had any impacts to the genetic structure of these populations. We also calculated the effective number of breeders for collection locations of natural- and hatchery-origin summer Chinook from 1993 and 2008. In general, population differentiation was not observed among the temporally replicated collection locations. A single collection from the Okanogan River (1993) was the only collection showing statistically significant differences. The effective number of breeders was not statistically different from the early collection in 1993 in comparison to the late collection in 2008. Overall, these analyses revealed a lack of differentiation among the temporal replicates from the same locations and among the collection from different locations, suggesting the populations have been homogenized or that there has been substantial gene flow among populations. Additional comparisons among summer-run and fall-run Chinook populations in the upper Columbia River were conducted to determine if there was any differentiation between Chinook with different run timing. These analyses revealed pairwise F_{ST} values that were less than 0.01 for the collections of summer Chinook to collections of fall Chinook from Hanford Reach, lower Yakima River, Priest Rapids, and Umatilla. Collections of fall Chinook from Crab Creek, Lyons Ferry Hatchery, Marion Drain, and Snake River had pairwise F_{ST} values that were higher in comparison to the collections of summer Chinook. The consensus clustering analysis did not provide good statistical support to the groupings, but did show relationships among collections based on geographic proximity. Overall the summer and fall run Chinook that have historically been

spawned together were not differentiated while fall Chinook from greater geographic distances were differentiated.

Introduction

The National Marine Fisheries Service (NMFS) recognizes 15 Evolutionary Significant Units (ESU) for Chinook salmon (*Oncorhynchus tshawytscha*) (Myers et al. 1998). The summer Chinook from the upper Columbia River are included in the Upper Columbia River Summer- and Fall-Run ESU, which encompasses all late-run (summer and fall), ocean-type Chinook salmon from the mainstem Columbia River and its tributaries (excluding the Snake River) between Chief Joseph and McNary Dams (Waknitz et al. 1995). Waknitz et al. (1995) concluded that due to high total abundance this ESU was not likely to become at risk from extinction. Yet, a majority of natural spawning activity was in the vicinity of Hanford Reach, and it was unclear whether natural production was self-sustaining given the vast summer Chinook artificial propagation efforts (Waknitz et al. 1995). Additionally, the Biological Review Team expressed concern about potential consequences to genetic and life-history traits from an increasing contribution of hatchery fish to total spawning escapement (Waknitz et al. 1995).

Artificial propagation of ocean-type Chinook from the middle/upper Columbia has been continuous since the implementation of the Grand Coulee Fish Maintenance Project (GCFMP) in 1939 (Myers et al. 1998). The US Fish and Wildlife Service established three hatchery programs for summer/fall Chinook during the GCFMP, Leavenworth NFH, Entiat NFH, and Winthrop NFH. The Washington Department of Fisheries (now Washington Department of Fish and Wildlife) followed with hatchery programs at Rocky Reach (1964), Wells Dam (1967), Priest Rapids (1974), and Eastbank (1990) facilities. Currently, only Leavenworth NFH and Winthrop NFH are not producing summer/fall Chinook. Entiat NFH has resumed production of summer/fall Chinook (Wells FH Stock) in 2009 and released their first yearling summer Chinook smolts in 2010. Since

1941, over 200 million ocean-type Chinook salmon have been released into the middle Columbia River Basin (Myers et al. 1998). Initially, the hatchery programs differentiated between early returning fish (i.e., stream-type) and later returning fish (i.e., ocean-type), but no distinction was made regarding the “summer” and “fall” components of the ocean-type stocks (Waknitz et al. 1995). Therefore, all Chinook salmon now migrating above Rock Island Dam descend from not only a mixture between different stocks from the basin, but also a mixture between the endemic summer and fall life histories. While hatchery protocols have been modified of late to maintain discreet summer and fall Chinook hatchery stocks (Utter et al. 1995; see also HGMP), physical evidence and genetic data suggests that summer and fall Chinook may have become homogenized. During the 1970’s and 80’s, given coded-wire tag recoveries, summer-run Chinook originating from above Rock Island Dam were believed to have spawned extensively with Hanford Reach and Priest Rapids Hatchery fish (Chapman 1994). Stuehrenberg et al. (1995) reported that 10% of their radio tagged summer Chinook were occupying typical fall-run spawning habitat on the mainstem Columbia river, and 25% of fall fish released from Priest Rapids were recovered as summers at (or above) Wells Hatchery. Genetic data reported by Marshall et al. (1995) and Waknitz et al. (1995) corroborate these observations, as genetic distances observed between summer and fall Chinook within the Upper Columbia River Summer- and Fall-Run ESU were essentially zero.

In response to the need for evaluation of the supplementation hatchery programs, both a monitoring and evaluation plan (DCPUD 2005; Murdoch and Peven 2005) and the associated analytical framework (Hays et al. 2006) were developed for the Habitat Conservation Plan’s Hatchery Committee through the joint effort of the fishery co-managers (CCT, NMFS, USFWS, WDFW, and YN) and Chelan County and Douglas County PUDs. These reports outline 10 objectives to be applied to various species assessing the impacts of hatchery operations mitigating the operation of Wells, Rocky Reach, and Rock Island hydroelectric projects. The present monitoring and evaluation study plan differs in scope from previous monitoring and evaluation projects proposed by WDFW Molecular Genetics Lab, in that it does not investigate a single watershed, but instead will encompass all summer Chinook stocks from the upper Columbia River including the three supplementation (Wenatchee, Methow, and Okanogan) and the harvest augmentation program (Wells summer Chinook). The objectives of this study were to determine if genetic diversity, population structure, and effective population size have changed in natural spawning populations as a result of the hatchery programs.

Materials and Methods

Collections

A total of 2,416 summer Chinook were collected from tributaries in the upper Columbia River basin and were analyzed (Table 1). Two collections of natural-origin summer Chinook from 1993 (prior to the supplementation program) were taken from the Wenatchee River Basin and were compared to collections of hatchery and natural-origin from 2006 and 2008 that were post-supplementation. Two pre-supplementation collections from the Methow River (1991 and 1993) were compared to post-supplementation collections from 2006 and 2008. Three pre-supplementation collections from the Okanogan River Basin (1991, 1992, and 1993) were compared with post-supplementation collections from 2006 and 2008. A collection of natural-origin summer Chinook from the Chelan River was also analyzed. Additionally, hatchery collections from Eastbank Hatchery (Wenatchee and MEOK stock) and Wells Hatchery were analyzed and compared to the in-river collections. Summer Chinook data (provided by the USFWS) from the Entiat River was also used for comparison. Lastly, data from eight collections of fall Chinook was compared to the collections of summer Chinook.

Laboratory Analyses

All laboratory analyses were conducted at the WDFW Genetics Laboratory in Olympia, Washington. Genomic DNA was extracted by digesting a small piece of fin tissue using the nucleospin tissue kits obtained from Macherey-Nagel following the recommended conditions in the user manual. Extracted DNA was eluted with a final volume of 100 µL.

Genotype information was generated using thirteen microsatellite markers following standard laboratory protocols and analysis methods. Descriptions of the loci assessed in this study and polymerase chain reaction (PCR) conditions are given in Table 2. PCR reactions were run with a thermal profile consisting of: denaturation at 95°C for 3 min, denaturation at 95°C for 15 sec, anneal for 30 sec at the appropriate temperature for each locus (Table 2), extension at 72°C for 1 min, repeat cycle (steps 2-4), final extension at 72°C for 30 minutes. PCR products were then processed with an ABI-3730 DNA Analyzer. Genotypes were visualized with a known size standard (GS500LIZ 3730) using GENEMAPPER 3.7 software. Alleles were binned in GENEMAPPER using the standardized allele sizes established for the Chinook GAPS dataset (Seeb et al. 2007).

Within-collection Statistical Analyses

Allele frequencies were calculated with CONVERT (version 1.3, Glaubitz 2003). Hardy-Weinberg proportions for all loci within each collection were calculated using GENEPOP (version 3.4, Raymond and Rousset 1995). Heterozygosity (observed and expected) was computed for each collection group using GDA (Lewis and Zaykin 2001).

Allelic richness and F_{IS} (Weir and Cockerham 1984) inbreeding coefficient were calculated using FSTAT (version 2.9.3.2, Goudet 2001). Linkage disequilibrium for each pair of loci in each collection was calculated using GENEPOP v 3.4 (10,000 dememorizations, 100 batches, and 5,000 iterations per batch). Pairwise estimates of genetic differentiation between collection groups were calculated using GENEPOP (version 3.4, Raymond and Rousset 1995). Statistical significance for the tests of Hardy-Weinberg proportions, linkage disequilibrium, and genotypic differentiation was evaluated using a Bonferroni correction of p-values to account for multiple, simultaneous tests (Rice 1989).

Between-collection Statistical Analyses

Pairwise F_{ST} estimates were computed to examine population structure among collections using GENETIX (version 4.03, Belkhir et al. 2001). This estimate uses allelic frequency data and departures from expected heterozygosity to assess differences between pairs of populations.

We used PHYLIP (version 3.5c, Felsenstein 1993) to calculate Cavalli-Sforza and Edwards (1967) pairwise chord distances between collections. Bootstrap calculations were performed using SEQBOOT followed by calculations of genetic distance using GENDIST. The NEIGHBOR-JOINING method of Saitou and Nei (1987) was used to generate the dendrograms and CONSENSE to generate a final consensus tree from the 1,000 replicates. The dendrogram generated in PHYLIP was plotted as an unrooted radial tree using TREEVIEW (version 1.6.6, Page 1996).

Effective Number of Breeders

The effective number of breeders (N_b) was estimated for pre- and post-supplementation program collections (where possible) to investigate whether hatchery programs had affected that genetic metric over the operational period. Wang (2009) derived an equation for effective size (N_e) as a function of the frequency of nested full-sib and half-sib families in a random collection of individuals.

$$\frac{1}{N_e} = \frac{1+3\alpha}{4}\left(Q_1 + Q_2 + 2Q_3\right) - \frac{\alpha}{2}\left(\frac{1}{N_1} + \frac{1}{N_2}\right) \qquad \text{(equation 10)}$$

Where α is a measure of the deviation of genotype frequencies from Hardy-Weinberg expectation (equivalent to Wright's (1969) F_{IS}), Q_i are the probabilities that a pair of offspring are paternal half sibs, maternal half sibs, or full sibs, respectively, and N_1 and N_2 are the number of male and female parents that generation, respectively. Genetic parameters (i.e., sibship distributions) were estimated for summer Chinook collections using algorithms implemented in COLONY (Jones and Wang 2009). To be clear, Wang's (2009) method as implemented here will estimate N_b, given multi-locus genotypes from each collection were partitioned by brood year for this analysis. To obtain an estimate of N_e each N_b value must be multiplied by the mean generation time of that population.

Results

Collections

A total of 2,350 individuals from 32 collections of temporally replicated samples (six locations) were analyzed (Table 1). Temporally replicated collections of hatchery and natural-origin samples were from the Wenatchee, Methow, and Okanogan Rivers. Temporally replicated hatchery-origin summer Chinook were from Wells Hatchery, Eastbank Hatchery - Wenatchee stock, and Eastbank Hatchery - Methow/Okanogan (MEOK) stock. A total of 232 of those individuals were excluded from any analyses because they failed to amplify at nine or more loci. Data for remaining 2,118 individuals were analyzed to assess differences between temporally replicated natural- and hatchery-origin summer Chinook for each location and to compare the differences among the different collection locations. Summer Chinook data from the temporally replicated collection locations were then combined and compared to fall Chinook data from the GAPS v.3.0 dataset.

Statistical Analyses

The population statistics (Hardy-Weinberg equilibrium and F_{IS}) calculated for each of the 32 temporally replicated collection locations were consistent with neutral expectations (i.e., no associations among alleles). Three collections did have a single locus that did not meet expectations (Wenatchee hatchery-origin 2006, Wells hatchery 2006, and Okanogan hatchery-origin 2009). Based on these results we suggest the collections represented randomly breeding groups and were not comprised of mixtures of individuals from different genetic source populations.

Population differentiation was assessed for each of the temporally replicated collections from within each location (Table 3). This analysis revealed the only significant difference observed within a collection location pertained to the collection from 1993 Okanogan River natural-origin samples. Because of the significant difference of this collection to the other temporal replicates it was not included in further analyses.

Given the absence of genetic differentiation observed among the temporally replicated collections, the 32 collections from the Wenatchee, Methow, and Okanogan River were combined to form three location-specific collections for analysis. Population differentiation metrics were compared among the composite Wenatchee, Methow, and Okanogan collections and eight other location-specific collections (11 locations total). Comparing all collections, there were a total of 39 significant genic test comparisons out of a total 496 (Table 4). Thirty-eight of the 39 statistically significant pairwise differences pertained to the Okanogan River and 2006 Wells Hatchery collections (Table 4). F_{ST} results are described further below.

Within-collection genetic metrics were estimated for the 11 location-specific collections of summer Chinook from the upper Columbia River, in addition to eight collections of fall Chinook (Table 1). The population statistics (Hardy-Weinberg equilibrium and F_{IS}) calculated for these collections of summer and fall

Chinook were also consistent with neutral expectations. The collection from Lyons Ferry Hatchery had one locus that did not meet expectations and the collections from Crab Creek and Marion Drain both had three loci that did not meet expectations.

The hatchery collections in general had a higher percentage of significantly linked loci; however the observed genetic diversity were similar for the natural and hatchery-origin collections. Analysis of allelic richness was based on 11 individuals per collection, the minimum number of individuals across all collections with complete multilocus genotypes. The largest number of linked loci occurred in the Crab Creek, Entiat River, and Okanogan natural-origin collections. Allelic richness was on average lower in the collections of summer Chinook (10.7) collections in comparison to the collections of fall Chinook (11.0).

Pairwise F_{ST} (Table 4) estimates revealed low levels of differentiation, where all observed F_{ST} values between the collections of summer Chinook were lower than 0.0096. There were 15 out of 28 comparisons between collections of summer Chinook that were significantly different from zero and occurred primarily from comparisons of the Okanogan River (hatchery and natural-origin) and Wells Hatchery to all other collections. The collection of Eastbank Hatchery – MEOK stock was differentiated from the Wenatchee River natural-origin and Entiat River collections. The collection from the Chelan River had a small sample size of 23 individuals and only differentiated from the Eastbank Hatchery – MEOK stock. F_{ST} estimates regarding pairwise comparisons between each of four fall Chinook collection locations (Crab Creek, Lyons Ferry Hatchery, Marion Drain, and Snake River) to all other collections were significantly different from zero (Table 5). Pairwise comparisons for three other fall Chinook collections (Hanford Reach, lower Yakima River, and Umatilla River) to the collections of summer Chinook were significantly different from zero (Table 6). The only fall Chinook collection that was not significantly differentiated from all of the summer Chinook was Priest Rapids.

The relative genetic relationships among the test groups were assessed using the consensus clustering analysis (Figure 1). Statistical support for the dendrogram topology (i.e., tree shape) was low regarding the branching that separated the collections of summer Chinook from the upper Columbia River. The collections of fall Chinook; however were supported with bootstrap support over 76% with the exception of three collections (lower Yakima River, Crab Creek, and Umatilla River). In other words, 760 of the 1000 bootstrap replicates supported the placement of the node separating summer and fall collections. The collection from the Chelan River had bootstrap support of 68%; however the sample size for that collections was small (N = 23). Even though the bootstrap support was low among the collections of summer Chinook there was concordance between geography and genetic distance.

Where comparisons were possible between pre- and post-supplementation program collections, the effective number of breeders (N_b) estimated to have comprised those collections were slightly lower for contemporary (2008) collections; however in all cases the 95% confidence intervals overlapped between historical and contemporary collections, suggesting statistical equivalency. Regarding Wenatchee River collections, the point estimates of N_b ranged from 134 (08FU) to 190 (93DD), where all collections had overlapping confidence intervals (Table 7). The upper bound of the 1989 brood year for collection 93DD was very large, suggesting the sample size was insufficient for properly inferring the sibship distribution within the collection. Comparing the Okanogan natural collections 93ED and 08GA, the estimated N_b were 142 (CI 102 – 203) and 127 (CI 92 – 180), respectively. For the Eastbank Hatchery MEOK stock comparisons, the N_b estimated for the 93DF collection was 171 (CI 129 – 229), as compared to the 166 (CI 126 – 226) estimated for collection 08MO. In all cases, the estimated N_b can be converted to effective population size (N_e) by multiplying the estimate by the mean generation time.

Discussion

The collections of summer Chinook populations from the upper Columbia River are of interest because census sizes are reduced below historic levels and are the subject of mitigation and supplementation hatchery programs. Concern over the impacts of hatchery supplementation programs on the genetic integrity of natural-origin populations led to our primary objective, which was to evaluate genetic metrics for temporally replicated collections of summer Chinook in the upper Columbia River pre and post hatchery supplementation. A similar analysis by Kassler and Dean (2010) was conducted on spring Chinook in the Tucannon River to evaluate the effects of a supplementation and captive brood program on natural-origin stocks. Additionally, upper Columbia River spring Chinook supplementation programs (Blankenship et al. 2007; Small et al. 2007), spring and fall Chinook populations in the Yakima Basin (Kassler et al. 2008), and a potentially unique population of fall Chinook in Crab Creek (Small et al. 2010) have been evaluated. In the present analysis of summer Chinook populations, collections of pre- and post- supplementation summer Chinook were collected from the Wenatchee River, Methow River, and Okanogan River Basins and analyzed to determine if the genetic profile has changed as a result of the supplementation program. Analysis was then conducted on the collections of summer run to compare the fall run Chinook collections in the upper Columbia River basin.

Allozyme analyses of these three summer run Chinook stocks in the upper Columbia River have identified that each stock was distinct, with a closer relationship detected between the Wenatchee and Methow Rivers (WDF and WDW 1993, Marshall 2002). Wenatchee summer Chinook are thought to be a mixture of native summer Chinook and Chinook from the Grand Coulee Fish Maintenance Project (GCFMP). The goal of the GCFMP project between 1939 and 1943 was to trap migrating Chinook salmon at Rock Island dam (75 miles below Grand Coulee) and homogenize the populations, which reduced the genetic uniqueness of the distinct tributary populations present in the upper Columbia River.

We found allele frequencies for individual temporally replicated hatchery- and natural-origin collection locations of adult summer Chinook were not significantly different from that expected of a single underlying population, except for one collection (1993 Okanogan natural-origin; Table 3). This collection was differentiated to the Okanogan collections in 2006 and 2008; however it was not differentiated from the collection in 1992. The Okanogan collection from 1992 was also not differentiated to any other collection; therefore the difference in the collection from Okanogan 1993 was likely not an indication of genetic change from pre supplementation to post supplementation. The collection was however dropped from further analyses so as to not confuse interpretation of results. The lack of allelic differentiation observed among the temporally replicated collections was interpreted as the genetic metrics from each location in the early 1990's did not differ from the samples collected in 2008. Spanning a few generations, allele frequencies are not expected to change for large populations at genetic equilibrium. In contrast, changes in allele frequencies of small populations may occur due to the stochastic sampling of genes from one generation to the next (i.e., genetic drift).

A second round of analyses was conducted to evaluate the genetic relationships of the summer run collections (temporal collections were combined) with data from the Entiat River, Chelan River, and eight collections of fall Chinook. Assessment of the relationship between the summer run collections in comparison to each other provided very little evidence of genetic differentiation between these collections. While population differentiation did show some significant differences between the Okanogan River and Wells Hatchery collections, all of the pairwise F_{ST} values were below 0.003. Meaning that a very small proportion of the observed genetic variation could be attributed to restrictions in gene flow (i.e., population structure)

The comparison of the hatchery-origin collections revealed a lack of differentiation between the Eastbank Hatchery – Wenatchee stock, Eastbank Hatchery – MEOK stock, and the Wells Hatchery (with exception of the 2006 collection). The genetic similarity or low level of genetic differentiation among these stocks suggests that there has been an integration of natural- and hatchery-origin summer Chinook in the upper Columbia River or a lack of ancestral genetic difference. The difference of the 2006 Wells Hatchery collection to the other collections is most likely a result of sampling effect because of the lack of differentiation among the stocks in the basin. If the 2006 collection had been mixed from different sources of summer Chinook there would not be a detectable level of differentiation as was seen with the 2006 sample.

The analyses to compare summer and fall Chinook collections provided some understanding on the genetic relationships of Chinook with different run timings in the upper Columbia River basin. Historically, the hatchery programs in the upper Columbia River were separated into groups of the early returning fish (i.e., stream-type) and later returning fish (i.e., ocean-type), but the programs did not sort individuals identified as "summer" or "fall" stocks (Waknitz et al. 1995). Now all Chinook salmon that are migrating above Rock Island Dam descend from a mixture of different stocks from the upper Columbia River basin, but also a mixture between the endemic summer and fall life histories.

Small et al. (2010) conducted an analysis on summer run and fall run Chinook in the upper Columbia River and concluded that Crab Creek Chinook in the upper Columbia River were genetically distinct to all other fall and summer run Chinook stocks that were analyzed. They did note a departure from Hardy Weinberg expectation as a result of a null allele at the microsatellite locus *Ogo-4* and a higher linkage disequilibrium value due to the inclusion of family groups in one of their samples. Kassler et al. (2008) found differentiation among spring and fall Chinook populations in the Yakima River.

The tests of pairwise F_{ST} indicated a very low level of genetic differentiation (less than one percent difference) between collections of summer-run Chinook and fall-run Chinook. The range of pairwise F_{ST} values for comparisons between the summer run and fall run collections was 0.0016 – 0.0248. The larger values from the range were associated to the collections from Crab Creek, Lyons Ferry Hatchery, and Marion Drain. Studies by Kassler et al. (2008) and Small et al. (2010) have documented differences among the populations of these collections to others within the upper Columbia River basin. The low pairwise F_{ST} values between Priest Rapids and Hanford Reach collections and the summer run collections were not surprising because summer-run Chinook originating from above Rock Island Dam were believed to have spawned extensively with Hanford Reach and Priest Rapids Hatchery fish during the 1970's and 80's (Chapman 1994). The lack of differentiation among the summer and fall stocks in the Columbia River was also identified by Utter et al. (1995) and the HGMP where they state physical evidence and genetic data suggests that summer and fall Chinook may have become homogenized.

Despite low levels of statistical bootstrap support for dendrogram topology (i.e., tree shape), there was concordance observed between geographic location and the genetic relationships among the summer and fall Chinook populations. The collections from the Okanogan (hatchery and natural-origin) did separate out with collections from Wells Dam Hatchery, Entiat River, and Eastbank Hatchery – MEOK stock, and were next to a group of the Methow and Wenatchee collections. The fall Chinook populations are also separated to the summer collections and the position of all but three of these collections (lower Yakima River, Crab Creek, and Umatilla River) were statistically supported. The geographic proximity of the fall collections seemed to follow the observed pattern in this dendrogram. The relationship of the Snake River and Lyons Ferry Hatchery in proximity to the collection from Marion Drain was not surprising while the relationship between Priest Rapids and Hanford Reach was easily a result of the stocking practices of fall Chinook in the 1970 and 1980's.

A secondary objective of this study was to determine if the effective population size of upper Columbia River summer Chinook populations had changed over time due to supplementation efforts. We observed that the number of effective breeders in the collections from 1993 and 2008 has not changed thus providing reason to believe that the genetic diversity of summer Chinook in the upper Columbia River has not been altered through the supplementation program.

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Table 1. Samples of adult hatchery- and natural-origin summer and fall Chinook that were analyzed from the upper Columbia River. Total number of individuals that were analyzed / individuals with data for 9 or more loci that were included in the analysis. Collection statistics (allelic richness, linkage disequilibrium (before and after Bonferroni correction), F_{IS}, heterozygosity (H_O and H_E)) and p-values for deviations from Hardy-Weinberg equilibrium (HWE). P-values were defined as significant after implementation of Bonferroni correction for multiple tests (Rice 1989).

WDFW GSI code[a]	Collection location	N =	Allelic Richness[b]	Linkage Disequilibrium[c]	F_{IS} (p-value)[d]	H_O	H_E
93DD	Wenatchee River upstream of Tumwater Dam - natural origin	51 / 45					
93DE	Wenatchee River downstream of Tumwater Dam - natural origin	88 / 88					
06CQ	Wenatchee River upstream of Tumwater Dam - natural origin	95 / 86					
06CR	Wenatchee River downstream of Tumwater Dam - natural origin	95 / 82					
08FV	Wenatchee River upstream of Tumwater Dam - natural origin	95 / 82					
08FW	Wenatchee River downstream of Tumwater Dam - natural origin	95 / 87					
	Wenatchee River - Natural origin combined	**519 / 470**	**10.7**	**17 / 4**	**0.001 (0.403)**	**0.8504**	**0.8513**
06CP	Wenatchee River - hatchery origin	95 / 70					
08FU	Wenatchee River - hatchery origin	95 / 83					
	Wenatchee River - Hatchery origin combined	**190 / 153**	**10.6**	**18 / 6**	**0.018 (0.013)**	**0.8409**	**0.8561**
93EC	Methow River - natural origin	27 / 27					
06CT	Methow River - natural origin	95 / 90					
08FY	Methow River - natural origin	95 / 88					
09CO	Methow River - natural origin	91 / 80					
	Methow River - Natural origin combined	**308 / 285**	**10.7**	**4 / 1**	**0.006 (0.160)**	**0.8506**	**0.8554**
06CS	Methow River - hatchery origin	14 / 8					
08FX	Methow River - hatchery origin	21 / 18					
09CP	Methow River - hatchery origin	19 / 18					
	Methow River - Hatchery origin combined	**54 / 44**	**10.8**	**11 / 2**	**-0.003 (0.593)**	**0.8553**	**0.8523**

Table 1 continued.							
92FM	Okanogan River - natural origin	49 / 46					
93ED*	Okanogan River - natural origin	103 / 87					
06CV	Okanogan River - natural origin	95 / 88					
08GA	Okanogan River - natural origin	95 / 92					
09CN	Okanogan River - natural origin	133 / 126					
	Okanogan River - Natural origin combined	**475 / 439**	**10.8**	**9 / 4**	**0.003 (0.304)**	**0.8563**	**0.8596**
* - not included in the combined dataset							
06CU	Okanogan River - hatchery origin	58 / 49					
08FZ	Okanogan River - hatchery origin	19 / 18					
09CM	Okanogan River - hatchery origin	117 / 107					
	Okanogan River - hatchery origin combined	**194 / 174**	**10.8**	**31 / 10**	**-0.011 (0.920)**	**0.8678**	**0.8586**
91FL	Wells Hatchery	68 / 42					
92FK	Wells Hatchery	25 / 23					
93DG	Wells Hatchery	11 / 9					
06DM	Wells Hatchery	95 / 91					
08HY	Wells Hatchery	95 / 91					
	Wells Hatchery combined	**294 / 256**	**10.7**	**8 / 3**	**-0.001 (0.529)**	**0.8670**	**0.8665**
08MN	**Eastbank Hatchery - Wenatchee River stock**	**95 / 90**	**10.7**	**6 / 1**	**0.020 (0.024)**	**0.8326**	**0.8498**
92FO	Eastbank Hatchery - Methow / Okanogan (MEOK) stock	36 / 33					
93DF	Eastbank Hatchery - Methow / Okanogan (MEOK) stock	90 / 86					
08MO	Eastbank Hatchery - Methow / Okanogan (MEOK) stock	95 / 88					
	Eastbank Hatchery - MEOK stock combined	**221 / 207**	**10.7**	**2 / 0**	**-0.005 (0.782)**	**0.8647**	**0.8604**
		2,350 / 2,118					

Table 1 continued.

06KN	**Chelan River**	**70 / 23**	**10.3**	**11 / 0**	**0.027 (0.118)**	**0.8334**	**0.8556**
Data provided by USFWS							
	Entiat River - summer Chinook	**190**	**10.9**	**33 / 10**	**0.008 (0.119)**	**0.8553**	**0.8625**
Data from Small et al. (2010)							
08EH	Crab Creek	108					
09AZ	Crab Creek	291					
	Crab Creek	**399**	**10.5**	**35 / 14**	**0.018 (0.000)**	**0.8519**	**0.8676**
GAPS v.3.0 data							
	Priest Rapids Hatchery - fall Chinook	**81**	**11.1**	**3 / 2**	**0.015 (0.079)**	**0.8591**	**0.8723**
	Hanford Reach - fall Chinook	**220**	**11.3**	**4 / 0**	**0.010 (0.068)**	**0.8661**	**0.8746**
	Umatilla - fall Chinook	**96**	**11.2**	**17 / 6**	**-0.003 (0.623)**	**0.8719**	**0.8693**
	lower Yakima River - fall Chinook	**103**	**11.0**	**3 / 1**	**0.000 (0.511)**	**0.8724**	**0.8721**
	Marion Drain - fall Chinook	**190**	**10.8**	**9 / 4**	**0.022 (0.001)**	**0.8586**	**0.8782**
	Lyons Ferry Hatchery - fall Chinook	**186**	**10.6**	**7 / 4**	**0.013 (0.033)**	**0.8527**	**0.8641**
	Snake River - fall Chinook	**521**	**11.1**	**0 / 0**	**-0.001 (0.634)**	**0.8720**	**0.8708**
		NA / 2,009					

[a] - Year that samples were collected is identifed by the two numbers in the WDFW GSI code

[b] - based on a minimum of 11 diploid individuals

[c] - adjusted alpha p-value = 0.0006

[d] - adjusted alpha p-value = 0.0002

Table 2. PCR conditions and microsatellite locus information (number alleles/locus and allele size range) for multiplexed loci used for the analysis of Chinook. Also included are the observed and expected heterozygosity (H_o and H_e) for each locus.

PCR Conditions			Locus statistics		Heterozygosity		
Poolplex	Locus	Dye Label	# Alleles/ Locus	Allele Size Range (bp)	H_o	H_e	References
Ots-M	*Ots-201b*	blue	49	137 - 334	0.9474	0.9544	Unpublished
	Ots-208b	yellow	56	154 - 378	0.9523	0.9672	Greig et al. 2003
	Ssa-408	red	32	184 - 308	0.9177	0.9214	Cairney et al. 2000
Ots-N	*Ogo-2*	red	22	206 - 260	0.8526	0.8673	Olsen et al. 1998
Ots-O	*Ogo-4*	blue	20	128 - 170	0.6694	0.7028	Olsen et al. 1998
	Ots-213	yellow	45	178 - 370	0.9430	0.9525	Greig et al. 2003
	Ots-G474	red	16	152 - 212	0.6816	0.6838	Williamson et al. 2002
Ots-R	*Ots-3M*	blue	15	128 - 158	0.7854	0.7938	Banks et al. 1999
	Omm-1080	green	54	162 - 374	0.9517	0.9670	Rexroad et al. 2001
Ots-S	*Ots-9*	red	9	99 - 115	0.6531	0.6543	Banks et al. 1999
	Ots-212	blue	33	123 - 251	0.9205	0.9360	Greig et al. 2003
Ots-T	*Oki-100*	blue	50	164 - 361	0.9500	0.9567	Unpublished
	Ots-211	red	34	188 - 327	0.9325	0.9414	Greig et al. 2003

Table 3. Tests of population differentiation for temporal collections of summer Chinook from natural and hatchery-origin populations in the upper Columbia River. P-values that are highlighted grey are significantly different after Bonferroni correction (Rice 1989). Adjusted alpha p-value was 0.0001 . The H and W in the collection identifier is for wild or hatchery-origin and the two digit number identifes the year samples were collected.

Wenatchee River

	WenW93U	WenW93D	WenH06	WenW06U	WenW06D	WenH08	WenW08U	WenW08D
WenW93U	****							
WenW93D	0.0162	****						
WenH06	0.0033	0.0102	****					
WenW06U	0.3039	0.1642	0.4795	****				
WenW06D	0.0261	0.0160	0.0678	0.5300	****			
WenH08	0.1126	0.0708	0.0073	0.4359	0.0893	****		
WenW08U	0.2115	0.1148	0.4191	0.7243	0.3830	0.8856	****	
WenW08D	0.1915	0.0014	0.7047	0.4928	0.1671	0.7755	0.7665	****

D - collection was downstream of Tumwater Dam; U - collection was upstream of Tumwater Dam

Methow River

	MetW93	MetH06	MetW06	MetH08	MetW08	MetW09	MetH09
MetW93	****						
MetH06	0.3962	****					
MetW06	0.5481	0.4688	****				
MetH08	0.1408	0.1192	0.2052	****			
MetW08	0.8219	0.8937	0.6156	0.3779	****		
MetW09	0.2564	0.4282	0.2502	0.0328	0.7309	****	
MetH09	0.1543	0.5678	0.0547	0.0017	0.0098	0.0073	****

Okanogan River

	OkanW92	OkanW93	OkanH06	OkanW06	OkanH08	OkanW08	OkanH09	OkanW09
OkanW92	****							
OkanW93	0.0066	****						
OkanH06	0.0193	0.0000	****					
OkanW06	0.2843	0.0082	0.0031	****				
OkanH08	0.1290	0.1106	0.0652	0.7329	****			
OkanW08	0.0106	0.0029	0.0082	0.4075	0.7396	****		
OkanH09	0.0187	0.0001	0.0094	0.0551	0.2214	0.0281	****	
OkanW09	0.0527	0.0000	0.0024	0.7130	0.0262	0.0065	0.0002	****

Table 3 continued.

Wells Dam Hatchery

	Wells91	Wells92	Wells93	Wells06	Wells08
Wells91	****				
Wells92	0.5863	****			
Wells93	0.0490	0.0784	****		
Wells06	0.0089	0.0100	0.0542	****	
Wells08	0.0819	0.1088	0.2552	0.0256	****

Eastbank Hatchery - Wenatchee and MEOK stocks

	EBHWen08	EBHME92	EBHME93	EBHME08
EBHWen08	****			
EBHME92	0.8681	****		
EBHME93	0.0251	0.8661	****	
EBHME08	0.0086	0.9563	0.1895	****

Table 4. F_{ST} pairwise comparisons and genotypic tests of differentiation for hatchery- and natural-origin summer Chinook from the upper Columbia River. Above the diagonol are the F_{ST} values and below are p-values for the test of genotypic differentiation. Non-significant p-values for the result of the genotypic differentiation test are in bold type and F_{ST} values that are not significantly different from zero are in bold type.

	Wenatchee Hatchery	Wenatchee Natural	Methow Hatchery	Methow Natural	Okanogan Hatchery	Okanogan Natural	Wells Hatchery	Eastbank Wenatchee stock	Eastbank MEOK stock	Entiat River	Chelan River
Wenatchee Hatchery	****	**0.0000**	**0.0011**	**0.0000**	**0.0013**	**0.0010**	0.0015	**0.0004**	**0.0007**	**0.0004**	**0.0072**
Wenatchee Natural	**0.4351**	****	**0.0016**	**0.0000**	0.0014	0.0016	0.0024	**0.0006**	0.0012	0.0009	**0.0068**
Methow Hatchery	**0.3800**	**0.0205**	****	**0.0012**	0.0029	**0.0008**	**0.0027**	**0.0014**	**0.0022**	**0.0019**	**0.0078**
Methow Natural	**0.2237**	**0.6566**	**0.1502**	****	**0.0011**	0.0011	0.0013	**0.0007**	**0.0007**	**0.0008**	**0.0053**
Okanogan Hatchery	0.0001	0.0000	**0.0364**	**0.0008**	****	**0.0010**	**0.0014**	0.0029	**0.0000**	**0.0007**	**0.0055**
Okanogan Natural	0.0000	0.0000	**0.1755**	0.0000	**0.0003**	****	0.0016	0.0023	**0.0005**	**0.0008**	**0.0049**
Wells Hatchery	0.0000	0.0000	**0.0129**	0.0000	0.0000	0.0000	****	0.0036	**0.0006**	**0.0008**	**0.0041**
Eastbank Wenatchee	**0.5261**	**0.4102**	**0.1215**	**0.8404**	**0.0015**	0.0000	0.0000	****	**0.0018**	0.0030	0.0096
Eastbank MEOK stock	**0.0485**	0.0000	**0.4246**	**0.0009**	**0.5786**	**0.0051**	0.0000	**0.0065**	****	**0.0005**	**0.0039**
Entiat River	**0.0565**	0.0000	**0.1795**	**0.0044**	**0.0005**	0.0000	**0.0032**	**0.0039**	**0.0042**	****	**0.0052**
Chelan River	**0.0091**	**0.0026**	**0.0182**	**0.0156**	**0.0048**	**0.0030**	**0.0066**	**0.0059**	**0.0493**	**0.0617**	****

Table 5. F_{ST} pairwise comparisons and genotypic tests of differentiation for fall Chinook. Above the diagonol are the F_{ST} values and below are p-values for the test of genotypic differentiation. Non-significant p-values for the result of the genotypic differentiation test are in bold type and F_{ST} values that are not significantly different from zero are in bold type.

	Crab Creek	Hanford Reach Fall	Lyons Ferry Hatchery Fall	lower Yakima River Fall	Marion Drain Fall	Priest Rapids Fall	Umatilla River Fall	Snake River Fall
Crab Creek	****	0.0087	0.0134	0.0079	0.0143	0.0107	0.0073	0.0097
Hanford Reach Fall	0.0000	****	0.0077	**0.0000**	0.0064	**0.0000**	**0.0000**	0.0022
Lyons Ferry Hatchery Fall	0.0000	0.0000	****	0.0063	0.0074	0.0092	0.0062	0.0029
lower Yakima River Fall	0.0000	**0.4140**	0.0000	****	0.0054	**0.0000**	**0.0000**	0.0018
Marion Drain Fall	0.0000	0.0000	0.0000	0.0000	****	0.0067	0.0061	0.0060
Priest Rapids Fall	0.0000	**0.0695**	0.0000	**0.0083**	0.0000	****	**0.0000**	0.0027
Umatilla River Fall	0.0000	**0.4879**	0.0000	**0.4896**	0.0000	**0.2539**	****	0.0011
Snake River Fall	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	****

Table 6. F_{ST} pairwise comparisons and genotypic tests of differentiation for hatchery- and natural-origin summer Chinook from the upper Columbia River and fall Chinook. Above the diagonol are the F_{ST} values and below are p-values for the test of genotypic differentiation. Non-significant p-values for the result of the genotypic differentiation test are in bold type and F_{ST} values that are not significantly different from zero are in bold type.

Population Differentiation

	Wenatchee Hatchery	Wenatchee Natural	Methow Hatchery	Methow Natural	Okanogan Hatchery	Okanogan Natural	Wells Hatchery	Eastbank Wenatchee stock	Eastbank MEOK stock	Entiat River	Chelan River
Crab Creek	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hanford Reach Fall	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	**0.0349**
Lyons Ferry Hatchery Fall	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
lower Yakima River Fall	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	**0.0074**
Marion Drain Fall	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Priest Rapids Fall	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	**0.0642**
Umatilla River Fall	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	**0.0579**
Snake River Fall	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 6 continued.

Pairwise F_{ST}

	Crab Creek	Hanford Reach Fall	Ferry Hatchery	Yakima River	Marion Drain Fall	Priest Rapids Fall	Umatilla River Fall	Snake River Fall
Wenatchee Hatchery	0.0158	0.0054	0.0180	0.0056	0.0153	**0.0025**	0.0053	0.0103
Wenatchee Natural	0.0162	0.0059	0.0185	0.0063	0.0157	0.0030	0.0059	0.0102
Methow Hatchery	0.0191	0.0104	0.0248	0.0095	0.0220	0.0069	0.0107	0.0165
Methow Natural	0.0148	0.0057	0.0182	0.0051	0.0148	0.0033	0.0055	0.0101
Okanogan Hatchery	0.0146	0.0041	0.0166	0.0042	0.0151	**0.0016**	0.0041	0.0082
Okanogan Natural	0.0163	0.0064	0.0187	0.0062	0.0170	0.0035	0.0068	0.0113
Wells Hatchery	0.0120	0.0051	0.0135	0.0044	0.0120	0.0028	0.0046	0.0077
Wenatchee stock	0.0184	0.0073	0.0203	0.0074	0.0167	0.0047	0.0084	0.0128
Eastbank MEOK stock	0.0128	0.0036	0.0143	0.0038	0.0135	**0.0019**	0.0038	0.0079
Entiat River	0.0147	0.0059	0.0176	0.0057	0.0156	0.0028	0.0056	0.0100
Chelan River	0.0074	**0.0046**	0.0110	**0.0040**	0.0160	**0.0047**	**0.0035**	0.0072

Table 7. Effective number of breeders per brood year with the largest number of samples of summer Chinook in the upper Columbia River. Brood years with sample size less than 19 individuals (shown in bold type) were not analyzed with exception of the 2008 Wells Hatchery collection. A comparison could not be made between an early and late collection from Wells Hatchery.

WDFW Code	Collection Location	Sample Size	Nb =	CI95(L) =	CI95(U) =
93DD[A]	Wenatchee Natural - upstream	23 / 19	152 / 190	77 / 87	616 / 2,147,483,647
08FV	Wenatchee Natural - upstream	56	162	112	249
93DE[A]	Wenatchee Natural - downstream	39 / 34	145 / 152	94 / 95	256 / 302
08FW	Wenatchee Natural - downstream	67	140	105	199
08FU	Wenatchee Hatchery	60	134	90	213
93EC[A]	Methow Natural	**10 / 15**	---	---	---
08FY	Methow Natural	62	150	106	218
08FX	Methow Hatchery	**9**	---	---	---
93ED	Okanogan Natural	69	142	102	203
08GA	Okanogan Natural	59	127	92	180
08FZ	Okanogan Hatchery	**16**	---	---	---
93DG	Wells Hatchery	**6**	---	---	---
08HY[B]	Wells Hatchery	24 / 39	---	---	---
08MN	Eastbank Hatchery - Wenatchee	88	190	144	263
93DF	Eastbank Hatchery - MEOK	84	171	129	229
08MO	Eastbank Hatchery - MEOK	88	166	126	226

[A] - calculations were made for samples from brood year 1988 / brood year 1989

[B] - samples were collected from brood year 2003 / brood year 2004

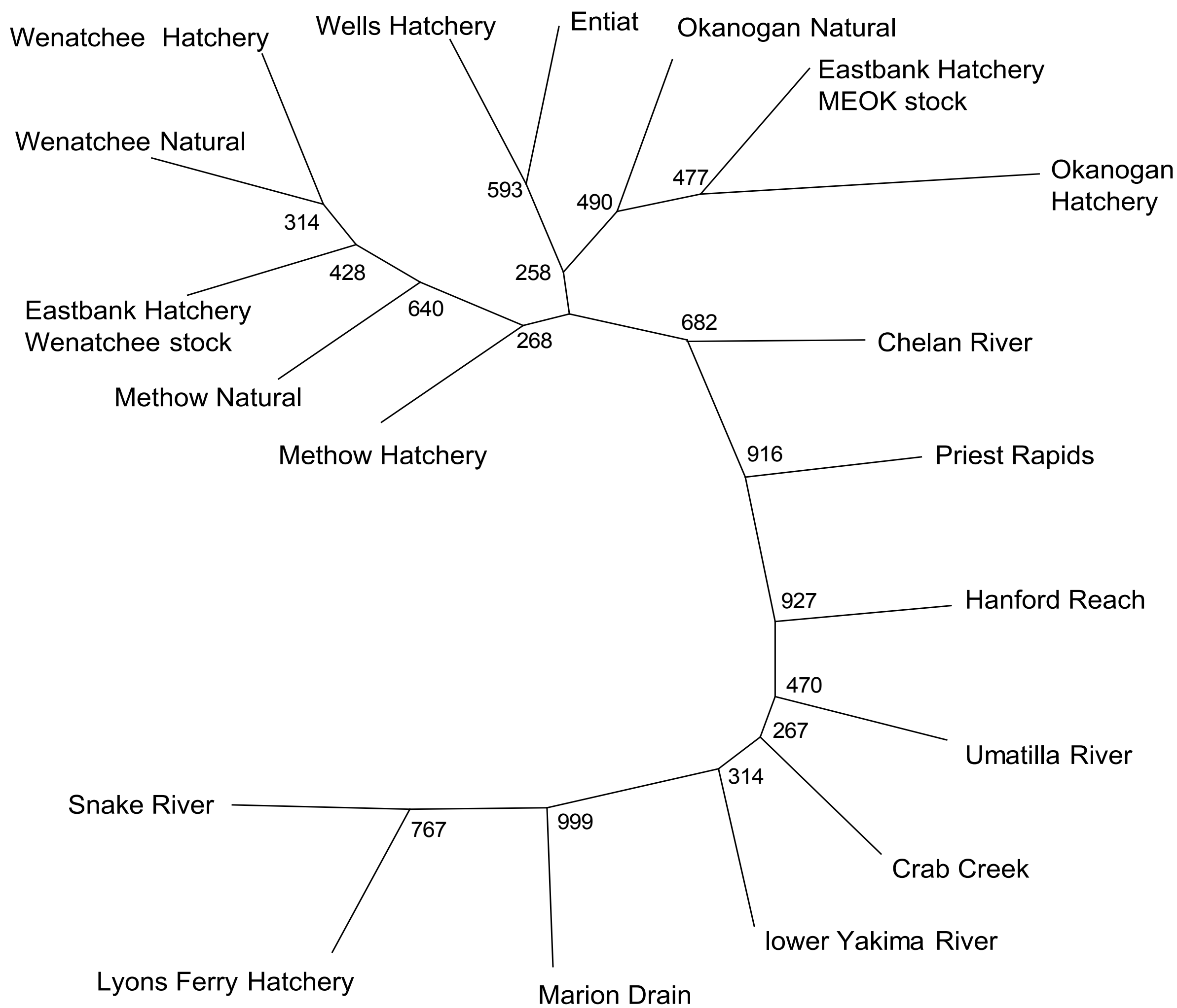

Figure 1. Relationship of natural- and hatchery-origin Chinook collections from the upper Columbia River basin using Cavalli-Sforza and Edwards (1967) chord distance. Bootstrap values are shown at each node.

Appendix L

Summer Chinook Spawning Ground Surveys in the Methow River Basin and Chelan River, 2013

BioAnalysts, Inc.
4725 North Cloverdale Road, Ste. 102
Boise ID 83713

CHELAN COUNTY
327 N. Wenatchee Ave.
Wenatchee, WA 98801

February 26, 2014

To: HCP Hatchery Committee

From: Denny Snyder, Lance Keller, and Mark Miller

Re: 2013 Summer Chinook spawning ground surveys in the Methow Basin and Chelan river

The purpose of this memo is to provide information on the hatchery-supplemented natural spawning population of summer Chinook in the Methow River basin and Chelan River. This work is part of a larger effort focused on monitoring and evaluating Chelan PUD's hatchery supplementation program. The tasks and objectives associated with implementing Chelan PUD's hatchery M&E plan for 2013 are outlined in several documents (Murdoch and Peven 2005; Peven 2006; Hays et al. 2006). Figures and tables are presented at the end of this memo. In 2013, the Okanogan River basin was surveyed by the Colville Tribes.

METHODS

Spawning ground surveys were conducted by foot and raft beginning the last week of September and ending mid-November in the Methow and first week of December in the Chelan River. We did not use aerial surveys on the Methow River because past work has demonstrated that ground counts were more accurate than aerial surveys (Miller and Hillman 1997). Ground surveys were used to provide more accurate counts and a complete census of Chinook redds within their spawning distribution. Observers floated through sampling reaches and recorded the location and numbers of redds each week. Observers recorded the date, water temperature, river mile, and constructed a drawing of the area where redds were located. A different symbol was used each week to record the number of new and incomplete redds.

To maintain consistency, at least one observer surveyed the same stream reach on successive dates. In areas where numerous summer Chinook spawn, we constructed detailed maps of the river and used the cell-area method (Hamilton and Bergersen 1984) to identify the number of redds within each cell. Cells were bound by noticeable landmarks along the banks (e.g., bridges or trees) or at stream habitat boundaries (e.g., transitions between pools and riffles). The number of redds were then recorded in the corresponding grid on the map. When possible, observers estimated the number of redds in a large disturbed area by counting females that defended redds. We assumed that the area or territory defended by a female was one redd. Escapement was estimated by multiplying the redd count times the observed male-to-female ratio of summer Chinook observed at Wells Dam during broodstock collection.

Carcasses of summer Chinook were sampled to describe the spawning population. Biological data included collection of scale samples for age analysis, length measurements (POH and FKL), sex, egg voidance, marks and scanned for PIT tags. These data will be used to assess length-at-age, size-at-age, egg voidance, origin (hatchery or naturally produced), and stray rates. No DNA samples were collected on summer Chinook this year. Information on summer Chinook spawning in the Chelan River was collected by Chelan PUD and is presented in the results. We only report the escapement and number of redds for the Okanogan and Similkameen rivers.

RESULTS

Methow

There were 1,551 summer Chinook redds counted within seven reaches of the Methow River (Table 1). No redds were counted in the Chewuch River this year. This was the third highest redd count observed in the last 23 years for the Methow River (Table 3). Spawning began the last week of September and peaked in mid-October and continued into the third week of November (Figure 1). Numerous redds and fish were observed in the lower Methow River during the second and third weeks of November. The high number of fall Chinook counted over Wells dam may account for the increase in spawning late in the lower Methow River. The high number of fish observed at Wells dam in 2013 was four times (17,354) the ten year average (3,678). Stream temperatures in the Methow River when spawning began varied from 7.5-10.0 °C. Peak spawning occurred in reaches (M2-M4, M6 and M7) of the Methow River during the second week of October. Spawning peaked the third week of October in reach (M5) and the fourth week in reach (M1). Most redds (94%) were located in reaches (M1-M3) downstream from the town of Twisp and in reach (M5) between Methow Valley Irrigation Diversion (MVID) and Winthrop Bridge (Table 1). Few summer Chinook spawned (1%) upstream from the Winthrop Bridge in reaches M6 and M7. Estimated escapement based on expansion of redd counts from the sex-ratio observed at Wells Dam during broodstock collection suggests that 3,583 summer Chinook (1,551 redds x 2.31 fish/redd) escaped to the Methow River.

There were 1,173 summer Chinook salmon carcasses sampled within the seven reaches of the Methow River (Table 2). The presence or absence of an adipose fin could not be determined on three of those fish. Thirty-two percent of the fish returning to the Methow River were sampled based on the estimated escapement of 3,583 summer Chinook. Females made up 58% and males 42% of the carcasses examined. Mean percent egg voidance assessed from 681 female carcasses was 96%. Eleven females (2%) died before spawning (i.e., they retained all their eggs). Ad-clipped hatchery fish made up 49% and naturally produced fish (adipose fin present) were 51% of the sample collected (Table 2). The distribution of ad-clipped hatchery and naturally produced fish showed that more than half (90%) of the ad-clipped hatchery fish were located in the lower three reaches while naturally produced fish were more evenly distributed with (75%) in the lower three reaches (Figure 2). There were 13 PIT-tagged summer Chinook recovered during carcass surveys.

Chelan River

Chelan County PUD personnel counted 729 redds in the Chelan River. Spawning activity began the first week of October and peaked two weeks later (Table 1; Figure 1). Spawning continued into the first week of December. This was the highest redd count observed in the last 13 years for the Chelan River. The majority (75%) of spawning occurred in the Powerhouse tailrace and in the habitat channel (Table 1). Estimated escapement based on expansion of redd counts from the sex-ratio observed at Wells Dam during broodstock collection suggests that 1,684 summer Chinook (729 redds x 2.31 fish/redd) escaped to the Chelan River.

There were 369 summer Chinook carcasses sampled, A total of five carcasses were classified as unknown origin when sampled (Table 2). Nine carcass were sampled near the Chelan River, from an area with no known reach identification. Twenty-one percent of the summer Chinook returning to the Chelan River were sampled based on the estimated escapement of 1,684 fish. Females made up 68% and males 32% of the carcasses examined. Mean percent egg voidance from 252 female carcasses was 88%. Sixteen females (6%) died before spawning. Ad-clipped hatchery fish made up 63% and naturally produced fish were 37% of the fish examined. There were two PIT-tagged summer Chinook recovered in the Chelan River during carcass surveys.

Okanogan River Basin

In 2013, the Colville Tribes conducted summer Chinook surveys on the Okanogan and Similkameen Rivers. A total of 2,556 redds were counted in the Okanogan River and 1,390 redds were counted in the Similkameen River. Based on the expansion of redd counts the estimated escapement for the Okanogan river is 5,470 summer Chinook and 2,975 summer Chinook to the Simlkameen River (personal Communication Andrea Pearl, CCT).

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Peven, C. 2005. Chelan County PUD Hatchery Implementation Plan 2006. Prepared for Chelan PUD Habitat Conservation Plan's Hatchery Committee, Chelan PUD, Wenatchee, WA.

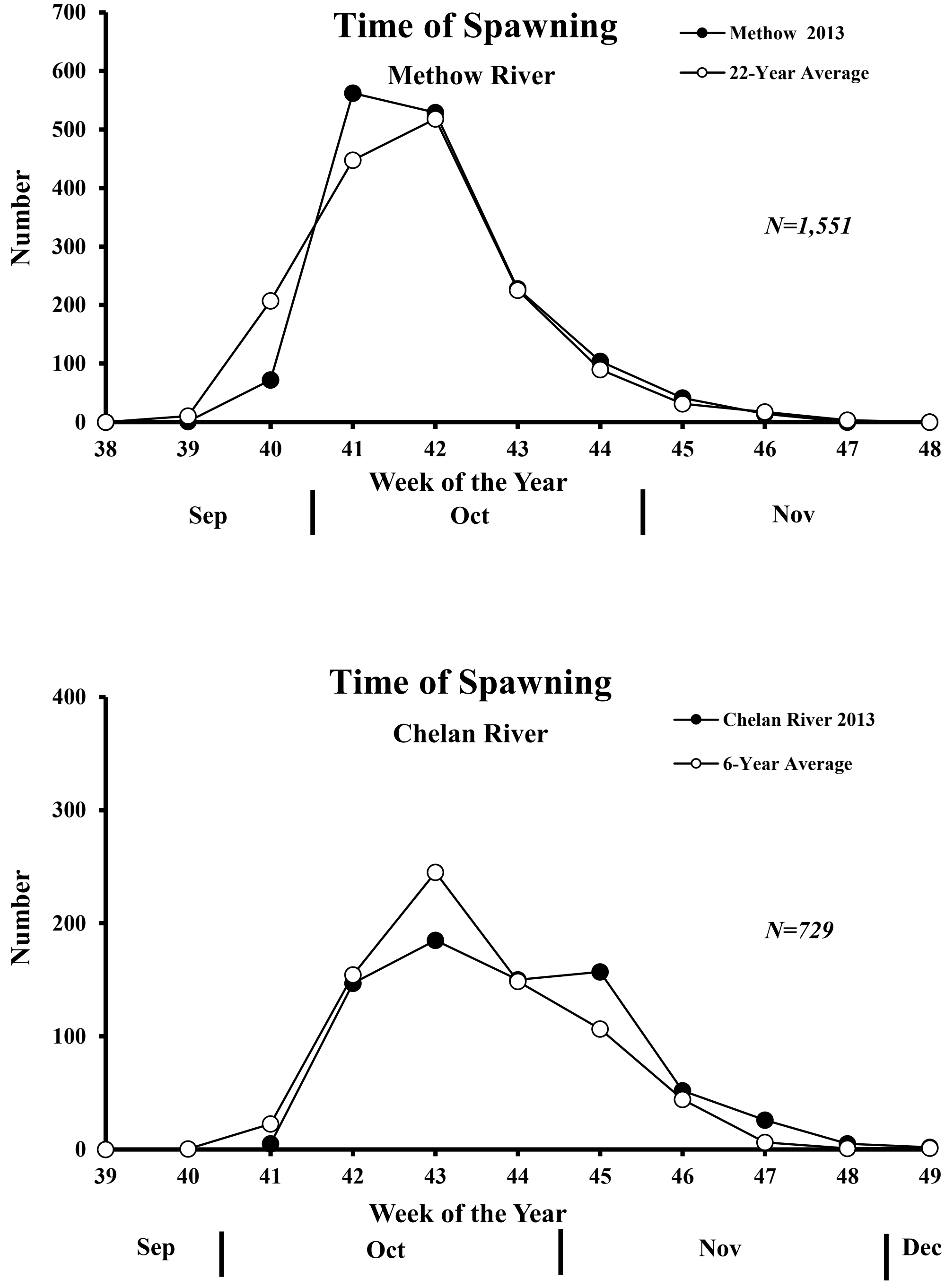

Figure 1. Number of new redds counted each week from mid-September to first week of December. The figure displays the beginning, peak, and end of spawning for summer Chinook in the Methow and Chelan rivers in 2013 compared to an average.

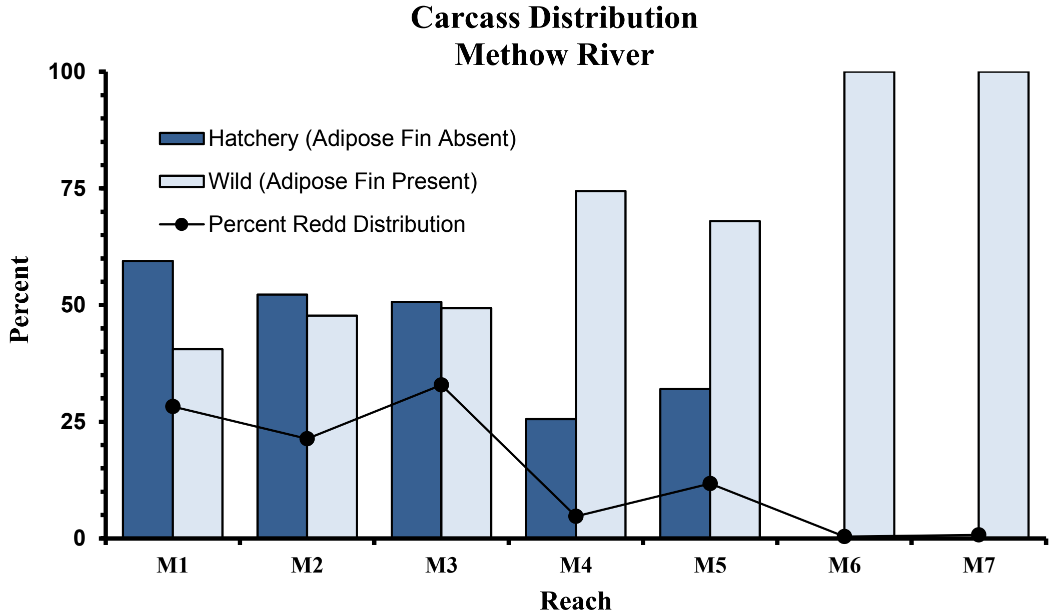

Figure 2. Percent distribution of ad-clipped hatchery and naturally produced fish plotted against the percent distribution of redds observed in reaches of the Methow River, 2013.

Table 1. Number of summer Chinook redds observed each week within the Methow and Chelan rivers, 2013. Dashes indicate no survey occurred.

Reach	Location (Rkm)	Sep		Oct				Nov				Dec	Total	Percent
		22-28	29-5	6-12	13-19	20-26	27-2	3-9	10-16	17-23	24-30	1-7		
Methow River														
M1	0.0-23.8	-	7	53	93	142	88	41	14	-	-	-	438	28
M2	23.8-43.8	-	32	145	107	32	15	0	-	-	-	-	331	21
M3	43.8-63.7	1	31	243	200	35	0	0	-	-	-	-	510	33
M4	63.7-72.3	0	0	41	19	13	0	-	-	-	-	-	73	5
M5	72.3-80.1	0	0	66	109	6	1	-	-	-	-	-	182	12
M6	80.1-83.0	0	1	4	1	0	0	-	-	-	-	-	6	0
M7	83.0-96.1	0	1	10	0	0	0	-	-	-	-	-	11	1
Total:		**1**	**72**	**562**	**529**	**228**	**104**	**41**	**14**	**-**	**-**	**-**	**1,551**	**100**
Chelan River														
P.H. Tailrace		-	-	1	47	87	71	88	16	7	2	1	320	44
Col. R. Tailrace		-	-	0	30	18	40	37	10	3	2	0	140	19
Pool		-	-	4	7	6	5	7	11	2	0	0	42	6
Habitat Channel		-	-	0	63	74	34	25	15	14	1	1	227	31
Total:		**-**	**-**	**5**	**147**	**185**	**150**	**157**	**52**	**26**	**5**	**2**	**729**	**100**

Table 2. Number and percent of hatchery (ad-clipped) and naturally produced (not ad-clipped) summer Chinook collected in Methow and Chelan rivers, 2013. The origin of three fish sampled could not be determined in the Methow River and five fish in the Chelan River. Nine fish were sampled near the Chelan River, however not in known reach locations.

Reach	Location (Rkm)	Ad-Clipped Hatchery				Naturally Produced				Reach Total
		Male	Female	Total	Percent	Male	Female	Total	Percent	
Methow River										
M1	0.0-23.8	58	118	176	59	81	39	41	41	296
M2	23.8-43.8	60	90	150	52	89	48	48	48	287
M3	43.8-63.7	24	171	195	51	91	99	49	49	385
M4	63.7-72.3	5	18	23	26	43	24	74	74	90
M5	72.3-80.1	5	27	32	32	29	39	68	68	100
M6	80.1-83.0	0	0	0	0	5	2	100	100	7
M7	83.0-96.1	0	0	0	0	1	4	100	100	5
Total:		**152**	**424**	**576**	**49**	**339**	**594**	**51**	**51**	**1,170**
Chelan River										
P.H Tailrace		8	24	32	54	6	12	18	36	50
Col. R. Tailrace		23	42	65	1	20	35	55	46	120
Pool		10	12	22	79	3	3	6	21	28
Habitat Channel		26	80	106	68	17	34	51	32	157
Total:		**67**	**158**	**225**	**63**	**46**	**84**	**130**	**37**	**355**

Table 3. Historical aerial and ground redd counts of summer Chinook in the Methow, Chelan, Okanogan, and Similkameen rivers, 1956-2013.

Year	Methow		Okanogan		Similkameen		Chelan	
	Aerial	Ground	Aerial	Ground	Aerial	Ground	Aerial	Ground
1956	109	--	37	--	30	--	--	--
1957	451	--	53	--	30	--	--	--
1958	335	--	94	--	31	--	--	--
1959	130	--	50	--	23	--	--	--
1960	194	--	29	--	--	--	--	--
1961	120	--	--	--	--	--	--	--
1962	678	--	--	--	17	--	--	--
1963	298	--	9	--	51	--	--	--
1964	795	--	112	--	67	--	--	--
1965	562	--	109	--	154	--	--	--
1966	1,275	--	389	--	77	--	--	--
1967	733	--	149	--	107	--	--	--
1968	659	--	232	--	83	--	--	--
1969	329	--	103	--	357	--	--	--
1970	705	--	656	--	210	--	--	--
1971	562	--	310	--	55	--	--	--
1972	325	--	182	--	64	--	--	--
1973	366	--	138	--	130	--	--	--
1974	223	--	112	--	201	--	--	--
1975	432	--	273	--	184	--	--	--
1976	191	--	107	--	139	--	--	--
1977	365	--	276	--	268	--	--	--
1978	507	--	195	--	268	--	--	--
1979	622	--	173	--	138	--	--	--
1980	345	--	118	--	172	--	--	--
1981	195	--	55	--	121	--	--	--
1982	142	--	23	--	56	--	--	--
1983	65	--	36	--	57	--	--	--
1984	162	--	235	--	301	--	--	--
1985	164	--	138	--	309	--	--	--
1986	169	--	197	--	300	--	--	--
1987	211	--	201	--	164	--	--	--
1988	123	--	113	--	191	--	--	--
1989	126	--	134	--	221	370	--	--
1990	229	--	88	47	94	147	--	--
1991	--	153	55	64	68	91	--	--
1992	--	107	35	53	48	57	--	--
1993	--	154	144	162	152	288	--	--
1994	--	310	372	375	463	777	--	--

Year	Methow		Okanogan		Similkameen		Chelan	
	Aerial	Ground	Aerial	Ground	Aerial	Ground	Aerial	Ground
1995	--	357	260	267	337	616	--	--
1996	--	181	100	116	252	419	--	--
1997	--	205	149	158	297	486	--	--
1998	--	225	75	88	238	276	30	--
1999	--	448	222	369	903	1,275	63	--
2000	--	500	384	549	549	993	124	196
2001	--	675	883	1,108	865	1,540	112	240
2002	--	2,013	1,958	2,667	2,000[a]	3,358	180	253
2003	--	1,624	1,099	1,035	103	378	117	173
2004	--	973	1,310	1,327	2,127	1,660	177	185
2005	--	874	1,084	1,611	1,111	1,423	44	179
2006	--	1,353	1,857	2,592	1,337	1,666	--	208
2007	--	620	1,265	1,301	523	707	--	86
2008	--	599	1,019	1,146	673	1,000	--	153
2009	--	692	1,109	1,672	907	1,298	--	246
2010	--	887	688	1,011	642	1,107	--	398
2011	--	941	1,203	1,714	1,047	1,409	--	413
2012	--	960	1,170	1,613	762	1,066	--	426
2013	--	1,551	--	2,556	--	1,390	--	729

[a] Unable to accurately count redds because of superimposition.

APPENDIX Q
CHELAN PUD METHOW SPRING CHINOOK HATCHERY AND GENETIC MANAGEMENT PLAN

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Chelan PUD Methow Spring Chinook Program
Species or Hatchery Stock:	Upper Columbia River Spring Chinook (*Oncorhynchus tshawytscha*)
Agency/Operator:	Chelan County Public Utility District No. 1 (Chelan PUD) Washington Department of Fish and Wildlife (WDFW)
Watershed and Region:	Methow Sub-basin/Columbia Cascade Province
Date Submitted:	March 4, 2014
Date Last Updated:	March 4, 2014

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Table 2-18. Percentages of hatchery-origin spring Chinook spawners in the Methow Sub-basin, based on Table 2-14.

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LIST OF ACRONYMS AND ABBREVIATIONS

BKD	bacterial kidney disease
CCT	Confederated Tribes of the Colville Indian Reservation
cfs	cubic foot per second
Chelan PUD	Public Utility District No. 1 of Chelan County
CI	confidence interval
CWT	coded wire tag
ELISA	enzyme-linked immunosorbent assay
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FDA	Food and Drug Administration
FERC	Federal Energy Regulatory Commission
FL	fork length
fpp	fish per pound
gpm	gallons per minute
HCP	Habitat Conservation Plan
HGMP	Hatchery and Genetic Management Plan
HRR	hatchery replacement rate
HOR	hatchery origin recruit
HSRG	Hatchery Scientific Review Group
ICTRT	Interior Columbia Basin Technical Recovery Team
IHOT	Integrated Hatchery Operations Team
ITS	incidental take statement
JFP	Joint Fisheries Parties
M&E	monitoring and evaluation
mg/kg	milligrams per kilogram
MPG	Major Population Group
NFH	National Fish Hatchery
NMFS	National Marine Fisheries Service
NNI	No Net Impact
NOR	Natural-origin recruit
NOS	natural-origin spawner
NPDES	National Pollution Discharge Elimination System
NRR	Natural Replacement Rate
NTTOC	non-target taxa of concern
O&M	operation and maintenance
OD	optical density
PFMC	Pacific Fisheries Management Council
pHOS	proportion of hatchery-origin spawners
PIT	passive integrated transponder
PNFHPC	Pacific Northwest Fish Health Protection Committee

PNI	Proportionate Natural Influence
pNOB	proportion of natural-origin broodstock
ppm	parts per million
RCW	Revised Code of Washington
S/S	spawner to spawner
SAR	Smolt-to-Adult Return
UCR	Upper Columbia River
UCSRB	Upper Columbia Salmon Recovery Board
USFWS	U.S. Fish and Wildlife Service
VSP	Viable Salmonid Population
WDFW	Washington State Department of Fish and Wildlife
WRIA	Water Resources Inventory Area
YN	Yakama Nation

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Chelan PUD Methow River Spring Chinook Program.

1.2) Species and population (or stock) under propagation, and ESA status.

Upper Columbia River Spring Chinook (*Oncorhynchus tshawytscha*), Endangered.

1.3) Responsible organization and individuals

Permit applicants:

Public Utility District No. 1 of Chelan County (Chelan PUD) and Washington State Department of Fish and Wildlife (WDFW).

Chelan PUD and WDFW are joint permit applicants with specific responsibilities under the proposed permit: 1) Chelan PUD as funder of facilities, operation and maintenance (O&M), and hatchery program monitoring and evaluation (M&E); and 2) WDFW as authorized fisheries manager and as Chelan PUD's current hatchery operator and implementing contractor for the M&E Plan. Future contractors for Chelan PUD, whether for hatchery operations or M&E, may conduct those activities under Chelan PUDs authorization.

Name (and title): Alene Underwood, Hatchery Program Manager
Agency or Tribe: Chelan PUD
Address: 327 North Wenatchee, Wenatchee WA 98801
Telephone: (509) 661-4473
Email: Alene.Underwood@chelanpud.org

Name (and title): Keith Truscott, Natural Resource Director
Agency or Tribe: Chelan PUD
Address: 327 North Wenatchee, Wenatchee WA 98801
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Name (and title): Jeff Korth, Region 2 Fish Program Manager
Agency or Tribe: WDFW
Address: 327 North Wenatchee, Wenatchee WA 98801
Telephone: (509) 754-6032
Email: korthjwk@dfw.wa.gov

Authorized Agent:

The Yakama Nation (YN) will play an important role in the implementation of the proposed permit. The YN operate facilities that may be used to acclimate Chelan PUD's Methow Spring Chinook salmon. The Yakama Nation is an Authorized Agent of Chelan PUD.

Other agencies, Tribes, co-operators, or organizations involved, including contractors, and

extent of involvement in the program:

- Rock Island and Rocky Reach Habitat Conservation Plan (HCP) Hatchery Committees: Oversee development of recommendations for implementation of the hatchery elements of the HCP; Hatchery Committee members include representatives from Chelan PUD, WDFW, Confederated Tribes of the Colville Indian Reservation, Confederated Bands and Tribes of the Yakama Nation, National Marine Fisheries Service (NMFS), and U.S. Fish and Wildlife Service (USFWS)
- Washington Department of Fish and Wildlife (WDFW): current contracted hatchery operator and co-permittee for the current permit (number 1196)
- Confederated Bands and Tribes of the YN
- Confederated Tribes of the Colville Indian Reservation (CCT): NMFS: Administration of the Endangered Species Act
- USFWS: Administration of the Endangered Species Act
- Joint Fisheries Parties (JFP): USFWS, NMFS, WDFW, YN, and CCT

1.4) Funding source, staffing level, and annual hatchery program operational costs.

Chelan PUD funds this program as authorized and obligated by the Rocky Reach and Rock Island HCPs. The total annual operational cost is expected to be between $250,000 and $750,000.

1.5) Location(s) of hatchery and associated facilities.

Several facilities will be involved in the implementation of this hatchery program, all located in the Columbia River basin in Washington (Table 1-1). See Section 5 for the activities to occur at each of these facilities.

Table 1-1. Facilities in Chelan PUD's Methow River Spring Chinook Hatchery Program.

Facility	Water body	River Mile	Basin Name	State	WRIA
Winthrop National Fish Hatchery	Methow River	45.0	Columbia River	WA	48
Eastbank Hatchery	Columbia River	473.0	Columbia River	WA	45
Carlton Acclimation Facility	Methow River	37.5	Columbia River	WA	48
Chewuch Acclimation Pond	Chewuch River	8.0	Columbia River	WA	48
Yakama Nation Expanded Acclimation sites such as Goat Wall (RM 68.0) and Mid Valley Pond (RM 54.4)	Various	Various	Columbia River	WA	48
Other locations as approved by the HCP Hatchery Committees	Various	Various	Columbia River	WA	48

Notes:
WRIA = Water Resources Inventory Area
HCP = Habitat Conservation Plan

1.6) Type of program.

Integrated Recovery Program.

1.7) Purpose (Goal) of program.

With respect to Chelan PUD, the purpose of this hatchery program is to satisfy the hatchery compensation requirements of the Rock Island and Rocky Reach Hydroelectric Projects HCPs. The HCPs were executed pursuant to Section 10 of the Endangered Species Act (ESA) as a vehicle to permit Chelan PUD to carry out its functions in a manner consistent with the ESA. The overriding goal of the HCPs—developed in accordance with the ESA's goals of conserving and facilitating the recovery of natural populations—is to achieve No Net Impact (NNI) on anadromous salmonids as they pass the Projects. NNI goals should be met in a manner consistent with the objective of rebuilding natural populations. Under the terms of the HCPs, and for the purpose of achieving NNI, Chelan PUD provides the funding and capacity required to meet hatchery compensation for all Plan Species for unavoidable losses at the projects.

Section 8 of the HCPs details the objectives, responsibilities, and requirements of hatchery programs required as mitigation for the operation of the project.

Section 8 includes the following objective:

8.1 Hatchery Objectives
8.1.2 The District shall implement the specific elements of the hatchery program consistent with overall objectives of rebuilding natural populations and achieving NNI. Species specific hatchery program objectives developed by the JFP [Joint Fisheries Parties] may include contributing to the rebuilding and recovery of naturally reproducing populations in their native habitats, while maintaining genetic and ecologic integrity, and supporting harvest.

In addition, the JFP developed program goal statements that have been documented in the *Conceptual Framework for Chelan PUD Hatchery Programs* (Murdoch and Peven 2007). The stated spring Chinook program goal is to support the recovery of ESA-listed species by increasing the abundance of the natural adult population, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity (Murdoch and Peven 2005).

1.8) Justification for the program.

The artificial propagation program for Methow spring Chinook specifically addresses the unavoidable losses associated with the operation of Rock Island and Rocky Reach Projects, and contributes to the long-term persistence of ESA-listed Upper Columbia River spring Chinook by increasing the abundance of the population. NMFS has determined that the program is likely necessary to prevent the extinction of the ESU until habitat conditions that limit the productivity of naturally produced spring Chinook in the region are improved.

1.8.1) Legal Agreements and Requirements

This application includes actions required of Chelan PUD pursuant to its Rock Island and Rocky Reach HCPs, which are included as conditions of Chelan's FERC licenses to operation these projects. Other actions that are beyond Chelan PUD's HCP obligations but represent important fishery management activities also may be implemented by the JFP. This section is intended to provide background and context to aid in the interpretation and application of the terms and obligations set forth below and in the existing Hatchery and Genetic Management Plan (HGMP). Specifically, this section: 1) identifies and describes the purposes and objectives of the HCPs, as relevant to the hatchery program; 2) outlines certain responsibilities and obligations of Chelan PUD based on the commitments and assurances provided in the HCPs; and 3) describes certain obligations and responsibilities applicable to the requested permit.

Chelan PUD's HCPs

Section 8 of the HCPs details the objectives, responsibilities, and requirements of hatchery programs required as mitigation for the operation of the Projects. Specifically, Section 8.1.1 indicates that Chelan PUD shall provide hatchery compensation for spring Chinook salmon originating upstream of the Rocky Reach and Rock Island Dams.

Adaptive Management & Section 10 Permits

Chelan PUD's spring Chinook hatchery program obligations under the HCPs are implemented through an adaptive management process set forth in the HCPs and overseen by the HCP Hatchery Committees. Specifically, the HCP Hatchery Committees may periodically adjust Chelan PUD's hatchery production levels (see HCPs at Section 8.4.3) and make program modifications to achieve program objectives, including changes to facilities, release methods, and rearing strategies necessary to achieve and maintain NNI (see HCPs at Section 8.6.1).

The HCPs' adaptive management processes are integral to the effective operation of the spring Chinook hatchery program described in this application. Any updated Section 10 permit and associated environmental reviews should incorporate, rely on, and anticipate compliance with the HCPs' adaptive management provisions. Incorporating adaptive management into the requested Section 10 permit, as contemplated by the HCPs, will minimize the need for future modification of the Section 10 permit and facilitate the efficient management and oversight of the program by the HCP Hatchery Committees. As an HCP Hatchery Committee member, NMFS plays a key role in this process.

The program described herein represents an attempt to use the adaptive management provisions of the HCP to address the Hatchery Scientific Review Group (HSRG 2009) recommendation wherein Proportionate Natural Influence is greater than or equal to 0.67. The HSRG recognized that short-term Proportionate Natural Influence (PNI) goals may be difficult to meet when abundance levels are low, "The HSRG recommends that managers continue to operate the programs as currently planned in the near term. The HSRG acknowledges that managing for the recommended PNI values for a Primary population may not be possible or appropriate when abundance levels are low." Generally, under the HSRG recommendations, the proportion of hatchery-origin spawners (pHOS) should be reduced to extent practicable while the proportion of natural-origin broodstock (pNOB) should be maximized.

Roles and Responsibilities of Applicants:
In accordance with their respective obligations and authorities, the specific roles and responsibilities of Chelan PUD and WDFW in conducting permit activities are as follows:

The Chelan PUD will:

- Provide and maintain or acquire hatchery capacity for the Methow spring Chinook hatchery program.
- Fund or conduct hatchery operations related to spawning, incubation, rearing, and acclimation activities at locations approved by the HCP Hatchery Committee.
- Fund or conduct hatchery monitoring and evaluation under Section 8 of the HCPs.

The WDFW will:

- Collect broodstock, conduct hatchery operations, and implement M&E as a contractor to Chelan PUD[1].
- Take such actions as necessary to achieve pHOS and achieve PNI goals, in consultation with the JFP.
- Implement fishery-related management plans and activities, in consultation with the JFP.

1.8.2) Program Summary

Chelan PUD and WDFW have distinct roles and responsibilities for implementing the actions described in this application. Chelan PUD has an independent responsibility to meet hatchery compensation obligations described in the HCPs. WDFW has the responsibility and authority to conduct activities necessary to manage fisheries resources of the State of Washington. Harvest is not addressed in the HCPs because it is not within the regulatory jurisdiction of the Federal Energy Regulatory Commission (FERC) license (NMFS 2007). Annual decisions related to the active management of adult returns, including fisheries and the disposition of collected adults, are subject to the JFP and ESA regulators.

Chelan PUD's Methow program will release 60,516 smolts representing about 10% of the total spring Chinook releases in the Methow Sub-basin (623,765 smolts). The Douglas and Grant PUDs production groups comprise 26% (i.e., 163,249 smolts) and the USFWS comprises the remaining 64% (i.e., 400,000 smolts).

[1] The Chelan PUD currently funds WDFW to operate its hatcheries and conduct M&E activities under a separate agreement.

Chelan PUD's juvenile spring Chinook will be released into the Methow Sub-basin from acclimation sites/facilities located on the Methow River or the Chewuch River.

The purpose of releasing juvenile fish at acclimation sites is to improve adult homing, to natural spawning areas where they can ostensibly contribute to the abundance and productivity of natural populations.

The desire to have hatchery-origin fish contribute to the abundance of natural populations is the cornerstone of hatchery supplementation. "At the core of a conservation program is the objective of increasing the number of spawning adults (i.e., the combined number of naturally produced and hatchery fish) in order to affect a subsequent increase in the number of returning naturally produced fish or natural origin recruits (NOR). In order for the natural population to remain stable or to increase, the Natural Replacement Rate (NRR), or the ratio of NORs to the parent spawning population, must be at a level where parents are being replaced by their offspring as spawners in the next generation. It is possible to affect an increase in natural origin spawners through supplementation with a stable or decreasing NRR. However, if the NRR is below replacement (NRR<1.0) and prolonged, termination of the supplementation program will result in a declining natural population. The proportion of the hatchery-origin spawners (pHOS) that will increase natural production without creating adverse effects to the genetic diversity or reproductive success rate of the natural population is unknown, and may be dependent on how individual hatchery programs are operated, as well as available spawning and rearing habitat. Some programs may restrict pHOS to reduce the risk to the natural population with the intent of optimizing productivity, concomitantly reducing the overall number of spawners" (Hillman et al. 2013).

Recognizing that allowing hatchery fish to spawn in areas with natural populations also poses an inherent risk of negative interactions with natural origin fish, Chelan PUD will provide WDFW with tools and resources to ensure that WDFW has the capability to remove at least the number of hatchery-origin fish that are expected to be produced by Chelan PUD's program (165 adults on average; Table 1-2).

Table 1-2. Expected adult returns based on SAR data and program release quantities for Methow River releases (does not include Twisp program).

Methow Production	SAR (%)	Smolts Released	Expected Hatchery Returns (% of total)
Chelan Methow Program (Chelan PUD)	0.273 [1]	60,516	165 (9.9%)
Methow Hatchery (Douglas and Grant PUDs)	0.273 [1]	134,126	366 (22.1%)
Winthrop NFH (USFWS)	0.282 [2]	400,000	1,128 (68.0%)
		Total Adult Returns:	1,659

Notes:
1 = Source: Murdoch et al. 2012
2 = Source: USFWS 2012
SAR = Smolt-to-Adult Return; NFH = National Fish Hatchery; USFWS = U.S. Fish and Wildlife Service

Achieving PNI goals, where PNI = pNOB /(pHOS + pNOB), will require decisions and actions to control the proportion of hatchery-origin spawners on the spawning grounds (i.e., pHOS). Chelan PUD will mark fish and provide funding and access to available infrastructure to ensure that WDFW, as an authorized manager, can conduct actions necessary to meet pHOS targets.

WDFW will remove excess Methow River hatchery-origin spring Chinook to meet pHOS, at levels determined by the JFP (in coordination with other managers or regulatory agencies in the appropriate management venues). It is expected that pHOS management will be based on the abundance of hatchery- and natural-origin adult returns with emphasis on removing higher numbers of hatchery fish as natural origin escapements increase. It is expected that it may take several years to fully develop the operational approaches to remove excess hatchery-origin fish due to the uncertainty in effectiveness. Between now and 2017, the effectiveness of these approaches will be further challenged by larger adult returns from pre-recalculation production levels released from acclimation sites throughout the Methow Sub-basin.

For production in the Methow River (and Chewuch River), the abundance of hatchery-origin returns and lack of within-basin collection opportunities for controlling pHOS complicates achieving PNI. The following operational parameters and management guidelines, originally included in the HCP Hatchery Committee-approved Methow spring Chinook HGMP (Douglas PUD 2010) and provided in the Methow Basin Management Frameworks for spring Chinook and Steelhead (NMFS 2013), are recommended for this program:

Adult management will be used to manage overall basin pHOS, by the following sliding scale:

Natural-Origin Escapement	Management Response
<300	500 total spawners
301-500	pHOS ≤ 0.4
501-900	pHOS ≤ 0.3
901-1500	pHOS ≤ 0.2
1501-2000	pHOS ≤ 0.1
>2000	pHOS = 0

- Minimum escapement should not fall below 500 spawners. Under the Interior Columbia Basin Technical Recovery Team (ICTRT 2007) viability criteria, populations with fewer than 500 spawners are not considered viable. Hatchery production should be secondary in priority to achieving a spawning escapement of at least 500 spawners.
- The rate of extraction of natural-origin broodstock from all hatchery programs should never exceed 0.33 percent of the NORs to the Methow Sub-basin.
- Escapement of NORs will not be restricted.

Table 1-3. Expected PNI and pHOS levels under different adult management scenarios.

Scenario	SAR % (From Murdoch et al. 2013)	Expected number of hatchery returns from Chelan PUD's program	Geometric mean of Methow and Chewuch natural-origin returns (Murdoch et al. 2012)	Total Escapement (hatchery + natural origin)	Geometric mean of Methow and Chewuch Natural-Origin returns (less 38 fish for broodstock)	Expected pNOB	Expected pHOS	Expected PNI
Average expected returns using Methow SAR	0.273	165	242	407	204	1.0	0.45	0.69
Average expected returns using Chewuch SAR	0.12	73	242	315	204	1.0	0.26	0.79
Average expected returns using Methow SAR (with 25% adult removal)	0.273	124	242	366	204	1.0	0.38	0.73
Average expected return using Chewuch SAR (with 25% adult removal)	0.12	55	242	297	204	1.0	0.21	0.83
Average expected returns using Methow SAR (with 50% adult removal)	0.273	83	242	325	204	1.0	0.29	0.78
Average expected return using Chewuch SAR (with 50% adult removal)	0.12	37	242	279	204	1.0	0.15	0.87

Notes:
PNI = proportionate natural influence
SAR = smolt-to-adult return
pHOS = proportion of hatchery-origin spawners
PNOB = proportion of natural-origin broodstock

It is expected that, despite the small size of Chelan PUD's program, adult management activities will be implemented. To facilitate the removal of excess hatchery-origin fish, Chelan PUD has identified the following tools and approaches:

- **Broodstock collection:** Excess hatchery-origin adults from the Methow conservation program may be used as broodstock for the Winthrop National Fish Hatchery (NFH) spring Chinook program and the Chief Joseph Hatchery (CJH) spring Chinook program when managing for pHOS. The number of broodstock available for other facilities will decrease commensurate with increasing escapement of hatchery returns to the natural spawning grounds in order to meet spawning escapement goals.
- **PIT tag and external marks:** Chelan PUD will passive integrated transponder (PIT) tag up to 25 percent of smolts released (or some other level as agreed upon by the HCP-HC) from Chelan PUD's program to ensure that up to 25 percent of returning adults can be readily identified and potentially removed using non-lethal sorting techniques at any traps located throughout the Sub-basin. Chelan PUD will also fund external marking required for conservation and harvest management. Chelan PUD will fund up to 100 percent external marking if necessary to support adaptive management and ESA compliance of the program. WDFW will determine annual external marking levels and coordinate or obtain approval from other managers as needed.
- **Rocky Reach Trap (RRT):** Based on previous efforts with steelhead and bull trout conducted in 2002 and between 2005 and 2007, respectively, the RRT can effectively remove externally marked fish, one fish at a time, without delaying unmarked fish or non-target species. Additionally, based on a 2013 pilot study, the RRT can remove externally marked spring Chinook salmon, one fish at a time, without delaying non-target species. An additional pilot study will be conducted in 2014 that will evaluate the efficacy of trapping adult spring Chinook using separation-by-code technology. If this methodology proves successful, the RRT may be used for adult management, as approved by the JFP.
- **Wells Trap:** Hatchery-origin returns may be managed at the ladder traps at Wells Dam in years when pHOS requires adjustment and minimum spawning escapement goals have been achieved (Douglas PUD 2010).
- **FTE funding to WDFW:** In order to ensure that WDFW has the capacity to manage excess hatchery origin spring Chinook from Chelan's program, Chelan PUD will provide funding to WDFW sufficient to support up to one full-time employee.
- **Fishery:** Implementation of fisheries may help reduce the number of hatchery-origin adults; however, under present marking agreements any fishery would be directed at Winthrop NFH returning adults, and not necessarily at fish originating from this program. Therefore, a fishery may help overall adult management in the Sub-basin, but may not have a substantial effect on adult management of Chelan PUD's spring Chinook production in the Methow Sub-basin unless alternate marking strategies were employed.

1.9) List of program "Performance Standards".

See Tables 1-4 and 1-5 in Section 1.10.

1.10) List of program "Performance Indicators", designated by "benefits" and "risks."

1.10.1) "Performance Indicators" addressing benefits.

The performance indicators in Table 1-3 are from the M&E Plan developed and approved by the HCP Hatchery Committees, titled *Monitoring and Evaluation for PUD Hatchery Programs funded by Chelan PUD* (Hillman et al. 2013). In the context of benefits and risks, the target (Table 1-3) represents the opportunity for benefits to accrue, leading to a specific program goal (Table 1-4), whereas the failure to meet a target represents the risk of not meeting the stated goals. Additional performance indicators addressing operational and program risks are identified in Table 1-5.

Table 1-4. Program objectives, indicators, and goals for conservation hatchery programs including productivity and monitoring indicators (also applies to safety-net programs when used to support a conservation program).

Type	Objective	Indicator	Target	Goals
Productivity Indicator	Determine if the program has increased the number of naturally spawning adults	Abundance of natural spawners Adult productivity (NRR)	Increase No Decrease	Rebuild natural populations
Productivity Indicator	Determine if the proportion of hatchery fish affects freshwater productivity	Residuals vs. pHOS Juveniles per redd vs. pHOS	No relationship No relationship	Rebuild natural populations
Monitoring Indicator	Determine if run timing and distribution meets objectives	Migration timing Spawn timing Redd distribution	No difference No difference No difference	Rebuild natural populations and maintain genetic diversity
Monitoring Indicator	Determine if program has affected genetic diversity and population structure	Allele frequency (hatchery vs. wild) Genetic distance between populations Effective population size Age and size at maturity	No difference No difference Increase No difference	Maintain genetic diversity
Monitoring Indicator	Determine if hatchery survival meets expectations	HRR HRR	HRR>NRR HRR>Goal	Rebuild natural populations
Monitoring Indicator	Determine if stray rate of hatchery fish is acceptable	Out of basin Within basin	≤5% ≤10%	Rebuild natural populations and maintain genetic diversity

Type	Objective	Indicator	Target	Goals
Monitoring Indicator	Determine if hatchery fish were released at program targets	Size and number	= Target	Rebuild natural populations
Monitoring Indicator	Provide harvest opportunities when appropriate	Harvest	Escapement goals	Harvest opportunity

Notes:
HRR = hatchery replacement rate
NNR = natural replacement rate

1.10.2) "Performance Indicators" addressing risks.

Table 1-5. Performance Indicators Addressing Risks

Performance Standards	Performance Indicators	Monitoring and Evaluation
1. Artificial propagation activities comply with Endangered Species Act (ESA) responsibilities to minimize impacts and/or interactions to ESA-listed fish	Program complies with Section 10 permit conditions including juveniles are raised to smolt-size (approximately 15 to 18 fish/pound) and released at a time that fosters rapid migration downstream. Smolts will be 100% mass marked and CWT to identify them from naturally produced fish.	As identified in the Hatchery and Genetic Management Plan (HGMP): monitor size, number, date of release and mass mark quality. Additional monitoring metrics include straying, in-stream evaluations of juvenile and adult behaviors, natural-origin recruits (NOR)/hatchery-origin recruits (HOR) ratio on the spawning grounds, fish health documented. Required data are generated through the Monitoring and Evaluation (M&E) Plan and provided to NMFS as required per annual report compliance.
2. Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring.	All facilities meet WDFW water-right permit compliance and National Pollution Discharge Elimination System (NPDES) requirements (NPDES permit No.WAG-5011).	Flow and discharge reported in monthly NPDES reports. Environmental monitoring of total suspended solids, settle-able solids, in-hatchery water temperatures, in-hatchery dissolved oxygen, nitrogen, ammonia, and pH will be conducted and reported as per permit conditions.
3. Water intake systems minimize impacts to listed wild salmonids and their habitats.	Intake screens designed and operated to assure approach velocities and operating conditions provide protection to wild salmonid species.	Intake system designed to deliver permitted flows. Operators monitor and report as required. Hatcheries participating in the programs will maintain all screens associated with water intakes in surface water areas to prevent impingement, injury, or mortality to listed salmonids.
4. Hatchery operations comply with all ESA permit requirements.	Section 10 annual reports are submitted in compliance with permits.	Section 10 annual reports are submitted in compliance with permits.

Performance Standards	Performance Indicators	Monitoring and Evaluation
5. Artificial production facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols including Integrated Hatchery Operations Team (IHOT), co-managers Fish Health Policy, and drug usage mandates from the Federal Food and Drug Administration.	Hatchery goal is to prevent the introduction, amplification, or spread of fish pathogens that might negatively affect the health of both hatchery and naturally reproducing stocks and to produce healthy smolts that will contribute to the goals of this facility.	Pathologists from WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites, and/or pathological changes, as needed.
6. The risk of catastrophic fish loss due to hatchery facility or operation failure is minimized.	Staffing allows for rapid response for protection of fish from risk sources (such as water loss or power loss). Backup generators to provide an alternative source of power to supply water during power outages. Protocols in place to test standby generator and all alarm systems on a routine basis. Alarm systems installed and operating at each rearing vessel to detect loss of or reduced flow and reduced operating head in rearing vessels. Densities at minimum to reduce risk of loss to disease. Sanitation – all equipment is disinfected between uses on different lots of fish including nets, crowders, boots, raingear, etc.	Hatchery engineering design and construction accommodate security measures. Operational funding accommodates security measures. Training in proper fish handling, rearing, and biological sampling for all staff. Staff are trained to respond to alarms and operate all emergency equipment on station. Maintenance is conducted as per manufacturer's requirements and according to hatchery maintenance schedules.

Performance Standards	Performance Indicators	Monitoring and Evaluation
7. Broodstock collection and juvenile hatchery releases minimize ecological effects on listed wild fish.	Hatchery spring Chinook reared to sufficient size such that smoltification occurs within nearly the entire population, reducing residence time in streams after release (CV length ≤ 10%, condition factor 0.9 to 1.0). Smolts acclimated and imprinted on surface water from the natal steam to enhance smoltification and reduce residence time in the tributaries and mainstem migration corridors. All spring Chinook encountered in hatchery broodstock collection operations will be held for a minimal duration in the traps; generally less than 24 hours and follow permit protocols. Spring Chinook trapped in excess of broodstock collection goals will be released upstream or returned to natal streams immediately.	Fish culture and evaluation staff, monitor behavior, coefficient of variation in length, and condition. Fish health specialists will certify all hatchery fish before release. Up to three downstream juvenile smolt traps will be used to monitor the outmigration of hatchery and wild fish. Outmigration may also be monitored through PIT tag detection systems at mainstem passage facilities. Broodstock collection protocols developed each season and reviewed by the HCP Hatchery Committees.

Notes:
CV = coefficient of variation
CWT = coded wire tag

1.11) Expected size of program.

60,516 smolts

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).

38 natural origin adults at a sex ratio of 1:1 (see Section 7.4).

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.

See Tables 1-2 and 5-1.

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

1.12.1) Number of Adults Produced

The number of adults produced by this program is expected to range from 13 to 320 fish with a geometric mean of 165. Tables 1-6, 1-7, and 1-8 provide expected and historic production information for the program, respectively.

Table 1-6. Expected range of adult production originating from Chelan PUD's Methow spring Chinook obligation based on HCP SAR target and observed SARs.

SAR Origin	SAR %	Source of SAR	Expected Number of Adults Produced (from 60,516 smolt release)
HCP target	.300	Table 6 in Appendix D in Murdoch and Peven 2005	182
Historical geometric mean for Methow program	.273	Murdoch et al. 2012	165
Historical geometric mean for Chewuch program	.120	Murdoch et al. 2012	73
Min SAR (since 1993 brood year)	.022	Murdoch et al. 2012	13
Max SAR (since 1993 brood year)	.528	Murdoch et al. 2012	320

Notes:
SAR = smolt-to-adult return
HCP = Habitat Conservation Plan

Table 1-7. Historical Methow SARs from Chelan PUD-funded Methow program (Murdoch et al. 2012).

Brood Year	Smolts Released	Adult Returns	SAR %
1993	210,849	192	0.091
1994	4,477	1	0.022
1995	28,878	122	0.422
1996	202,947	500	0.246
1997	332,484	821	0.247
1998	435,670	2300	0.528
1999	180,775	145	0.08
2000	266,392	852	0.32
2001	130,787	508	0.388
2002	181,235	599	0.331
2003	48,831	57	0.117
2004	65,146	316	0.485
		Mean	**0.273**

Note:
SAR = smolt-to-adult return

Table 1-8. Historical Chewuch SARs from Chelan PUD-funded Chewuch program (Murdoch et al. 2012).

Brood Year	Smolts Released	Adult Returns	SAR %
1992	40,881	39	0.1
1993	284,165	116	0.04
1994	11,854	2	0.02
1996	91,672	37	0.04
1997	132,759	295	0.22
2001	261,284	738	0.28
2002	254,238	699	0.27
2003	127,614	61	0.05
2004	204,906	194	0.09
		Mean	**0.12**

Note:
SAR = smolt-to-adult return

1.12.2) Stray Rates

The number of strays originating from Chelan PUD's program is expected to be low because: 1) Chelan PUD will acclimate juveniles on Methow River water, which will maximize homing fidelity; and 2) the number of adults produced by the program is expected to be very small based on release sizes and empirical smolt-to-adult return (SAR) data. Based on comparisons with existing programs, the proportion of strays within and among populations is expected to remain below the 10 percent and 5 percent target levels, respectively.

The ecological effect (and genetic risk) of straying is a function of the number of fish that stray to a receiving population. The size of a program (in smolts released) and the associated historic smolt to adult returns (SAR) for a given program provide basic parameters for estimating the abundance of adult returns and, therefore, the magnitude of their contribution as strays in the future. In the description below, the numerical abundance of strays, relative to historic Methow and Chewuch releases (i.e., smolts released) and SARs are examined for comparisons to Chelan PUD's proposed program.

The size of the proposed Chelan PUD Methow Spring Chinook Program (60,516 smolts) would be 16.5 percent of the combined historical Methow and Chewuch spring Chinook production programs combined (60,516/366,666 = 16.5 percent) and 18.7 percent of the mean number of smolts released annually from the combined programs (i.e., 323,160) during brood years reported from the *Five Year Monitoring and Evaluation Report* (60,516/323,160 = 18.7 percent; Murdoch et al. 2012). In the future, the proposed Douglas and Grant PUD programs are expected to release 134,126 smolts, which will result in cumulative program releases slightly larger than half the size of the historic Methow and Chewuch programs (194,642/366,666 = 53.1 percent [based on historic release goals]; and 194,642/323,160 = 60.2 percent [based on mean number of smolts released annually]). The SAR rate is expected to be the same (0.273 percent and 0.12 percent, for Methow and Chewuch, respectively; Murdoch et al. 2012).

For the Chewuch program, within population stray rates were higher than the Methow program (Murdoch et al. 2012): "Analysis of stray rates within and between independent populations did not begin until 2000 due to lack of spawning ground data in prior years. Surveyors recovered Chewuch spring Chinook carcasses on both the Methow and Twisp rivers, where Chewuch spring Chinook comprised an average of 10.5% and 0.7% of the spawning population, respectively. The proportion of the Chewuch spring Chinook spawning populations comprised in the Twisp River was significantly lower (t-test: $P < 0.0001$) than the maximum target of 10% and no different from that target in the Methow River (t-test: $P = 0.57$)." However, Chelan PUD would be releasing fewer than 36% of the number of smolts that were released previously which could proportionally reduce the number of adult strays.. Scaling the expected number of adult returns with release sizes and SARs (i.e., 60,516 planned smolt release compared with 172,189 historic mean smolt release and expected SAR of 0.12%) suggests that the expected number of strays from Chewuch would be based on a population of 73 returning adults as opposed to 206 returning adults, historically. From the perspective of a potential receiving population, smaller numbers of adults from the hatchery program translate to fewer potential strays and a proportionally smaller effect on the receiving population.

For the Chewuch program, among population stray rates were very low (Murdoch et al. 2012): "The only other independent population from which Chewuch spring Chinook have been recovered on the spawning grounds was the Similkameen River in 2001. An estimated five fish spawned in the Similkameen River. This likely posed little genetic risk to the Similkameen summer Chinook population due to the fact that spring Chinook are unlikely to cross breed with summer Chinook due to difference in spawn timing, and the Similkameen has a very high abundance of summer Chinook spawning." Among population straying would be further reduced by the small program size.

In the event that stray rates exceed the HCP targets, Chelan PUD may fund additional in-basin imprinting opportunities such as 1) development of new water sources within the Sub-basin; 2) early life history acclimation (i.e., incubation and fry); or 3) other measures approved by the HCP Hatchery Committees as part of the adaptive framework of the HCPs.

1.13) Date program started (years in operation), or is expected to start.

The historic Methow spring Chinook program at the Methow Hatchery began in 1992. The Upper Columbia River (UCR) spring Chinook salmon evolutionarily significant unit (ESU) was listed as endangered on March 24, 1999 (NMFS 1999) with supplementation activities as conditioned by Section 10 permit No. 1196 starting at Methow Hatchery with brood year 2000 fish. The proposed program as described in this HGMP would commence with brood year 2013 (release year 2015).

1.14) Expected duration of program.

The program is intended to continue for the remaining 50-year term of the Rocky Reach and Rock Island HCPs, which were approved by the FERC in 2004. The HCP Hatchery Committees agreed to current production levels for the 2014 to 2023 release years on December 14, 2011.

1.15) Watersheds targeted by program.

Methow Sub-basin/Columbia Cascade Province, Water Resources Inventory Area (WRIA) 48.

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

This hatchery program is adaptively managed by the Rocky Reach and Rock Island HCP Hatchery Committees, which have agreed to the collective goal of recovery and sustainability of the population within the context of meeting the HCP requirement of NNI. The HCP Hatchery Committees therefore aim for a program of adequate size and characteristics to meet this goal. During the development and implementation of the HCPs, many alternatives were, and will continue to be, considered for this program. The HCP Hatchery Committees have concluded that a larger program would not be consistent with the HSRG's recommendations (HSRG 2009) to reduce artificial production in the Methow Sub-basin, while a smaller or non-existent program may fail to support recovery as described in the Recovery Plan (UCSRB 2007). Thus, the HCP Hatchery Committees developed the program described in this HGMP to meet the current biological, agency, and HCP goals.

SECTION 2. PROGRAM EFFECTS ON NMFS ESA-LISTED SALMONID POPULATIONS.

(USFWS ESA-Listed Salmonid Species and Non-Salmonid Species are addressed in Addendum A)

2.1) List all ESA permits or authorizations in hand for the hatchery program.

2.1.1) Section 10(a)(1)(A) Permit Number 1196

Artificial production of UCR spring Chinook is presently covered under Section 10(a)(1)(A) Permit No. 1196, initially set to expire January 20, 2014, but continues to be covered by an extension of the permit (issued September 20, 2013) until a new permit is issued for this program as described in this HGMP. Activities described in the application for this permit have been previously authorized under terms and conditions of the *Biological Opinion on Artificial Propagation in the Columbia River Basin* (NMFS 1999). WDFW submits annual reports as conditioned by Section 10 permit No. 1196 covering the period from January 1 to December 31 each year.

2.1.2) Rocky Reach and Rock Island Habitat Conservation Plans

In 2002, the Rocky Reach and Rock Island HCPs were signed by WDFW, USFWS, NMFS, and the Colville Confederated Tribes, and approved by FERC on June 21, 2004. The Yakama Nation signed the HCPs in March of 2005. The overriding goal of the HCPs is to achieve NNI on anadromous salmonids as they pass Rocky Reach and Rock Island Dam. One of the main objectives of the hatchery component of NNI is to provide species-specific hatchery programs that may include contributing to the rebuilding and recovery of naturally reproducing populations in their native habitats, while maintaining genetic and ecologic integrity, and supporting harvest. The HCPs are intended to be a comprehensive 50-year adaptive management plan for anadromous salmonids and their habitat as affected by the Rocky Reach and Rock Island Hydroelectric Projects. The HCPs were designed to address Chelan PUD requirements for FERC licensing and as such included all of the parties' terms, conditions, and recommended measures related to regulatory requirements to conserve, protect and mitigate plan species pursuant to ESA, the Federal Power Act, the Fish and Wildlife Coordination Act, the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act, the Pacific Northwest Electric Power Planning and Conservation Act, and Title 77 Revised Code of Washington (RCW). The HCP also obligates the parties to work together to address water quality issues.

2.2) Provide descriptions, status, and projected take actions and levels for NMFS ESA-listed natural populations in the target area.

2.2.1) Description of NMFS ESA-listed salmonid population(s) affected by the program.

Adult Age Class

Methow Spring Chinook Major Population Group (MPG)

Most Columbia River adult spring Chinook spend 2 years in the ocean before migrating back to their natal streams (Mullan 1987; Fryer et al. 1992; Chapman et al. 1995; Snow et al. 2008).

In the Methow Sub-basin, the average age class for naturally produced adults since 2001 has been approximately 7% age 3, 56% age 4, and 37% age 5 (Table 2-1). Age structure does not appear to vary much between major spawning aggregates, ranging between approximately 3 to 10% for age 3, 53 to 57% for age 4, and 37 to 40% for age 5 (Table 2-1). These estimates of age for spring Chinook sampled in the UCR comport well with spring Chinook sampled at Bonneville Dam where approximately 50% are estimated at age four and between 20% and 40% are age-5 (Chapman et al, 1995).

Table 2-1. Age structure of Methow Sub-basin spring Chinook salmon per major spawning area (based on Chapter 5 Appendices D-J, Snow et al. 2008).

Sub-basin/year	Number				Percent		
	1.1	**1.2**	**1.3**	**Total**	**1.1**	**1.2**	**1.3**
Methow							
2001	16	286	292	594	2.7	48.1	49.2
2002	1	21	64	86	1.2	24.4	74.4
2003	5	1	2	8	62.5	12.5	25.0
2004	3	196	0	199	1.5	98.5	0.0
2005	0	182	39	221	0.0	82.4	17.6
2006	0	101	27	128	0.0	78.9	21.1
2007	6	42	104	152	3.9	27.6	68.4
Average	4	118	75	198	10.3	53.2	36.5
Chewuch							
2001	8	641	83	732	1.1	87.6	11.3
2002	0	23	55	78	0.0	29.5	70.5
2003	4	2	19	25	16.0	8.0	76.0
2004	0	46	0	46	0.0	100.0	0.0
2005	2	206	11	219	0.9	94.1	5.0
2006	0	86	49	135	0.0	63.7	36.3
2007	1	14	59	74	1.4	18.9	79.7
Twisp							
Average	2	145	39	187	2.8	57.4	39.8
2001	18	439	49	506	3.6	86.8	9.7
2002	66	115	181	362	18.2	31.8	50.0
2003	6	4	15	25	24.0	16.0	60.0
2004	16	227	0	243	6.6	93.4	0.0
2005	0	73	14	87	0.0	83.9	16.1
2006	0	45	20	65	0.0	69.2	30.8
2007	2	0	38	40	5.0	0.0	95.0
Average	15	129	45	190	8.2	54.4	37.4
Total Sub-basin							
2001	42	1366	424	1832	2.3	74.6	23.1

Sub-basin/year	Number				Percent		
	1.1	1.2	1.3	Total	1.1	1.2	1.3
2002	67	159	300	526	12.7	30.2	57.0
2003	15	7	36	58	25.9	12.1	62.1
2004	19	469	0	488	3.9	96.1	0.0
2005	2	461	64	527	0.4	87.5	12.1
2006	0	232	96	328	0.0	70.7	29.3
2007	9	56	201	266	3.4	21.1	75.6
Average	22	393	160	575	6.9	56.0	37.0

Methow Summer Steelhead MPG

Chapman et al. (1994) summarized information for 459 naturally produced adult steelhead collected at Wells Dam, Wells Reservoir, and the Methow River between 1987 and 1993 (Table 2-2). They found that the majority of both males and females had spent 2 years in the ocean (Table 2-2; Figure 2-1). Between 1997 and 2006, 478 naturally produced fish were sampled at Wells Dam. The majority of these fish had spent 1 year in the ocean (see Table 2-2, Figure 2-1). It is uncertain why this inconsistency exists, although salt water ageing was estimated from otoliths between 1987 and 1993 and with scales between 1997 and 2006. In addition, sample sizes were small in many years.

In previous summaries of hatchery-origin age structure (Mullan et al. 1992; Chapman et al. 1994), most hatchery-origin fish were designated as 1-salt. While this still appears to be true for males, females appear to have shifted to more 2-salt, which is more similar to wild fish between 1987 and 1993 (Table 2-3).

Table 2-2. The number and percentage of steelhead by saltwater age and sex from Chapman et al. (1994) for years 1987 to 1993, and Snow et al. (2008) for years 1997 to 2006.

Brood year	Male				Female				Total
	1-salt		2-salt		1-salt		2-salt		
	#	%	#	%	#	%	#	%	
1987	12	16.9	8	11.3	16	22.5	35	49.3	71
1988	9	13.4	12	17.9	9	13.4	37	55.2	67
1989	16	18.2	25	28.4	16	18.2	31	35.2	88
1990	5	5.7	24	27.3	12	13.6	47	53.4	88
1991	16	22.5	9	12.7	28	39.4	18	25.4	71
1992	2	5.9	8	23.5	1	2.9	23	67.6	34
1993	5	12.5	13	32.5	3	7.5	19	47.5	40
Total	65	14.2	99	21.6	85	18.5	210	45.8	459
1997	18	31.6	10	17.5	14	24.6	15	26.3	57
1998	5	41.7		0.0	4	33.3	3	25.0	12

Brood year	Male				Female				Total
	1-salt		2-salt		1-salt		2-salt		
	#	%	#	%	#	%	#	%	
1999	5	18.5	4	14.8	5	18.5	13	48.1	27
2000	13	31.7	4	9.8	13	31.7	11	26.8	41
2001	14	53.8	2	7.7	7	26.9	3	11.5	26
2002	3	16.7	1	5.6	5	27.8	9	50.0	18
2003		0.0	9	33.3		0.0	18	66.7	27
2004	53	45.3		0.0	55	47.0	9	7.7	117
2005	15	22.7	9	13.6	15	22.7	27	40.9	66
2006	21	24.1	16	18.4	8	9.2	42	48.3	87
Total	147	30.8	55	11.5	126	26.4	150	31.4	478

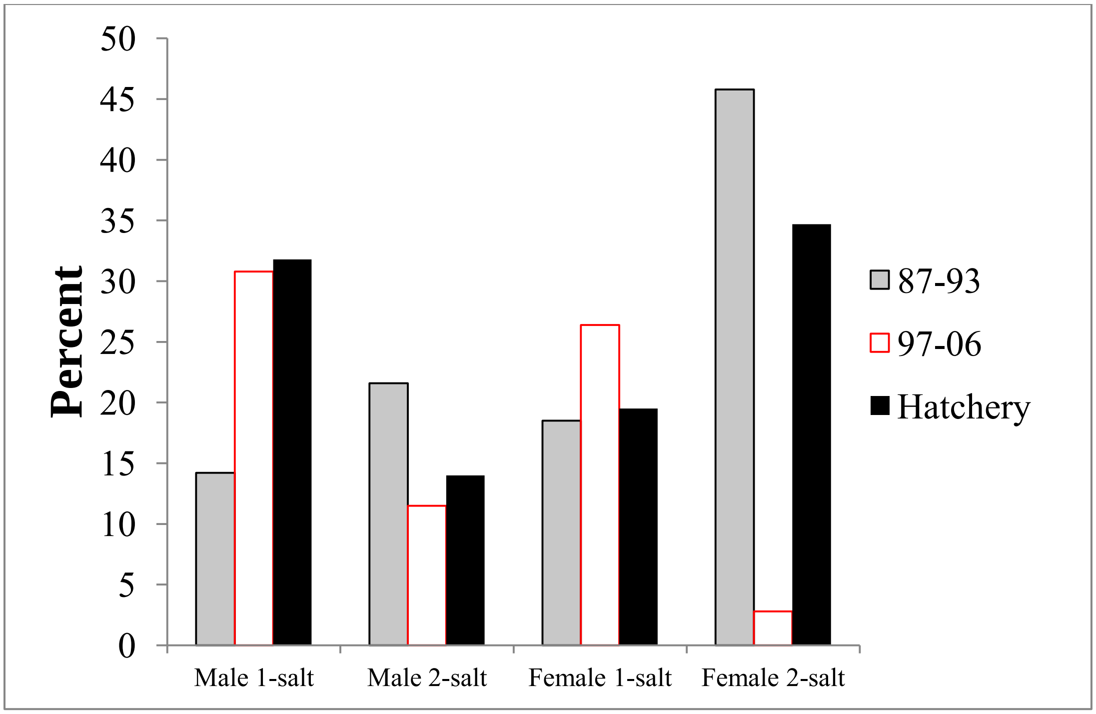

Figure 2-1. Comparison of saltwater age structure of naturally produced steelhead sampled between 1997-2006 and naturally produced and hatchery-origin fish between 1987 and 1993, based on Table 2-2 and 2-3.

Table 2-3. Numbers and percentages of steelhead by sex, saltwater age, and origin sampled at Wells Dam between 1997 and 2006 (based on Appendix C, Chapter 1 of Snow et al. 2008).

Brood year	Male				Female				Total
	1-salt		2-salt		1-salt		2-salt		
	#	%	#	%	#	%	#	%	
1997	145	46.5	20	6.4	94	30.1	53	17.0	312
1998	122	28.2	64	14.8	78	18.0	169	39.0	433
1999	123	33.2	41	11.1	66	17.8	141	38.0	371
2000	113	34.7	28	8.6	87	26.7	98	30.1	326
2001	12	5.7	27	12.8	66	31.3	106	50.2	211
2002	106	28.3	68	18.2	50	13.4	150	40.1	374
2003	30	11.2	89	33.1	17	6.3	133	49.4	269
2004	183	59.0	3	1.0	118	38.1	6	1.9	310
2005	93	29.5	53	16.8	31	9.8	138	43.8	315
2006	98	32.6	58	19.3	22	7.3	123	40.9	301
Total	1,025	31.8	451	14.0	629	19.5	1,117	34.7	3,222

Methow Core Area Bull Trout

Mullan et al. 1992 found that headwater male bull trout (potentially non-migratory ecotype) in the Methow River began to mature at age 5, and were all mature by age 6. Females from the same area began to mature at age 7 and were all mature by age 9. Mullan et al. (1992) found bull trout that did not mature until 9 years of age which are the oldest (at first maturity) reported within the literature. The oldest bull trout sampled in the Methow River was 12 years (Mullan et al. 1992).

2.2.1.2) Sex Ratio

Methow Spring Chinook MPG

Mullan (1987) presented data compiled from Howell et al. (1985) on the number of returning male and female hatchery spring Chinook in the mid-Columbia. From those data, the sex ratios for Leavenworth, Entiat, and Winthrop populations were calculated. The range (female to male) for the three stocks was 1.27:1 to 1.86:1 (based on lethal biological sampling).

Sampling at Wells Dam in 2007 and 2008, estimates of sex ratio (using ultrasound) ranged (males to females) from 1.5:1 to 1.9:1 for hatchery fish and 1.1:1 to 1.5:1 for wild fish (C. Snow, pers. comm). It is important to note that determining sex of fish from Wells Dam months prior to sexual maturity is not considered accurate for spring Chinook, which may explain the difference between these data and those described above from Chapman et al. (1994).

Methow Summer Steelhead MPG

Based on the most recent information available (Appendix C, Chapter 1 of Snow et al. 2008), the female to male ratio for hatchery-origin and naturally produced fish is 1.2:1 and 1.3:1, respectively. This is similar to what has been reported previously (Mullan et al. 1992; Chapman et al. 1994).

Methow Core Area Bull Trout

In Mullan et al. (1992), the overall female to male ratio was 1.11:1, but for mature fish, almost twice the percentage of the population of males was mature (14.6 percent of the females and 24.3 percent of the males).

2.2.1.3) Fecundity

Methow Spring Chinook MPG

Fecundity from wild and hatchery spring Chinook salmon has been measured in recent years as part of the hatchery supplementation evaluation program. In the Methow Sub-basin, fecundity (hand-counted) averaged 5,100 (range: 2,600 to 8,100) between 1992 and 1994 (Chapman et al. 1995). Since 2000, four-year-old wild females averaged about 4,000 eggs, while 5-year-old wild fish averaged about 4,800 eggs (Table 2-4). For hatchery fish, 4-year-old fish averaged about 3,800 eggs, and 5-year-old fish averaged about 4,400 (Table 2-4). As shown in Table 2-4, there are gaps between years, primarily for wild fish, especially 5-year-olds.

Table 2-4. Fecundity of Methow Sub-basin spring Chinook (from Chapter 1, Appendix D of Snow et al. 2008).

Stock/year	Age 4		Age 5	
	Wild	Hatchery	Wild	Hatchery
Met Comp				
2000		3,759		
2001	3,753	3,949		
2002		3,905		3,318
2003		3,795		4,839
2004	3,565	3,510		3,510
2005	3,823	3,475		3,261
Average	3,714	3,732		3,732
Twisp				
2000		3,820		5,292
2001	4,720	3,922	4,941	4,469
2002		4,653		
2003		3,195		5,867
2004	3,811	3,496		
2005	4,216		4,745	4,745
Average	4,249	3,817	4,843	5,093
Average for Sub-basin				

Stock/year	Age 4		Age 5	
	Wild	Hatchery	Wild	Hatchery
	3,981	3,771	4,843	4,413

Methow Summer Steelhead MPG

For fish sampled at Wells Dam between 2000 and 2006, 1-salt naturally produced fish average fecundity was higher than 1-salt hatchery-origin fish, while for 2-salt fish, hatchery-origin fish had slightly higher fecundity (Table 2-5).

Table 2-5. Mean fecundity by salt-age and origin of 2006 brood summer steelhead sampled at Wells Complex hatchery facilities (Appendix D, Chapter 1 from Snow et al. 2008).

Year	1-salt		2-salt	
	Hatchery	Wild	Hatchery	Wild
2000	4,837	5,760	6,049	
2001	4,356	3,865	6,624	6,714
2002	4,786	4,721	6,744	6,586
2003	4,241		6,545	6,954
2004	4,543	4,517	5,865	4,832
2005	4,547	5,370	6,575	6,627
2006	4,652	4,203	6,858	6,397
Average	4,566	4,739	6,466	6,352

Methow Core Area Bull Trout

Fecundity of bull trout varies with size. Fraley and Shepard (1989) found that fecundity averaged almost 5,500 eggs (up to over 12,000 in one individual) for migratory bull trout from the Flathead River. Martin et al. (1992) noted females between 271 and 620 millimeters (mm) long produced 380 to over 3,000 eggs in southeastern Washington streams. Mullan et al. (1992) found one bull trout that was 300 mm in the Methow Sub-basin had a fecundity of fewer than 200 eggs.

2.2.1.4) Size Range

Methow Spring Chinook MPG

Juveniles

In 2007, wild smolt length averaged 100.7 mm fork length (FL) (Table 2-6). Wild parr (fall-run) averaged almost 90.7 mm FL. Little variation in smolt length occurred between years (C. Snow, pers. comm.).

Table 2-6. Summary of length and weight of migrating Chinook juveniles in the Methow River in 2007 (from Chapter 3, Table 1 Snow et al. 2008).

		Fork Length (mm)			Weight (g)			
Brood	**Origin/Stage**	**Mean**	***N***	**SD**	**Mean**	***N***	**SD**	**K-factor**
2005	Wild smolt	100.7	395	8.6	11.6	393	2.9	1.1
2005	Hatchery smolt	129.9	186	17.5	27.8	186	11.2	1.3
2006	Wild fall parr	90.7	67	10.8	8.9	67	3.1	1.2

Notes:
N = number of observations
SD = standard deviation
K-factor = condition factor

Adults

Length measurements (FL) from wild and hatchery spring Chinook salmon have been measured in recent years as part of the hatchery evaluation program (Table 2-7). There appears to be little difference between streams or between wild and hatchery fish (Table 2-7).

Table 2-7. Mean fork length by age, sex, and brood of spring Chinook collected for the Methow Hatchery program, 1998 to 2005 (from Chapter 1, Appendix C of Snow et al. 2008).

		Age - 3		Age - 4		Age - 5	
Stock/Sex/Year		**Hatchery**	**Wild**	**Hatchery**	**Wild**	**Hatchery**	**Wild**
Met Comp - male							
1998		54.0	52.0	79.0	74.9	94.0	92.7
1999		52.0		78.0	76.4		100.0
2000		52.1		73.3			
2001		60.0		80.6			
2002		48.3		79.0		100.0	
2003		49.0	51.0			96.7	
2004		48.3		72.0			
2005		52.1		72.3			
Average		*52.0*	*51.5*	*76.3*	*75.7*	*96.9*	*96.4*
Met Comp - female							
1998				76.3	76.1	87.2	89.0
1999				78.0	77.6		86.5
2000				74.5			
2001				76.9			
2002				76.3		87.3	
2003				75.3			
2004				73.4	75.0	76.0	
2005				74.3	71.0	81.0	

Stock/Sex/Year		Age - 3		Age - 4		Age - 5	
		Hatchery	Wild	Hatchery	Wild	Hatchery	Wild
Average				*75.6*	*74.9*	*82.9*	*87.8*
Twisp - male							
1998				79.5		87.0	
1999		50.8					
2000		52.0	45.0	71.0			98.0
2001		63.0	52.5	79.3	75.3		
2002		46.3					
2003		50.7	50.0		67.0		
2004		49.0	45.7	72.2	71.6		
2005		49.6			82.0		
Average		*51.6*	*48.3*	*75.5*	*74.0*	*87.0*	*98.0*
Twisp - female							
1998				77.0		90.5	
1999					78.5		89.3
2000				75.1			91.0
2001				76.9	79.6	92.5	88.0
2002				75.0			
2003				70.7			93.4
2004				73.0	75.8		
2005					81.0		88.5
Average				*74.6*	*78.7*	*91.5*	*90.0*
Total Sub-basin Average - male							
1998		54.0	52.0	79.3	74.9	90.5	92.7
1999		51.4		78.0	76.4		100.0
2000		52.1	45.0	72.2			98.0
2001		61.5	52.5	80.0	75.3		
2002		47.3		79.0		100.0	
2003		49.9	50.5		67.0	96.7	
2004		48.7	45.7	72.1	71.6		
2005		50.9		72.3	82.0		
Average		*52.0*	*49.1*	*76.1*	*74.5*	*95.7*	*96.9*
Total Sub-basin Average - female							
1998				76.7	76.1	88.9	89.0
1999				78.0	78.1		87.9
2000				74.8			91.0
2001				76.9	79.6	92.5	88.0
2002				75.7		87.3	

Stock/Sex/Year		Age - 3		Age - 4		Age - 5	
		Hatchery	Wild	Hatchery	Wild	Hatchery	Wild
2003				73.0			93.4
2004				73.2	75.4	76.0	
2005				74.3	76.0	81.0	88.5
Average				*75.3*	*77.0*	*85.1*	*89.6*

Methow Summer Steelhead MPG

Juveniles

In the Upper Columbia Basin, naturally produced steelhead smolts sampled at Rock Island Dam have averaged between 163 to188 mm FL (Peven and Hays 1989; Peven et al.1994). In the Methow Sub-basin, smolt trapping has been ongoing since the mid-1990s. In general, length frequency of juveniles does not vary greatly between years (C. Snow, pers. comm.) and averages between from approximately 130 to 180 mm FL (this includes “transitional” juveniles that may or may not be smolting; Table 2-8).

Table 2-8. Mean length and weight at migration age of wild transition and smolt summer steelhead captured at the Methow and Twisp smolt traps in 2007 (Tables 2 and 4, respectively, from Chapter 3 of Snow et al. 2008).

Age	N (%)	Fork (mm)			Weight (g)			K-factor
		Mean	*N*	SD	Mean	*N*	SD	
Methow								
1	6 (4.3)	138.7	6	17.8	32.6	6	14.4	1.2
2	122 (86.5)	175.2	122	20.1	55.3	117	20.1	1.0
3	12 (8.5)	181.5	12	22.4	58.4	10	22.7	1.0
4	1 (0.7)	174.0	1	--	51.3	1	--	0.9
Twisp								
1	7 (2.4)	128.6	7	14.6	24.3	6	7.8	1.1
2	231 (80.8)	162.2	229	17.4	42.7	226	12.9	1.0
3	43 (15.0)	180.6	43	20.5	58.6	43	17.7	1.0
4	5 (1.7)	177.2	5	9.6	56.8	5	11.1	1.0

Notes:
N = number of observations
SD = standard deviation
K-factor = condition factor

Adults

Chapman et al. (1994) reported that female steelhead sampled at Wells from 1982 to 1992 ranged from 57 to 81 centimeters (cm) and 67 to 75 cm for fish spending 1 and 2 years in the ocean, respectively. Males ranged from 59 to 66 cm and 69 to 77 cm for 1-year and 2-year ocean fish.

The length frequency of broodstock captured in 2006 for the Wells steelhead program comports well with previous sampling at Wells Dam above (Table 2-9). In general, hatchery-origin fish are similar in size to naturally produced fish.

Table 2-9. Mean fork length (cm) by saltwater age, sex, and origin for broodstock sampled at Wells Hatchery Complex facilities, 1997 to 2006 (Chapter 1, Appendix C from Snow et al. 2008).

Brood year	Male				Female			
	1-salt		2-salt		1-salt		2-salt	
	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild
1997	64.2	63.8	76.6	74.5	62.3	61.6	71.9	74.3
1998	64.8	65.6	79.3		62.1	64.0	75.3	74.3
1999	63.3	64.0	80.0	80.8	62.3	61.8	74.3	73.8
2000	63.4	62.9	77.8	76.0	61.4	62.5	73.8	76.8
2001	61.2	60.9	76.1	82.5	60.2	59.4	72.9	73.3
2002	64.3	63.7	78.3	76.0	62.9	63.8	73.6	74.7
2003	61.9		78.6	81.6	60.4		74.7	75.8
2004	60.9	64.2	73.0		60.1	62.2	67.5	73.4
2005	60.4	62.1	74.0	75.6	59.4	62.5	71.8	73.4
2006	60.3	65.2	75.6	77.4	59.7	61.4	70.9	72.7
Average	62.5	63.6	76.9	78.1	61.1	62.1	72.7	74.3

Methow Core Area Bull Trout

Juveniles

Length at age of bull trout found in Methow River tributaries by Mullan et al. (1992) were the shortest by age group of any other lengths reported in the literature (Goetz 1989; Wydoski and Whitney 2003). Table 2-10 shows the age range of all bull trout sampled by Mullan et al. (1992) in the 1980s. Considering that males began maturing at age 5 and females by age 7 (see above), all lengths shown in Table 2-10 for fish aged 5 and younger can be considered juveniles, and all of those older than that may be juveniles or adults (assume that older than age 8 would be adults). Juvenile mean length ranged from between 51 and 195 mm FL.

Table 2-10. Mean fork length (mm) of bull trout sampled in the Methow Sub-basin (Mullan et al. 1992).

Stream	Age											
	1	2	3	4	5	6	7	8	9	10	11	12
Methow River				188.0	257.0							
Gold Creek					230.5							
Wolf Creek	58.3	86.8		168.2	199.5		229.5	250.0				
Early Winters Creek	52.6	89.7	124.0	136.2	174.5	198.0	200.0	186.0	210.0	188.7		205.0
Lake Creek	49.0				152.0							
WF Methow River	50.8	82.4			190.0		207.0					
Chewuch River						255.0						
EF Buttermilk Creek	48.3	87.4	112.0	130.0	204.0	231.0				324.0		
Monument Creek	42.3				179.0							
Lost Creek				195.0								
Cedar Creek	51.6				172.0							
Twisp River	58.3	97.6	120.5	163.8								
South Creek			116.0									
Average	51.4	88.8	118.1	163.5	195.4	228.0	212.2	218.0	210.0	256.4		205.0

Notes:
EF = east fork
WF = west fork

Adults

BioAnalysts (2002) compared a sample of resident and fluvial fish from the Methow Sub-basin and found that the fluvial fish were two to three times larger than resident fish of the same age. BioAnalysts (2004) tagged adult migratory bull trout at Rock Island, Rocky Reach, and Wells Dam in 2001 to 2003. For fish tagged in 2002 at Wells Dam, bull trout averaged 57.3 cm FL. Most of the fish tagged at Wells Dam eventually headed to the Methow Sub-basin (some fish tagged at both Rocky Reach and Rock Island also headed in some years to the Methow Sub-basin).

2.2.1.5) Migration Timing

Methow Spring Chinook MPG

Mainstem Columbia River

Adult spring Chinook destined for areas upstream from Bonneville Dam (upriver runs) enter the Columbia River beginning in March and reach peak abundance (in the lower river) in April and early May (WDF and ODFW 1994). Fifty percent of the spring Chinook run passes Priest Rapids and Rock

Island dams by mid-May, while most pass Wells Dam somewhat later (Howell et al. 1985). Chinook that pass Rock Island Dam are considered "spring-run" fish from the beginning of counting (mid-April) through approximately the third week of June (French and Wahle 1965; Mullan 1987).

Methow River

Methow Sub-basin spring Chinook migrate past Wells Dam and enter the sub-basin in May and June, peaking after mid-May. Differences in migration timing have been observed between, but not within, age classes. Hatchery 3-year-olds migrated to Wells Dam later than hatchery 4- and 5-year-olds (Snow et al. 2008). The Lower Columbia River fishery routinely commences during the earliest part of the run, which may have contributed to a decline in 5-year-old hatchery returns, which are available for harvest.

Methow Summer Steelhead MPG

Mainstem Columbia River

Adults return to the Columbia River in the late summer and early fall. A portion of the returning run over-winters in the mainstem reservoirs, ascending UCR dams in April and May of the following year.

In 2006, naturally produced fish began their migration earlier than hatchery-origin fish (Table 2-11). The run timing observed in 2006 followed a typical beginning (July) and ending (October) for a calendar year. However, a portion of the fish that spawned upstream of Wells Dam passed the dam in the following spring after over-wintering in the mainstem Columbia River which may be a result of intermittent availability of adult fish passage from roughly December through February.

Table 2-11. Migration of hatchery and wild steelhead to Wells Dam between 31 July and 26 October, 2006 (Table 6, Chapter 4 from Snow et al. 2008).

Origin	*N*	Cumulative Migration Date			
		25%	**50%**	**75%**	**100%**
Hatchery	6,002	7-Sept	19-Sept	28-Sept	26-Oct
Wild	489	27-Aug	11-Sept	28-Sept	26-Oct

Methow River

Currently, data on Methow-specific information on run timing is limited. Steelhead are known to enter the river in late summer (August), through the following May, based on observations from trout and steelhead fisheries and radio telemetry studies (English et al. 2001, 2003). The recent installation of a PIT tag array infrastructure in the Methow River and its tributaries, combined with ongoing juvenile and adult PIT tagging programs should provide data regarding migration patterns/timing for steelhead.

Methow Core Area Bull Trout
The focus of this discussion is on fluvial bull trout. Bull trout were tagged by BioAnalysts (2004) between May 1 and the first week of June in a 3-year study (2001-2003). Most bull trout entered the Methow by the end of June and were found in possible spawning locations (usually in August) well before the initiation of spawning. Most tagged bull trout left tributary streams by late November.

During the study period (2001 to 2003) bull trout entered Mid-Columbia tributaries from April to September, but most (94 percent) entered tributaries during May, June, and July. At the time bull trout entered tributary streams, the mean daily temperatures in the mainstem Columbia River varied from 5.4°C to 19.6°C. Similarly, tributary mean daily temperatures ranged from 7.5°C to 17.2°C. Most bull trout (92.3 percent) entered tributaries before the Columbia River reached a mean temperature of 15°C.

2.2.1.6) Spawning Range

Methow Spring Chinook MPG
Methow Sub-basin spring Chinook spawn primarily in the upper reaches of the Chewuch, Twisp, and Methow rivers, including the Lost River, Early Winters, and Wolf Creek tributaries. In descending order of numbers, redds were counted in the mainstem Methow, Twisp, Chewuch, Lost rivers, and Early Winters Creek. No significant differences have been detected in the distribution of hatchery and wild carcasses (females) within each subwatershed (Snow et al. 2008).

Methow Summer Steelhead MPG
In the Methow Sub-basin, steelhead currently spawn in the Twisp River, mainstem Methow River, Early Winters Creek, Lost River, Chewuch River, Beaver Creek, Black Canyon Creek, Buttermilk, Boulder, Eight-Mile, Suspension, and Little Suspension, and Lake creeks (Snow et al. 2008).

Methow Core Area Bull Trout
Bull trout are currently known to spawn in Lost, Chewuch, West Fork Methow, and Twisp rivers, Little Bridge, Early Winters, Goat, Wolf, East Fork Buttermilk, Blue Buck (in Beaver Creek watershed), Gold, and Lake creeks (Douglas PUD 2010).

2.2.1.7) Spawning Timing

Methow Spring Chinook MPG
Spawning occurs late July through mid-September. There have been no significant differences in spawn timing between hatchery and wild fish (females) within or among sub-basins, although it appears hatchery fish spawn earlier than wild fish (Snow et al. 2008).

Methow Summer Steelhead MPG
Spawning occurs in the late spring following entry into the river of the previous calendar year and usually ranges from mid-late March through May. Spawn timing within the index areas shows that

the peak spawn timing in 2007 in the Chewuch watershed occurred during the week of April 15. Peak spawning in the remaining three watersheds all occurred between April 15 and 30. Differences in spawn timing between hatchery and wild fish has not been assessed because many hatchery fish do not possess an externally visible mark (i.e., ad-clip[1]), thus confounding the surveyors' ability to determine the origin of spawning adults (Snow et al. 2008).

Methow Core Area Bull Trout
Bull trout are strongly influenced by water temperature during all life stages and for all ecotypes. Most bull trout spawn from mid-September through October, with timing related to declining water temperatures. Spawning sites are commonly found in areas of groundwater interchange, both from the subsurface to the river and from the river to the subsurface. Association with areas of groundwater interchange can promote oxygen exchange and mitigate severe winter temperatures including the formation of anchor ice.

Within the Methow Sub-basin, spawning begins in headwater streams in late September and continues through October, with commencement closely tied to water temperature between 9°C and 11°C (Brown 1992). After spawning, fluvial and adfluvial kelts return to their more moderate environments, while resident forms seek winter refuge. In Methow drainage tributaries, bull trout spawning and early rearing is confined to streams cold enough (less than 1,600°C annual temperature units) to support them in areas below barrier falls (Mullan et al. 1992). In most cases, such reaches are very short (less than 5 miles).

2.2.1.8) Juvenile Life History Strategy

Methow Spring Chinook MPG
Fry emerge the spring following spawning and typically smolt as yearlings; however, fall parr migrations from upper reaches have also been observed (Hubble 1993; Hubble and Harper 1999; Snow et al. 2008). Rearing location of these fall migrants prior to smolting the next spring is unknown.

Fryer et al. (1992) summarized age information of spring Chinook sampled at Bonneville Dam from 1987 through 1991. No adult scales with two stream annuli (2.x) were found, although in every year there were some fish estimated to have entered the ocean in their first year of life (0.x was probably from the Snake River Basin). Adults sampled in the UCR tributaries have shown only shown a 1.x life history.

Individuals that never migrated to the ocean make up some portion of the spawning population (Healey 1991; Mullan et al. 1992). Mullan et al. (1992) indicate that precocious maturation of male spring Chinook is common in the mid-Columbia basin and is characteristic of both hatchery and wild stocks. Generally the largest males show evidence of early maturity (Rich 1920). This may explain

[1] All hatchery-origin fish are externally marked, but a portion have only elastomer tags, which would not be readily visible to surveyors. It is also important to note that since steelhead are iteroparous, and they spawn during a period of increasing stream discharge, examination of carcasses, as in the case of spring Chinook salmon, is not possible.

why large numbers of hatchery fish mature precociously, since they are typically larger at age than their wild counterparts.

Harstad et al. (in review) measured the proportion of minijacks among males released from several spring-run and summer-run Chinook salmon hatchery programs throughout the Columbia River Basin for brood years 1999 through 2010. The hatcheries surveyed included both segregated (only hatchery-origin broodstock) and integrated (some natural-origin broodstock) programs. Minijacks were found in all programs monitored, and rates varied approximately 10-fold across release groups ranging from 7.9 - 71.4% of males in spring Chinook salmon programs. Mullan et al. (1992a) examined 20,000 wild juvenile Chinook in tributaries of the mid-Columbia River from 1983 to 1988 and found that precocious males made up about 1 percent of the sample. However, if jacks (age-3 males that return after 1 year in the ocean) are included, the percentage of males that mature precociously would be much greater than 10 percent.

The extent that precocious males contribute to reproduction is unknown. In the Upper Columbia Basin, males that mature in freshwater during their first or second summer may contribute to reproduction and may contribute more than jacks under certain conditions. For example, Leman (1968) and Mullan et al. (1992b) observed only precocious males attending large female Chinook in small headwater streams that were accessible only at high water. In Marsh Creek and Elk Creek, Idaho, precocious males occurred most frequently where there was active spawning (Gebhards 1960). These fish usually lay within the depressions of redds with an adult female or male and female pair. Gebhards (1960) reported seeing between 4 and 30 precocious males within redds. Apparently these fish frequent spawning areas to reproduce, not to forage on eggs. Gebhards (1960) analyzed the stomach contents of several precocious males and found that only 5 percent had consumed eggs. Furthermore, most (85.1 percent) of the dead precocious males found were partly or completely spent.

The mechanism that dictates the life history tactic of Chinook is not well understood (Gross 1991), however, recent studies have indicated that growth rates can be a large factor determining the incidence of precocial and residualism rates in hatchery fish (Larsen et al. 2004, 2006; Sharpe et al. 2007). In the wild, juvenile size is determined by many variables, such as genotype, egg size, time of hatching, water flow, water temperature, territory quality, stream productivity, predation pressure, and population density. Changes in these variables may therefore affect the life history of Chinook.

Precocious males may play a significant role in reproduction in the Upper Columbia Basin, spawning successfully not only as "sneakers" in the presence of older males, but as the sole male present in some areas and in some years when spawner numbers are very low. Precocious males may play a greater role in spawning in years when numbers of spawners were low (i.e., 1994 and 1995) that adult females were widely dispersed.

Methow Summer Steelhead MPG

The life-history pattern of steelhead in the Upper Columbia Basin is complex (Chapman et al. 1994). In the Upper Columbia region, Peven et al. (1994) observed smolt ages ranging from 1 to 7 years, with the highest percentages at ages 2 and 3. Female smolts (63 percent of fish sampled) were older and larger for most age classes than males.

Steelhead can residualize in tributaries and never migrate to the ocean, thereby becoming resident rainbow trout. Conversely, progeny of resident rainbow trout can migrate to the ocean and thereby become steelhead. This dynamic expression of life-history characteristics makes *O. mykiss* very challenging to understand and manage. Upstream distribution is limited by low heat budgets (about 1,600°C temperature units) (Mullan et al 1992a). The potential response of steelhead/rainbow in these cold water temperatures may be residualism, presumably because growth is too slow within the time window for smoltification. However, these headwater rainbow trout may contribute to anadromy via emigration and displacement to lower reaches, where warmer water improves growth rate and subsequent opportunity for smoltification.

Methow Core Area Bull Trout

Migratory juveniles usually rear in natal streams for 1 to 4 years before emigration (Goetz 1989; Fraley and Shepard 1989; Pratt 1992). Methow sub-basin juvenile bull trout rear in the coldest headwater locations until they reach a size that allows them to compete with other fish (75 to 100 mm; Mullan et al. 1992). Non-migratory forms above barrier falls probably contribute a limited amount of recruitment downstream; nevertheless, this recruitment contributes to fluvial and adfluvial productivity. The fluvial forms migrate to the warmer mainstem Methow and Columbia rivers (e.g., Twisp River, Wolf Creek), while the adfluvial populations (e.g., Lake Creek, Cougar Lake) migrate to nearby lakes.

2.2.1.9) Smolt Emigration Timing

Methow Spring Chinook MPG

Smolt trapping has occurred in the Methow Sub-basin since the mid-1990s as part of the hatchery evaluation program. In general, yearling spring Chinook (smolts) migrate down the Methow River between early March and the end of May to early June. The peak of the migration in 2007 appeared later in the Twisp River compared to the Methow River site (Figures 2-2 and 2-3), although trap efficiencies and periods when traps are inoperable may influence the absolute numbers of fish caught on a given date.

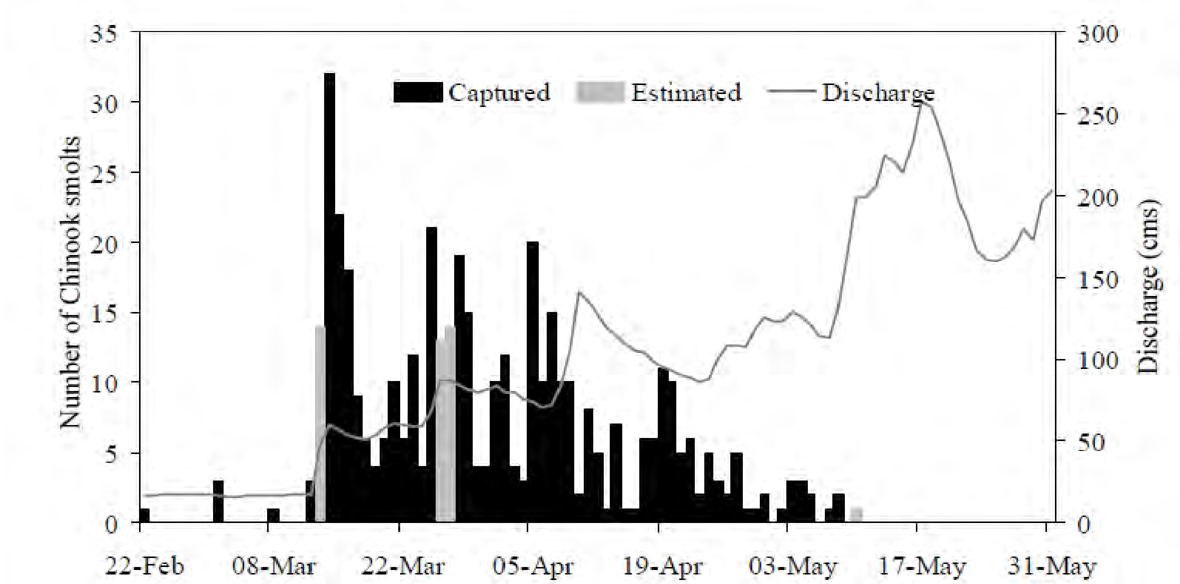

Figure 2-2. Daily capture of wild Chinook salmon smolts from the Methow River trap in 2007 (Figure 3, Chapter 3 from Snow et al. 2008).

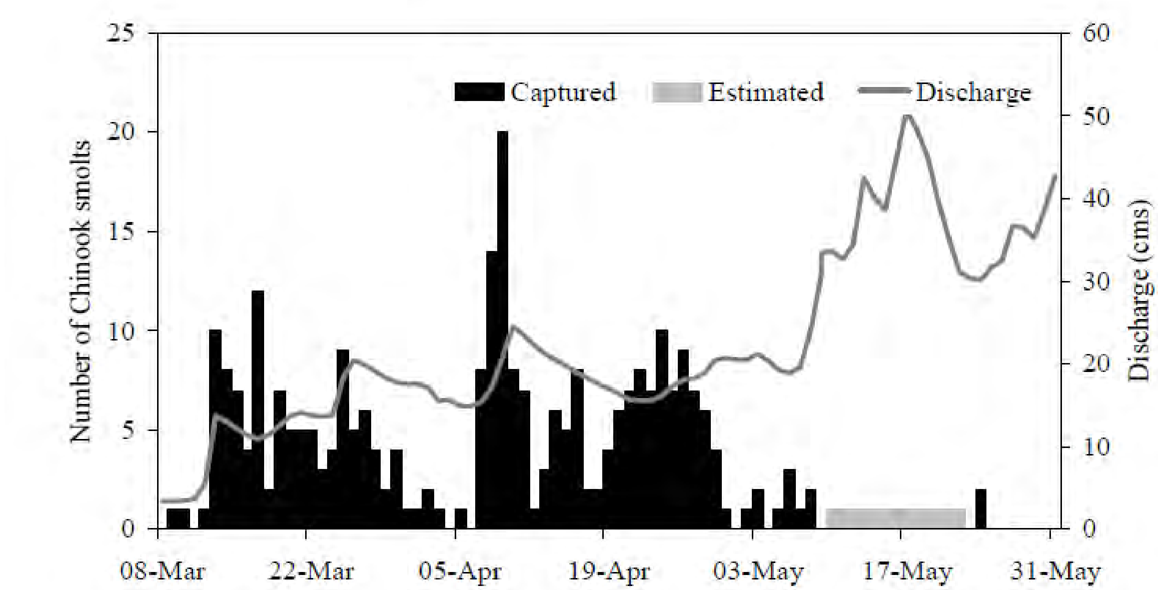

Figure 2-3. Daily capture of wild Chinook salmon smolts from the Twisp River trap in 2007 (Figure 6, Chapter 3 from Snow et al. 2008).

As previously stated, a substantial parr migration occurs within the Methow Sub-basin, and appears in two main phases—throughout the summer and then again in the fall (Figure 2-4).

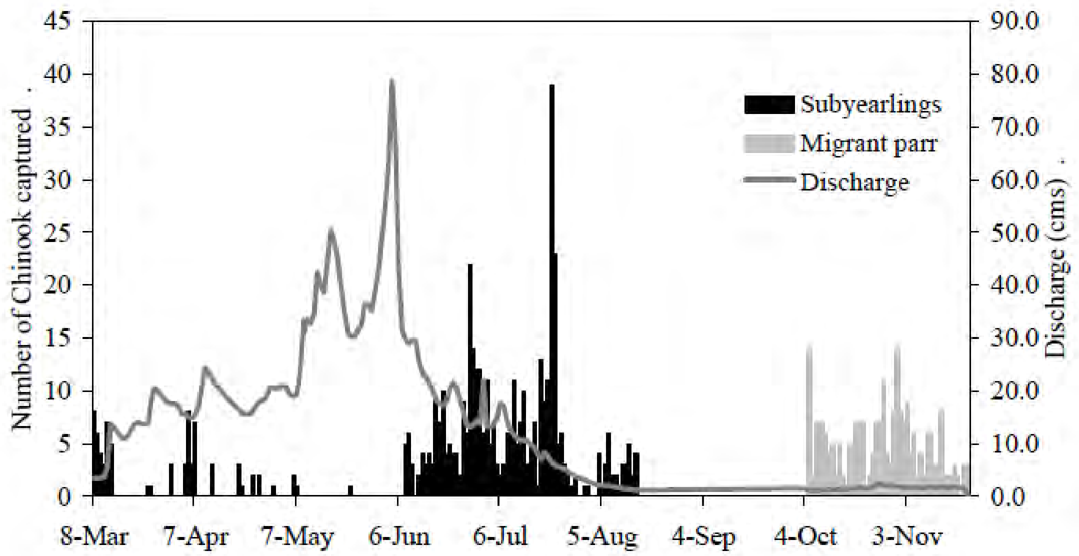

Figure 2-4. Daily capture of sub-yearling wild spring Chinook and migrant parr at the Twisp River trap in 2007 (Figure 7, Chapter 3 from Snow et al. 2008).

Methow Summer Steelhead MPG

Smolt trapping has occurred in the Methow Sub-basin since the mid-1990s as part of the hatchery evaluation program. In general, *O. mykiss* juveniles[1] migrate down the Methow River between early March and the end of May to early June. The peak of the migration in 2007 appeared later in the Twisp River compared to the Methow River site (Figures 2-5 and 2-6), although trap efficiencies and periods when traps are inoperable may influence the absolute numbers of fish caught on a given date.

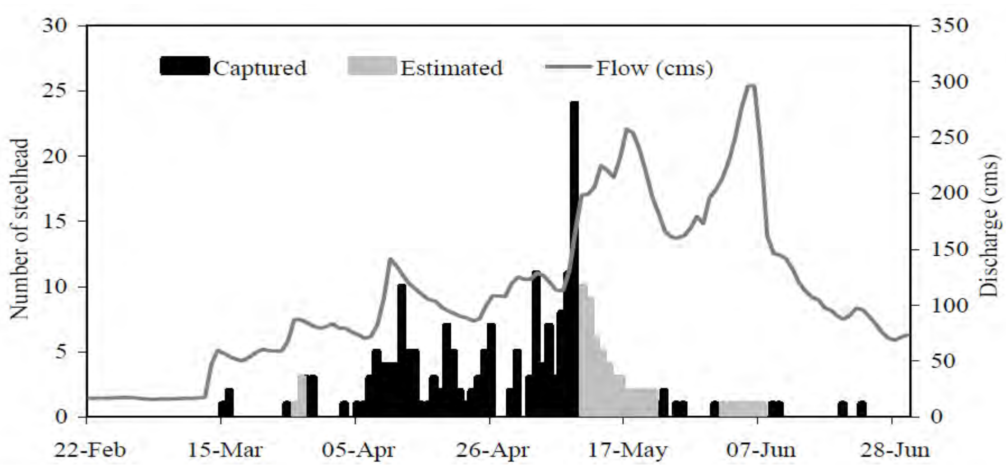

Figure 2-5. Daily capture of wild steelhead smolts and transitional parr from the Methow River trap in 2007 (Figure 5, Chapter 3 from Snow et al. 2008).

[1] Because it is not possible to determine whether juvenile O. mykiss are "trout" or "steelhead," we refer to them by their scientific nomenclature.

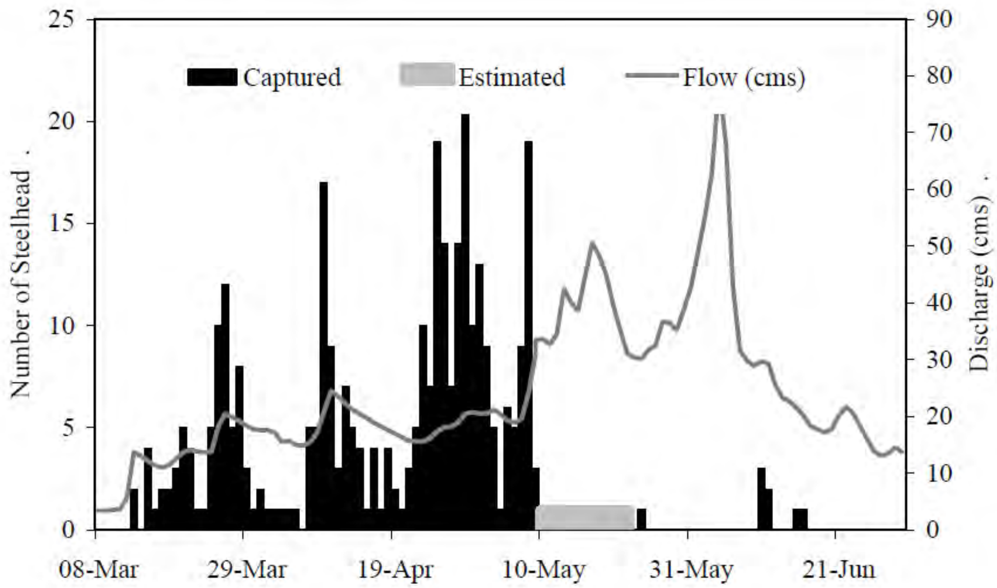

Figure 2-6. Daily capture of wild steelhead smolts and transitional parr from the Twisp River trap in 2007 (Figure 8, Chapter 3 from Snow et al. 2008).

As previously stated, a substantial parr migration occurs within the Methow Sub-basin, and appears in two main phases—throughout the summer and then again in the fall (Figure 2-7).

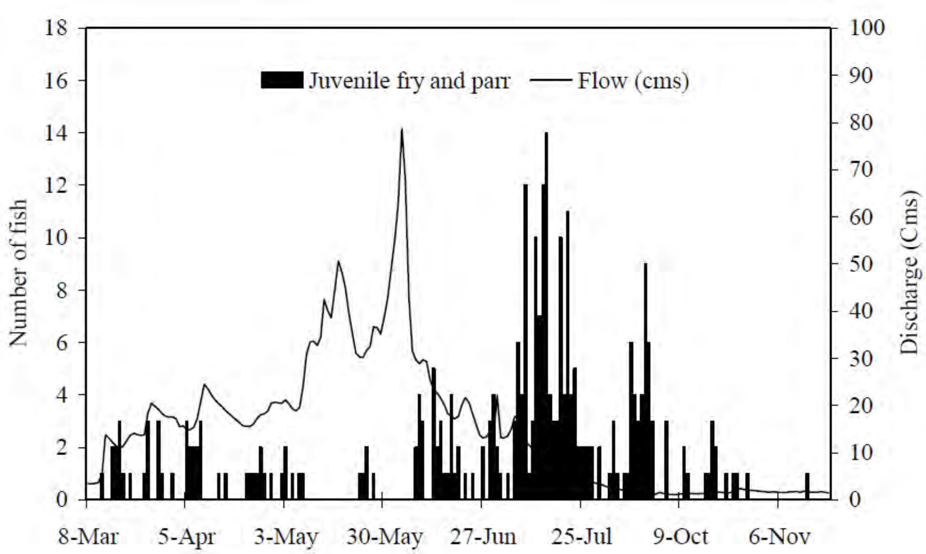

Figure 2-7. Daily capture of natural-origin steelhead fry and parr at the Twisp River trap in 2007 (Figure 9, Chapter 3 from Snow et al. 2008).

Methow Core Area Bull Trout
All of the fish that BioAnalysts (2004) tagged in their 3-year study appeared to have spent a minimum of three years in their natal stream prior to migrating to the Columbia River.

2.2.1.10) Spatial and Temporal Distribution of Spawners in Relation to Fish Release Location

Methow Spring Chinook MPG
Snow et al. (2008) found no significant differences in spawn timing between hatchery and natural-origin fish (females) within or among sub-basins. However, hatchery fish tended to spawn earlier than naturally produced fish, except in the Twisp River (which had the lowest proportion of hatchery-origin spawners).

Snow et al. (2008) found no significant differences in the distribution of hatchery and natural-origin carcasses (females) within each major spawning area. However, hatchery fish tended to spawn lower in each of the spawning areas than naturally produced fish.

Methow hatchery spring Chinook are typically released in three locations in the Methow Sub-basin. All current acclimation sites use surface water for rearing prior to release to increase homing fidelity. Despite this, an estimated 49 percent of the Twisp-released fish spawning in the Methow Sub-basin spawned in areas other than the Twisp River. However, because abundance of Twisp-stock fish is relatively low, their prevalence typically comprises a small proportion of the escapement within other spawning areas (i.e., Methow and Chewuch rivers). Similarly, an estimated 43 percent of the Chewuch-released fish spawned in areas other than the Chewuch River, but because release numbers are much greater, contribution of these fish to other spawning areas can be high. Conversely, an estimated 28 percent of Methow-released fish spawned in areas other than the Methow River (Snow et al. 2008).

Methow Summer Steelhead MPG
There is currently no way to differentiate steelhead by origin on the spawning grounds; this issue has been identified by the Upper Columbia Regional Technical Team as an important data gap.

Methow Core Area Bull Trout
There are currently no hatchery programs for bull trout in the Methow River.

– Identify the NMFS ESA-listed population(s) that will be <u>directly</u> affected by the program.

Methow Spring Chinook MPG

Common Name	Endangered Species Act	Natural population targeted for integration
Spring Chinook salmon (UCR)	Endangered	Methow River spring Chinook

Methow Summer Steelhead MPG

Common Name	Endangered Species Act	Natural population targeted for integration
Steelhead trout (UCR)	Threatened	Methow River summer steelhead

Methow Core Area Bull Trout

There are currently no hatchery programs for bull trout in the Methow River.

– Identify the NMFS ESA-listed population(s) that may be incidentally affected by the program.

Common Name	Endangered Species Act
Spring Chinook salmon (UCR)	Endangered
Steelhead trout (UCR)	Threatened
Bull trout (Columbia River)	Threatened[a]

[a] USFWS listed

2.2.2) Status of NMFS ESA-listed salmonid population(s) affected by the program.

2.2.2.1) Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds

Methow Spring Chinook MPG

The ICTRT (2007) has classified the Methow River spring Chinook as a "Very Large" population in size based on its historic habitat potential. A "Very Large" population is one that requires a minimum abundance of 2,000 natural-origin spawners and an intrinsic productivity of greater than 1.75 spawner to spawner (S/S) to be viable. The Recovery Plan (UCSRB 2007) incorporated the abundance goal of 2,000 naturally produced spawners (geometric mean over 12 years), but incorporated an earlier recommendation from the ICTRT of an intrinsic productivity of 1.2.

Methow spring Chinook currently are considered to have a greater than 25 percent chance of becoming extinct within 100 years.

Methow Summer Steelhead MPG

The ICTRT (2007) has classified the Methow River summer steelhead as an "Intermediate" population in size based on its historic habitat potential. An "Intermediate" population is one that requires a minimum abundance of 1,000 natural-origin spawners and an intrinsic productivity of greater than 1.1 S/S to be viable. The Recovery Plan (UCSRB 2007) incorporated the abundance goal of 1,000 naturally produced spawners (geometric mean over 12 years) and an intrinsic productivity of 1.1.

Methow summer steelhead are currently considered to have a greater than 25 percent chance of becoming extinct within 100 years.

Methow Core Area Bull Trout

Because of a lack of detailed information on the population dynamics of bull trout in the Upper Columbia Basin, a different approach was used to estimate Viable Salmonid Population (VSP) parameters for bull trout (UCSRB 2007). Bull trout abundance was estimated as the number of redds times 2.0 to 2.8 fish per redd. This approach provided a range of abundance estimates for bull trout within each core area (USFWS 2004, 2005). Productivity was based on trends in redd counts, while diversity was based on general life-history characteristics of bull trout (resident, fluvial, and adfluvial) within each core area. Although these parameters were less rigorous than the parameters used to estimate status of spring Chinook and steelhead, they provide relative indices of abundance, productivity, and diversity.

In the final listing rule (63 FR 31647), USFWS identified eight bull trout sub-populations in the Entiat, Wenatchee, and Methow river sub-basins (USFWS 1998). USFWS identified eight sub-populations within this recovery unit: Lake Wenatchee, Ingalls Creek, Icicle Creek, Entiat system, Methow River, Goat Creek, Early Winters Creek, and Lost River. USFWS considered half of these to be "at risk of stochastic extirpation" due to: a) their inability to be re-founded, b) presence of a single life history form, c) limited spawning areas, and d) relatively low abundance. In the 5-year review (USFWS 2008), the USFWS determined that the Methow core area was at high risk of extinction.

2.2.2.2) Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.

Methow Spring Chinook MPG

During the period 1960 to 1999, returns per spawner for spring Chinook in the Methow sub-basin ranged from 0.05 to 5.21 (UCSRB 2007). The 12-year geometric mean of returns per spawner during this period ranged from 0.41 to 1.02. The geometric mean at the time of listing (1999) was 0.51.

Since 1999, the natural replacement rate (the number of adult recruits from successive return years that originated from the same brood year, divided by the sum of the number of spawners for that brood year) has varied, but remains low, especially in the Methow River spawning area (Table 2-12). The most recent geometric mean of productivity remains near 0.51, (which is the same as the time of ESA listing for the Chewuch and Twisp spawning areas). Approximately half of the productivity is located in the Methow spawning area, which coincidentally has the highest proportion of hatchery-origin spawners.

Table 2-12. The natural replacement rate (NRR) of Methow Sub-basin spring Chinook between the 1992 and 2001 brood years (data from Chapter 5, Appendix A from Snow et al. 2008).

Year	NRR		
	Chewuch	Methow	Twisp
1992	0.11	0.10	0.30
1993	0.52	0.17	0.13
1994	0.30	0.20	0.34
1995	5.53	2.83	3.23
1996	12.75	17.89	8.64
1997	12.68	5.98	17.25
1998	12.66	3.73	17.75
1999	0.11	0.07	0.31
2000	1.10	0.52	1.72
2001	0.13	0.04	0.18
2002	0.32	0.15	0.48
Geometric mean	*1.00*	*0.53*	*1.16*

Methow Summer Steelhead MPG

In the UCSRB (2007), the returns per spawner were expressed as either a hatchery spawner effectiveness of 100 percent or 0 percent. The geometric mean of returns per spawner is 0.09 if hatchery spawner effectiveness was 100 percent, and 0.84 if hatchery spawner effectiveness was 0 percent (brood years 1960 to 1996).

More recently, Snow et al. (2008) estimated that the total (not accounting for hatchery spawner effectiveness) average return per spawner was 0.30 for brood years 1996 to 2001 (Table 2-13); which falls between the two values reported in the UCSRB (2007).

Table 2-13. The natural replacement rate (NRR) of Methow Sub-basin steelhead between the 1996 and 2001 brood years (data from Chapter 4, Table 16 from Snow et al. 2008).

Parent Brood	Recruits	NRR
1996	315	0.56
1997	684	0.28
1998	730	0.30
1999	167	0.11
2000	848	0.40
2001	595	0.16
Average	557	0.30

Methow Core Area Bull Trout

Numbers of redds counted in the Methow sub-basin appear to have increased since the mid-1990s. This reflects both an actual increase in redds and an artifact of improved survey methods. Data from recent years of surveys (2000 to 2007), with similar, indicate an increasing trend in redds, ranging from 147 in 2000 to 231 in 2007 (see below).

2.2.2.3) Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

Methow Spring Chinook MPG

From 1960 to 2003, abundance of age 3+ naturally produced spring Chinook in the Methow sub-basin ranged from 33 to 9,904 adults. During this period the 12-year geometric mean (1988-1999) of spawners in the sub-basin ranged from 480 to 2,231 adults. The 12-year geometric mean at the time of listing (1999) was 480 spawners (UCSRB 2007).

More recently (1992 to 2008), the estimated escapement of naturally produced spring Chinook has ranged from approximately 58 (2003) to 1,832 fish (2001), with a geometric mean of 363 (Table 2-14).

Table 2-14. Estimated escapement of spring Chinook in the Methow River, 1992 to 2008 (based on Appendices A and D, Chapter 5, from Snow et al. 2008 and unpublished 2009 WDFW data).

Return Year	Estimated Escapement							
	Chewuch		Methow		Twisp		Total	
	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild
1992		422		924		316		1,662
1993		184		537		426		1,147
1994		63		172		74		309
1995		6		27		12		45
1996								
1997		123		155		72		350
1998								
1999		21		70		25		116
2000	52	83	546	611	235	256	833	950
2001	1,761	732	6,994	594	384	506	9,139	1,832
2002	588	78	1,644	86	60	181	2,292	345
2003	465	25	597	8	18	25	1,080	58
2004	289	46	622	199	98	243	1,009	488
2005	289	219	526	221	34	87	849	527
2006	378	135	942	128	100	65	1,420	328
2007	203	74	545	152	65	40	813	266
2008	166	86	468	172	126	40	760	298

Return Year	Estimated Escapement							
	Chewuch		Methow		Twisp		Total	
	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild
Geometric mean	310	84	873	158	86	92	1,342	363

Methow Summer Steelhead MPG

Between 1988 and 2007, the run of naturally produced steelhead returning to the Methow River has ranged from 66 (1995) to 669 (2004). The most recent 12-year average (1996 to 2007) geometric mean is estimated at 329 fish (Table 2-15).

Table 2-15. Estimated return of naturally produced steelhead to the Methow River, 1988-2009. Information based on UCSRB (2007) and Snow et al. (2008) and unpublished WDFW data.

Return year	Estimated naturally produced return	12-year running geometric mean of return
1988	316	116
1989	401	126
1990	315	160
1991	552	184
1992	252	242
1993	130	240
1994	165	275
1995	128	250
1996	222	247
1997	96	224
1998	186	221
1999	350	229
2000	436	236
2001	702	247
2002	651	262
2003	847	272
2004	638	294
2005	558	331
2006	472	362
2007	762	420
2008	898	472

Methow Core Area Bull Trout

Bull trout redd surveys in the Methow sub-basin began in the early 1990s. Total numbers of redds within the sub-basin have ranged from 4 to 231 (Table 2-16). , Using 2.0 and 2.8 fish per redd (UCSRB 2007), abundance ranged between 22 and 647 fish per year in the Methow Sub-basin (Table 2-17).

Table 2-16. Bull trout redds from the Methow Sub-basin between 1992 and 2007 (pers. comm., Barb Kelly and Gene Shull, USFWS and USFS, respectively).

Stream/ Watershed[1]	Methow River Sub-basin															
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Lower Methow watershed					2	2	1	0		0	1	0		14	4	4
Twisp watershed	4	5	4	25	0	2	86	101	105	76	93	86	101	87	89	108
Chewuch watershed				22	13	9	8	0	18	31	22	20	10	43	54	46
Upper Methow watershed	7			28	29	18	40	30	42	47	79	21	58	71	63	73
Redd Total:	11	5	4	75	44	31	135	131	165	154	195	127	169	215	210	231
Miles Surveyed Total:				18.7	25.6	20.2	26.7	27.8	22.9	42.5	28.7	30.6	30.7	33.3	32.3	32.8

[1] Lower Methow includes Crater Creek, Middle Methow includes Wolf and Goat Creeks, and Upper Methow includes the upper mainstem Sub-basin (Early Winters subwatershed, and lower Lost River subwatershed).

Note: Not all bull trout redd counts were complete, and length of stream surveyed has varied between some surveys, in many cases with new survey reaches being added in recent years. Please refer to the annual spawning survey reports for more complete information.

Table 2-17. The number of bull trout estimated to spawn in the Methow Sub-basin between 1992 and 2007, based on Table 2-16 and using either 2.0 fish per redd (f/r) or 2.8.

Year	Total Redds	Fish @ 2.0 f/r	Fish @ 2.8 f/r
1992	11	22	31
1993	5	10	14
1994	4	8	11
1995	75	150	210
1996	44	88	123
1997	31	62	87
1998	135	270	378
1999	131	262	367
2000	165	330	462
2001	154	308	431
2002	195	390	546
2003	127	254	356
2004	169	338	473
2005	215	430	602
2006	210	420	588
2007	231	462	647

2.2.2.4) Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

Methow Spring Chinook MPG

The proportion of hatchery-origin fish on the spawning grounds has been increasing since 2001, and in particular, in the Chewuch and Methow spawning areas since 2005 (Table 2-18). Except for 2007, the proportion of hatchery-origin fish spawning in the Twisp has remained consistently below 30 percent (Table 2-18).

Table 2-18. Proportions of hatchery-origin spring Chinook spawners in the Methow Sub-basin, based on Table 2-14.

Return Year	Proportions							
	Chewuch		Methow		Twisp		Total	
	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild
2001	41.4	58.6	48.0	52.0	30.1	69.9	42.1	57.9
2002	46.9	53.1	48.7	51.3	24.9	75.1	45.7	54.3
2003	48.7	51.3	49.7	50.3	29.5	70.5	51.4	48.6
2004	46.9	53.1	48.7	51.3	19.9	80.1	43.0	57.0

Return Year	Proportions							
	Chewuch		Methow		Twisp		Total	
	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild
2005	56.9	43.1	70.4	29.6	28.1	71.9	61.7	38.3
2006	86.3	13.7	75.8	24.2	28.7	71.3	65.4	34.6
2007	73.3	26.7	78.1	21.9	61.9	38.1	69.5	30.5
2008	65.9	34.1	73.1	26.9	75.9	24.1	71.8	28.2
Average	*58.3*	*41.7*	*61.6*	*38.4*	*37.4*	*62.6*	*56.3*	*43.7*

Methow Summer Steelhead MPG

Using the proportion of natural-origin fish sampled at Wells Dam as a surrogate for the percentage of natural-origin fish on the spawning grounds shows that the proportion of hatchery steelhead on the spawning grounds is typically greater than 90 percent (Figure 2-8). The long-term average percentage of naturally produced fish sampled at Wells Dam is approximately 8 percent (Figure 2-8).

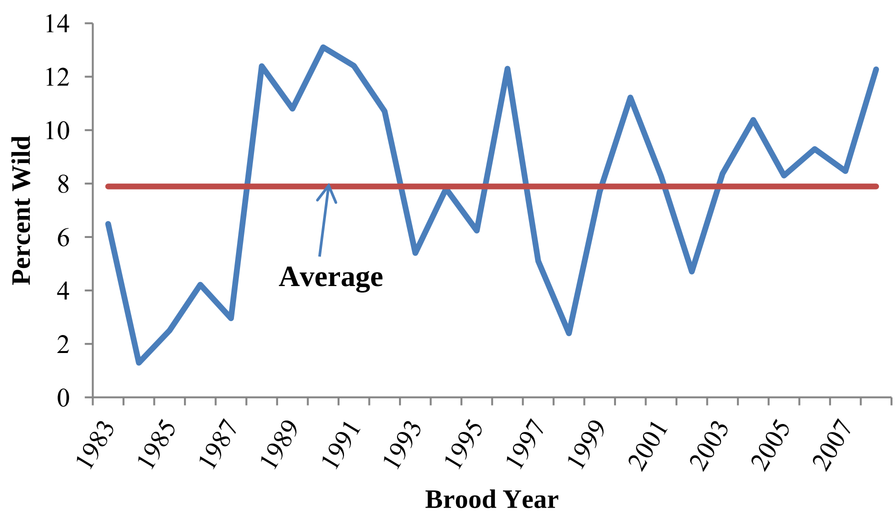

Figure 2-8. Percent of naturally-produced steelhead sampled in the run at large at Wells Dam for the 1983 to 2008 brood years (Data from UCSRB 2007 and C. Snow, pers. Comm)

Methow Core Area Bull Trout

There are currently no hatchery programs in the Methow Sub-basin.

2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of NMFS listed fish in the target area, and provide estimated annual levels of take

See Tables 2-19 and 2-20 for estimated levels of annual take.

Hatchery Program Activities.
These activities include:

- Collection of broodstock (up to 38 natural-origin adults) may occur through trap operations at Wells Dam, Rocky Reach Dam (as approved by the HCP Hatchery Committees), or other locations as approved by the HCP Hatchery Committees, or by other methods such as angling, seining or tangle netting in tributaries (as approved on an annual basis by the HCP Hatchery Committees) for natural-origin Methow spring Chinook salmon. See Table 5-1.
- Transfer of natural and hatchery-origin adults and fertilized eggs between the trapping locations and spawning/incubation facilities at Eastbank Hatchery and/or Winthrop NFH; and holding/artificial spawning of collected adults at these hatcheries.
- Propagation and incubation from the fertilized egg through the smolt life stage at the hatcheries.
- Transfer of fingerlings and pre-smolts from the hatcheries for rearing in acclimation facilities as outlined in Table 5-1.
- Release of smolts into the Methow Sub-basin from acclimation facilities/locations in the Methow Sub-basin as approved by the HCP Hatchery Committees.
- Monitoring of the programs in the hatchery environment using standard techniques such as growth and health sampling as detailed in the M&E Plan (Hillman et al. 2013).
- Monitoring of the programs in the natural environment using standard techniques such as juvenile fish traps, adult spawner surveys, etc., as described in detail in the M&E Plan (Hillman et al. 2013).

Adult Management Activities
Take of hatchery and natural origin spring Chinook may also occur as a result of adult management of hatchery spring Chinook to meet spawning escapement objectives (abundance of hatchery/wild origin composition on the spawning grounds). These activities may occur at Rocky Reach Trap, Wells Trap, and/or at the hatchery outfalls and weirs throughout the Methow Sub-basin (or other locations as determined by the HCP-HC).
Harvest

Adult Removal at Trapping Facilities/Locations

- **Funding:** Chelan PUD will provide funding for up to one full-time employee (for all spring Chinook hatchery programs) for adult management activities associated with Chelan PUD's NNI hatchery compensation. This funding includes manual adult management activities up to the point at which spring Chinook are removed at the trapping facilities and placed in holding containers. WDFW is responsible for coordinating the funding for adult management activities from the point at which fish are placed in holding containers when removed and/or for a fishery. The JFP will determine the disposition of the fish placed in the holding containers.

- **Permit Holder:** Chelan PUD and WDFW will be co-permit holders for adult management activities up to the point at which spring Chinook are removed from the trapping facilities and placed in holding containers. WDFW will be the permit holder for adult management activities from the point at which fish are placed in holding containers.
- **Agent:** WDFW, as co-permittee, is currently under contract with Chelan PUD and will remain so until the contract expires and is not renewed or renegotiated.

Table 2-19. Estimated levels of take of Upper Columbia River (UCR) spring Chinook by hatchery activity.

Listed species affected: UCR Spring Chinook	**ESU/Population:** Methow Population		**Activity:** Implement Hatchery Program	
Location of hatchery activity: Eastbank and hatchery facilities in the Methow River; other M&E activity locations in the Methow River and its Tributaries **Dates of activity:** Broodstock collection: May-August; screw traps spring thaw to ice up **Hatchery program operator:** Currently WDFW				
Type of Take	**Annual Take of Listed Fish By Life Stage** ***(Number of Fish)***			
	Egg/Fry	**Juvenile/Smolt**	**Adult**	**Carcass**
Observe or harass (a)			Up to 100% of run at-large to support broodstock sorting and adult management	Up to 100%
Collect for transport (b)			Up to 38 NORs or 45 HORs-if needed to support bacterial kidney disease (BKD) management	
Capture, handle, and release (c)		Release up to 60,516 hatchery smolts	Up to 100% of run at-large to support broodstock sorting and adult management	
Capture, handle, tag/mark/tissue sample, and release (d)		Trap up to 20% natural and hatchery population from any Methow tributary	Up to 100% of the natural and hatchery returns	100%
Removal (e.g. broodstock) (e)			Up to 38 NORs or 45 HORs-if needed to support BKD management	
Intentional lethal take (f)		Bio-sampling for research	Up to 38 NORs or 45 HORs-if needed to support BKD management; up to 100% hatchery returns for pHOS control	
Unintentional lethal take (g)			Up to 3 (5% of broodstock)	
Other Take (specify) (h)				

Notes:

a. Observation and/or harassment of listed fish associated with stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled, and released upstream or downstream.
d. Take associated with tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other take not identified above as a category.

Table 2-20. Estimated levels of take of Upper Columbia River (UCR) Summer Steelhead by hatchery activity.

Listed species affected: UCR Summer Steelhead **ESU/Population:** Methow and Okanogan Populations **Activity:** Implement Hatchery Program				
Location of hatchery activity: Eastbank and other hatchery facilities in the Methow River; other M&E activity locations in the Methow River and its tributaries **Dates of activity:** Broodstock collection: May-August; screw traps spring thaw to ice up **Hatchery program operator:** Currently WDFW				
Type of Take	**Annual Take of Listed Fish By Life Stage (*Number of Fish*)**			
	Egg/Fry	**Juvenile/Smolt**	**Adult**	**Carcass**
Observe or harass (a)				
Collect for transport (b)				
Capture, handle, and release (c)			Up to 100 adults	
Capture, handle, tag/mark/tissue sample, and release (d)		Trap up to 20% natural and hatchery population from any tributary	Trap up to 20% NOR and HOR population from any tributary	
Removal (e.g. broodstock) (e)				
Intentional lethal take (f)				
Unintentional lethal take (g)			Up to 9 adults; not exceed 1% of trapped steelhead	
Other Take (specify) (h)				

Notes:

a. Observation and/or harassment of listed fish associated with stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled, and released upstream or downstream.
d. Take associated with tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan or other regionally accepted policies Explain any proposed deviations from the plan or policies.

The objectives of this program are established in the Rocky Reach and Rock Island HCPs and described in Section 1. Implementation of the HCPs is a cornerstone of recovery efforts for the UCR spring Chinook and as such, has been imbedded in the Recovery Plan (UCSRB 2007). The Upper Columbia Salmon Recovery Board (UCSRB) led the development of the Recovery Plan which was adopted by NMFS as a final ESA recovery plan for UCR spring Chinook and steelhead on October 9, 2007. The UCSRB coordinates recovery planning in the UCR region with funding from the Washington State Governor's Salmon Recovery Office. A link to the NMFS webpage describing the plan is at http://www.nwr.noaa.gov/Salmon-Recovery-Planning/Recovery-Domains/Interior-Columbia/Upper-Columbia/Index.cfm.

Section 5.3.1 of the Recovery Plan describes the hatchery programs currently being implemented in the Upper Columbia ESU. Implementing entities include CCT, YN, USFWS, WDFW, Chelan PUD, Douglas PUD, and Grant PUD. Coordinating and technical bodies have been established to guide implementation of Chelan, Douglas and Grant County PUDs' hatchery programs (Coordinating Committees and Hatchery Committees), required by the PUD HCPs and by Grant County PUD's Biological Opinion (2008). The HCP and Priest Rapids Coordinating and Hatchery Committees include participation by the relevant PUD(s) and CCT, YN, USFWS, NMFS, and WDFW. This HGMP, to the extent consensus can be reached by the HCP-HC, will also be consistent with the principles advocated by the Hatchery Scientific Review Group on UCR spring Chinook artificial supplementation programs (HSRG 2009). These principles will be reflected in the program production size and duration, M&E, and in the artificial production strategies.

3.1.1) HSRG – Upper Columbia Review

The HSRG, as part of the Pacific Salmon Hatchery Reform Project, has completed a review of 178 hatchery programs and 351 salmonid populations in the Columbia River Basin. The project was conducted by the Columbia River HSRG, composed of 14 members, nine of whom were affiliated with agencies and tribes in the Columbia River Basin. The remaining five members were unaffiliated biologists. The objective was to produce recommendations that are based on broad policy agreements and are supported by consistent technical information about hatcheries, habitat, and harvest. The Upper Columbia Hatchery Programs Regional Review began in April 2008, and the final HSRG recommendations were published January 31, 2009 in Appendix E to the Columbia River Hatchery Reform System-Wide Report (HSRG 2009). Principles of the HSRG are incorporated into this HGMP to the extent agreements have been reached within the HCP-HC process.

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

3.2.1) Rocky Reach and Rock Island Habitat Conservation Plans

Biological Opinions with incidental take statements (ITSs) were issued for the Rocky Reach and Rock Island hydroelectric projects HCPs on August 12, 2003. The Rocky Reach FERC license was also consulted upon by NMFS on July 9, 2007. The amended Incidental Take Permit No.1196 (NMFS 2004) added Chelan PUD to the permit as a joint permit holder with WDFW and Douglas PUD on January 20, 2004. The artificial propagation activities of this program are included within the HCPs; see Sections 1.7 and 1.8 for more detailed information regarding the HCPs. The production levels specified in the HGMP are consistent with those currently in place under the HCP Hatchery Committees; therefore this HGMP is consistent with the HCPs.

3.2.2.) 2008-2017 / United States v. Oregon / Management Agreement

The purpose of this Management Agreement is to provide a framework within which the signatory parties can use their authorities to protect, rebuild, and enhance UCR fish runs while fairly sharing harvestable fish between Treaty and non-Treaty fisheries. The Management Agreement specifies harvest limits and artificial production measures for stocks of salmon and steelhead originating above Bonneville Dam. The hatchery production goal for the Methow Composite stock of spring Chinook as shown in Appendix B, Table B1 of the Management Agreement (released from Twisp and Chewuch River acclimation Sites as well as Methow Hatchery itself) is 550,000 yearling juveniles initially incubated and reared at the Methow Hatchery.

These production programs are implemented and/or adjusted based on modifications to productions levels through processes established under the mid-Columbia HCPs, the Priest Rapids Salmon and Settlement Agreement, and discussions associated with Part III.H of the Management Agreement. The current program involves the release of smolts from the Methow Hatchery; some Methow Hatchery production is acclimated at ponds located in the Twisp and Chewuch watersheds. The Management Agreement is entered as an order of the 7th US District Court in /*US v. Oregon*/ and, as such, its terms are binding on the parties. The mitigation production levels specified in this HGMP are identical to those of the Management Agreement; therefore, this HGMP is consistent with *US v. Oregon*.

This program does not affect the management, assessment, or goals of fisheries that occur outside of the Methow sub-basin. Low numbers of Methow spring Chinook are harvested in ocean fisheries. Impacts of ocean fisheries are regulated under authority of the Pacific Salmon Commission and the Pacific Fishery Management Council. Fisheries under these jurisdictions have been reduced in recent years in response to ESA listings. Mainstem Columbia River fisheries are regulated under a co-management framework pursuant to litigation in *US v Oregon*. The *2008-2017 United States v Oregon Management Agreement* provides the harvest management framework for spring Chinook fisheries below McNary Dam. The harvest schedule is designed to allow some level of harvest, while protecting the majority of ESA-listed NOR adults passing through the fisheries.

Allowable harvest rates are scaled to the abundance of the total run projected to pass Bonneville Dam and the abundance of NOR spring Chinook projected to enter the Snake River. The allowable harvest rates for Treaty and non-Treaty fisheries are designed to achieve a 50/50 sharing of harvestable fish in the non-selective Tribal fisheries and mark-selective non-Tribal fisheries in accordance with Treaty fishery case-law standards. Total allowable fishery impacts in combined mainstem fisheries range from less than 5.5 percent on total runs of less than 27,000 fish to a maximum of 17 percent on runs of 488,000 fish or more. Nevertheless, lower-mainstem commercial and recreational fisheries annually commence prior to confirmation of the forecasted run-size by actual fish counts at Bonneville Dam, potentially resulting in a disproportionate harvest of the early returning component of the UCR spring Chinook run, which historically comprised older, more-fecund fish (i.e., Age-5 fish) (Eldridge et al. 2010).

Fisheries in the UCR basin are currently limited by the need to protect ESA-listed UCR spring Chinook salmon and UCR steelhead. Fisheries in the migration corridor and ocean are also limited to protect these populations and to minimize harvest impacts on other listed salmon and steelhead returning to other Columbia River basin and Snake River basin areas as noted above. NMFS evaluates and authorizes annual fisheries proposed by the JFP in the action area each year through separate Section 7 biological opinions.

Until the spring of 2000—when a relatively large run of hatchery spring Chinook salmon returned and provided a small commercial Tribal fishery in the lower Columbia River—no commercial season for spring Chinook salmon had taken place since 1977. Present Columbia River harvest rates are very low compared with those from the late 1930s through the 1960s (NMFS 2008).

Harvest actions outside the action area, such as in the ocean, mainstem Columbia River, and other basin areas will be managed through the *U.S. v Oregon* and Pacific Fisheries Management Council (PFMC) planning and management processes, with guidance from NMFS. Proposed releases of spring Chinook salmon, summer Chinook salmon, sockeye salmon, and coho salmon juveniles into the UCR basin are not expected to create any substantial harvest complications with listed species. NMFS involvement with the co-managers in the PFMC and *U.S. v Oregon* fishery planning processes will adequately limit harvest effects on listed salmon and steelhead. Proposals for future fisheries will continue to be addressed by NMFS through separate Section 7 consultation processes.

3.3) Relationship to harvest objectives.

3.3.1) Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

There have been no recreational fisheries on Methow spring Chinook in the Methow River since the stock was listed in 1999. Neither formal creel survey nor punch card data were available to estimate total catch or effort in fisheries prior to 1999. The primary goal of the hatchery program is to support recovery of listed Methow spring Chinook and to contribute to the recovery of the UCR spring Chinook ESU and to the extent possible contribute to harvest opportunities. Implementation of fisheries is not the purview of Chelan PUD and thus a specific fisheries plan is not included in this

HGMP. Implementation of fisheries may help reduce the number of hatchery-origin adults; however, under current marking agreements, a fishery would be directed at Winthrop NFH returning adults, and not necessarily at fish originating from this program. Therefore, a fishery may help overall adult management in the Sub-basin, but may not have a substantial effect on adult management of Chelan PUD's spring Chinook production in the Methow Sub-basin unless alternative marking strategies were employed.

3.4) Relationship to habitat protection and recovery strategies.

Although habitat in much of the upper reaches of the Methow Sub-basin is in near pristine condition, habitat complexity, connectivity, water quantity, and riparian function have been compromised by human activities in other parts of the Methow Sub-basin, including portions where the majority of spring Chinook spawn. The Recovery Plan (UCSRB 2007) details specific objectives and actions for habitat protection and restoration necessary for the recovery of UCR salmon and steelhead populations.

Chelan PUD also provides funding for projects for the protection and restoration of HCP Plan Species habitat. The PUD provides this funding as a requirement of the Rocky Reach and Rock Island HCPs to compensate for up to two percent unavoidable project mortality. This HCP requirement, combined with the survival standards and hatchery compensation, satisfies Chelan PUDs mitigation obligation for passage losses due to the operation of Rocky Reach and Rock Island Dams.

3.5) Ecological interactions.

Potential effects of the Methow Hatchery spring Chinook hatchery program on salmonids and non-salmonids; salmonid and non-salmonid physical environments; potential effects of other supplementation programs; and natural-origin fish have been evaluated in the NMFS Biological Opinion (2004) and Environmental Assessment (NMFS 2002) for a multi-year authorization for an annual take of UCR spring Chinook salmon and UCR steelhead associated with the spring Chinook supplementation program (Permit 1196). Potential effects from the program are regulated by existing policies regarding hatchery operations, maintenance protocols, fish health practices, genetic effects, ecological interactions, and fish cultural practices, as prescribed in the 1994 IHOT annual report (IHOT 1995).

3.5.1) Populations that could negatively impact the program.

Predation

Fish, mammals, and birds are the primary natural predators of spring Chinook in the Upper Columbia Basin. Several fish species may consume spring Chinook. Northern pikeminnow (*Ptychocheilus oregonensis*), walleye (*Sander vitreus vitreus*), and smallmouth bass (*Micropterus dolomieu*) have the potential to negatively affect the abundance of juvenile Chinook (Gray and Rondorf 1986; Bennett 1991; Poe et al. 1994; Burley and Poe 1994). Adult salmonids within the

Upper Columbia Basin are opportunistic feeders and are therefore capable of preying on juvenile spring Chinook. Those adult salmonids likely to have some effect on the survival of juvenile salmonids include (in order of greatest likely impact), adult bull trout, rainbow trout, cutthroat trout, brook trout, and brown trout.

Juvenile hatchery spring Chinook salmon are liberated as yearling smolts through volitional releases. Because fish are released as yearling smolts, potential predation by native and non-native predators is thought to be reduced compared to sub-yearling releases.

Predation by piscivorous birds on juvenile salmonids may also represent a large source of mortality. The NMFS (2000) identified gulls *(Larus* spp.), cormorants (*Phalacrocorax* spp.), and Caspian terns *(Sterna caspi*a) as the most important avian predators in the Columbia River Basin. In the Columbia River estuary, avian predators consumed an estimated 16.7 million smolts (range, 10 to 28.3 million smolts), or 18 percent (range, 11 to 30 percent), of the smolts reaching the estuary in 1998 (Collis et al. 2000, as cited in Douglas PUD 2010). Caspian terns consumed primarily salmonids (74 percent of diet mass), followed by double-crested cormorants *(P. auritu*s; 21 percent of diet mass) and gulls (8 percent of diet mass).

Predation and delayed mortality for returning adult salmon as a result of wounding by marine mammals may negatively affect spring Chinook salmon. The incidence of wounds noted at Lower Granite Dam during 1991 was 20.9 percent for adult spring migrants and 9.4 percent for summer migrant salmon (Park 1993). In 1992, the numbers were 17.4 percent and 7.6 percent, respectively. Although UCR Chinook do not pass Lower Granite Dam, the losses there may be similar to losses experienced by UCR Chinook along their migration route.

Competition and potentially predation could also occur between juvenile spring Chinook and hatchery steelhead that reside in the mainstem Columbia River and in the Methow Sub-basin. Although the degree of steelhead residualism is unknown, it is thought to average between 5 and 10 percent of the number of fish released (USFWS 1994, as cited in Douglas PUD 2010).

Pathogens and Parasites

To improve imprinting and subsequent homing fidelity, the hatchery program commonly utilizes surface water to provide long and short term acclimation. Pathogens can be present in the surface water and can be transmitted horizontally from natural origin spring Chinook (e.g., bacterial kidney disease) and/or from decaying carcasses, which may shed parasites (e.g., *Dermocystidium*). Pathogens and parasites present in the surface water may be transported through the water intake, which can pose a significant risk to the program.

3.5.2) Populations that could be negatively impacted by the program.

The potential ecological effects of Methow spring Chinook on natural salmonid populations is broken down into three sections: 1) effects associated with juvenile releases; 2) effects associated with adult returns; and 3) effects associated with both juveniles and adults. Effects to non-salmonid species are unknown at this time, but will be addressed as part of Objective 12 of the M&E Plan (Hillman et al. 2013).

Juvenile Releases

Hatchery-origin juvenile spring Chinook from this program can potentially interact with natural-origin spring Chinook and steelhead juveniles. These species are present year-round in the UCR mainstem and tributary areas. Natural-origin spring Chinook salmon in the UCR initiate seaward migration as yearling fish between March and June (Chapman et al. 1995). Natural-origin steelhead fry emerge from the gravel in the late spring through August and disperse to downstream rearing areas in the late summer and early fall. UCR steelhead begin seaward migration as age 2+ (43.2 percent) or 3+ (46.4 percent) smolts (Peven 1990) during April and May at an average size of 136 to 188 mm (Chapman et al. 1994).

After initial incubation and rearing on well water at the Eastbank Hatchery, yearling juvenile spring Chinook salmon will be acclimated on and released into natal waters. Fish not leaving acclimation ponds volitionally will be forced out in May. Historically, it has been seldom necessary to force fish. The target release size of 15 to 18 fish per pound (fpp) for hatchery-origin spring Chinook yearlings is specified in the M&E Plan. This target for release size is intended to produce rapidly migrating juveniles that, because of their rapid migration, should not compete for resources with naturally produced spring Chinook or other species.

Adult Returns

Little is known about interactions between individual stocks of spring Chinook released into the Columbia River system from this hatchery program and other salmonids between the time they leave the estuary and return as adults to spawn. Available information is inferred from coded wire tag (CWT) data taken from fish harvested from the ocean. Based on this available data, it is assumed that ocean harvest of upper Columbia spring Chinook will continue to be minimal (2008 to 2017 US v. OR Management Agreement) and for practical purposes is assumed to be zero (FCRPS/Three Treaty Tribes MOA 2008). These data, however, do not give us insight into fish behavior nor inter-specific interactions among stocks in the ocean. However, given the assumed zero harvest of Methow spring Chinook in ocean fisheries, the Methow spring Chinook hatchery program is not a factor in determining ocean harvest regulations and quotas that could affect listed species.

Returning adult hatchery spring Chinook that stray to natural spawning areas may compete for spawning gravel and/or breed with native fish, potentially altering genetic fitness and influencing their ability to survive in the ecosystem. Guidance on acceptable out-of-basin stray rates of hatchery fish is 5 percent or less of total brood return (HSRG 2009). Due to the chronically low abundance of NORs in the Methow Sub-basin, hatchery-origin spawners may be necessary to provide an adequate number of spawners on the spawning grounds; however, strays from out-of-basin hatchery programs are undesirable. Overall, 14.5 percent of the estimated number of hatchery fish spawning in the Methow Sub-basin in 2007 strayed from other independent populations (Entiat, Chiwawa, and Dworshak Hatchery releases). These fish comprised 26.6 percent of the hatchery fish spawning in the Chewuch River subwatershed, and 17.2 percent of those spawning in the upper Methow; no out-of-basin strays were recovered in the Twisp River (Snow et al. 2008). Methow Hatchery stocks have comprised less than 5 percent of the estimated spawning escapement in the Entiat River between run years 1997 to 2006 (Snow et al. 2008).

The concept of within-basin straying in the Methow Sub-basin is controversial because hatchery spring Chinook of Methow/Chewuch-composite origin have been assigned arbitrarily to release location, either directly from the Methow Hatchery or from the Chewuch acclimation pond, with the goal that greater than 90 percent of them will return to the spawning grounds, rather than to the hatchery. Nevertheless, any fish recovered by the hatchery program M&E staff is classified as a within-basin stray if it is not within the stream in which it was released, regardless of the origin of its parents or length of acclimation at the release site. Table 3-1 summarizes the proportion of CWT recoveries by hatchery stock in the Chewuch, Methow and Twisp Rivers from run years 2000 to 2012. Stray rates of Twisp and Chewuch hatchery spring Chinook salmon were high for the 1998 and 2000 broods examined. Releases in both these watersheds were accomplished through the use of acclimation ponds supplied with local irrigation withdrawal from the Twisp and Chewuch rivers. Stray rates may decrease with a longer acclimation time, but longer acclimation at the current facilities may only be possible with eliminating dependence on water withdrawal from the ditch by obtaining a dedicated surface water and groundwater right that would extend the acclimation period.

Annual monitoring and evaluation, as required in the HCP, will be used to assess and direct future hatchery program operations to avoid exceeding the acceptable levels of strays from this hatchery program. Assuming that extended acclimation would translate into reduced straying; the current 30-day rearing period (if not zero days due to debris or ice) is apparently not adequate to control stray rates from these sub-basins (C. Snow, WDFW, pers. comm.). However, stray rates are not known for natural-origin fish in the Methow Sub-basin; thus, it is uncertain whether or not the rates of straying observed for fish originating from the Methow Hatchery differ from the rates within the natural population.

Potential adverse impacts to steelhead and bull trout during spring Chinook broodstock collection are negligible; WDFW has established specific procedures for handling non-target species to reduce negative effects (NMFS 2002). In addition, impacts to bull trout from the supplementation of spring Chinook are expected to be negligible (NMFS 2002).

Table 3.1. Proportion of CWT recoveries comprising estimated spawning escapement in the Methow Sub-basin. Percent of spawning escapement comprised by NOR fish is not included. Recoveries from 1998 and 2000 brood MetComp releases are listed as MetComp because no specific release location could be assigned (Chewuch and Methow River releases).

Estimated spawning escapement				Hatchery stock (% of spawning escapement)					
Run Year	HOR	NOR	Total	Chewuch	Methow	Twisp	Winthrop	MetComp	Out-of-basin
				Chewuch River					
2000	52	31	83	8.4	8.4	0.0	8.7	--	18.5
2001	1,761	732	2,493	33.8	2.0	0.2	10.4	2.1	0.2
2002	588	78	666	3.6	0.0	0.0	7.9	69.7	0.0
2003	465	25	490	0.0	1.5	0.0	2.6	78.5	0.5
2004	289	46	335	5.1	1.1	0.0	3.0	70.7	0.0
2005	289	219	508	41.9	3.6	0.4	2.1	4.0	3.8
2006	378	135	513	28.8	3.2	0.9	5.5	- -	7.4
2007	203	74	277	20.0	8.4	0.0	8.9	- -	19.4
2008	166	86	252	26.7	4.5	0.0	17.3	- -	10.4
2009	500	271	771	30.8	9.9	1.5	16.0	- -	1.5
2010	341	155	496	39.0	6.7	0.4	14.7	- -	2.5
2011	499	370	869	39.2	4.1	0.0	7.6	- -	13.0
2012	281	81	342	51.8	3.2	2.3	2.3	- -	5.0
				Methow River					
2000	574	65	639	2.5	38.0	2.9	25.5	- -	0.0
2001	6,994	594	7,588	7.9	27.8	0.4	45.6	1.8	0.4
2002	1,644	86	1,730	0.6	4.6	1.1	28.3	47.1	0.0
2003	597	8	605	0.0	5.1	4.0	26.3	43.3	0.6
2004	622	199	821	3.6	4.5	4.4	16.9	35.6	0.0
2005	526	221	747	32.2	16.2	1.6	11.7	1.2	1.7
2006	942	128	1,070	22.8	25.2	4.6	19.1	- -	7.0
2007	545	152	697	12.3	6.8	7.2	36.6	- -	6.9
2008	468	172	640	11.8	16.2	0.4	38.9	- -	3.1
2009	1,480	261	1,741	10.9	27.2	2.3	36.8	- -	3.4
2010	1,370	251	1,621	10.8	34.9	0.8	29.2	- -	0.4
2011	1,391	432	1,823	28.1	21.4	3.9	23.2	- -	5.1
2012	691	63	754	28.0	40.2	8.1	7.8	- -	2.5
				Twisp River					
2000	235	21	256	0.0	0.0	72.6	2.2	- -	0.0
2001	384	506	890	1.5	0.8	19.6	0.8	0.0	0.0
2002	60	181	241	0.0	0.0	9.1	12.1	3.1	0.0
2003	18	25	43	0.0	0.0	30.2	0.0	0.0	0.0
2004	98	243	341	0.0	0.0	19.7	1.2	1.3	4.4
2005	34	87	121	2.6	0.0	15.8	0.0	0.0	0.0
2006	100	65	165	0.0	2.5	40.0	2.8	- -	0.0
2007	65	40	105	0.0	0.0	55.2	0.0	- -	0.0
2008	126	40	166	2.7	0.0	60.1	0.0	- -	4.0
2009	97	32	129	0.0	0.0	55.6	3.4	- -	3.4
2010	96	156	252	1.4	0.0	30.1	2.8	- -	1.4
2011	85	159	244	2.5	0.0	17.4	0.0	- -	32.4
2012	146	56	202	2.2	1.1	62.4	1.1	- -	1.1

Both Juveniles and Adults
Negative effects to other species that may result from the program could occur from impacts to water quantity and water quality. To limit impacts to water quantity, the program complies with water-right permits established for the hatchery to prevent over appropriation of surface water. Hatchery surface water intakes are screened to current criteria. Water quality will be affected by effluent from the hatchery, but the hatchery facility is required to operate under NPDES permits issued by Washington State Department of Ecology. Hatchery effluent standards and state criteria for point-source discharge are set forth in the permit to protect aquatic life and the habitat in the area below the discharge point. Considering that the effluent produced from the hatchery facility complies with Environmental Protection Agency standards, coupled with the low percentage of effluent to discharge (dilution factor), there are probably minimal impacts to other species.

Hatchery-raised fish may be a source of pathogen transmission to natural-origin fish in the natural environment. This impact may occur from release sites in headwater spawning and/or rearing areas and throughout the entire migration corridor (e.g., BAMP 1998). Pathogens responsible for diseases are present in both hatchery and natural populations, although hatchery fish are probably more susceptible to disease pathogens because of the high rearing densities and resultant stress.

To mitigate for potential BKD transmission to fish in the natural environment, the HCP Hatchery Committees approved the following BKD management protocols:

- Hatchery-origin eggs/progeny with ELISA titers of OD ≥ 0.12 will be culled.
- Wild-origin eggs/progeny with ELISA titers of OD ≥ 0.12 will be raised at lower density of 0.06.
- All hatchery- and natural-origin eggs/progeny with ELISA titers of OD > 0.19 will be culled from the program.
- At the first signs of infection with BKD, juvenile spring Chinook will be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.
- When less than 5 percent of the program production is in the 0.12 ≤ OD ≤ 0.19 range, the Hatchery Committees may elect not to rear these fish to program size and instead utilize the available hatchery space for other purposes.

3.5.3) Populations that have a positive impact on the program.

Chinook, steelhead, and coho carcasses of both hatchery and natural-origin fish deposited within the Methow sub-basin are likely to have a positive influence on nutrient levels within the sub-basin. Increased nutrient levels are likely to provide a more productive environment within which the natural-origin and hatchery spring Chinook can rear and migrate. Marine-derived nutrients brought to the Methow Sub-basin by adult spring Chinook should benefit all species there (Stockner 2003).

3.5.4) Populations positively impacted by the program.

The Methow Sub-basin native fish assemblage is expected to benefit from nutrients derived from carcasses of returning adult Methow Hatchery spring Chinook at dispersed locations throughout the sub-basin (Stockner 2003). This hatchery program is designed to promote natural spawning of spring Chinook salmon in a more widely dispersed manner (relative to the unsupplemented condition) consistent with available spawning habitat in the Methow River watershed and its sub-watersheds. The dispersed spawning will likely have a positive effect on bull trout, resident rainbow trout, and westslope cutthroat trout populations scattered throughout the Methow sub-basin because these salmonids will consume salmon eggs, fry, and parr (and flesh from carcasses).

SECTION 4. WATER SOURCE

Responsibilities: Chelan PUD is responsible for funding and carrying out the activities described in Section 4. Chelan PUD and WDFW will be co-permit holders for the activities described in Section 4.

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

Eastbank Hatchery

Water is supplied by the Eastbank Aquifer, a high quality groundwater source with connectivity to the Columbia River. Both the Eastbank Hatchery Complex and the Regional Water System, which provides municipal water to the customers of Chelan PUD, the City of Wenatchee, and the East Wenatchee Water District, use the Eastbank Aquifer. The Eastbank Hatchery water right permit provides for 55 cubic foot per second (cfs) of instantaneous water supply. On an annual basis, temperatures range from approximately 45.5°F to 59.0°F. Spring Chinook are held for broodstock, incubated, and early-reared on this water. Water can be chilled to meet specific growth and incubation criteria.

Carlton Acclimation Facility

Surface water supply to the facility is from the Methow River through a screened surface water-pumped intake located on the right bank of the Methow River. The existing screen system consists of a pair of 30-inch diameter tee screens with a high pressure air backwash cleaning system. A total of 14.9 cfs is available for rearing from November through May. Additionally, a 12-inch groundwater well provides water to the surface water intake to minimize the formation of frazil ice on the intake screens during low temperatures. Well water is also tied into the main water supply line for emergency use.

Chewuch Pond

Water for the Chewuch Pond is diverted from the Chewuch Canal Company irrigation ditch via an easement for delivery of water (6 cfs) from February 1 through May 1.

Winthrop NFH

The USFWS HGMP for the Winthrop NFH contains information on water source for the hatchery.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

Water withdrawal for use in hatcheries is monitored through the Washington State Department of Ecology and the Washington State Chapter 90.03 RCW water code. None of the hatchery facilities employed to carry out the proposed artificial propagation programs de-water river reaches used by listed fish for migration, spawning, or rearing. Water intakes into artificial propagation facilities shall be screened in compliance with 1995 NMFS screening criteria and as per the 1996 addendum to those criteria (NMFS 1996). As an alternative, they will comply with transitional criteria set forth by NMFS in 2000 for juvenile fish screens constructed prior to the establishment of the 1995 criteria, to minimize risks to listed salmon and steelhead. WDFW will inspect and monitor the water intake screen structures at their hatchery facilities to determine if listed salmon and steelhead are being drawn into the facility.

Eastbank Hatchery and Carlton Acclimation Facility

At Eastbank Hatchery and Carlton Acclimation Facility, water withdrawal for hatchery use is regulated by the Washington State Department of Ecology under Chapter 90.03 of the RCW (water code). None of the hatchery facilities employed to carry out the proposed artificial propagation programs de-water river reaches used by listed fish for migration, spawning, or rearing. All hatcheries owned and/ or operated by WDFW discharge water in compliance with NPDES General Permit No. WAG 13, valid through August 1, 2015. This permit is administered in Washington by the Washington State Department of Ecology under agreement with the United States Environmental Protection Agency.

Winthrop NFH

The USFWS HGMP for the Winthrop NFH contains information on water source for the hatchery.

SECTION 5. FACILITIES

Responsibilities: Chelan PUD is responsible for providing the funding for the activities described in this section. WDFW is currently responsible for conducting the activities described in this section. Consistent with these responsibilities, Chelan PUD and WDFW will be co-permit holders for the activities described in this section with WDFW designated as an agent under a current contract between Chelan PUD and WDFW and until this contract expires or is not renewed or renegotiated.

Several facilities will be used in the implementation of this hatchery program, depending on activity type (Table 5-1).

Table 5-1. Facilities and activities in Chelan PUD's Methow River spring Chinook hatchery program.

Activity	Facility
Broodstock Collection	Wells Dam, Rocky Reach Dam Trap[1], Winthrop NFH and/or Methow Hatchery outfalls and other locations approved by HCP Hatchery Committees
Adult Holding	Eastbank Hatchery and Winthrop NFH and other locations approved by HCP Hatchery Committees
Spawning	Eastbank Hatchery and Winthrop NFH and other locations approved by HCP Hatchery Committees
Incubation	Eastbank Hatchery and Winthrop NFH and other locations approved by HCP Hatchery Committees
Early Rearing	Eastbank Hatchery and other locations approved by HCP Hatchery Committee
Overwinter Rearing	Carlton Acclimation Facility and other locations approved by HCP Hatchery Committees
Final Acclimation	Chewuch Acclimation Pond (DCPUD owns/Yakama Nation to operate), Proposed Yakama Nation Expanded Acclimation sites: Goat Wall Acclimation Site, Mid Valley Pond, Chewuch River (future YN site), and other locations approved by the HCP Hatchery Committees

[1] The use of this facility for broodstock collection will be contingent on HCP Hatchery Committees approval.

Table 5-2. Three-year hatchery life-history for Chelan PUD's spring Chinook Methow production depicting residence at different facilities.

	January	February	March	April	May	June	July	August	September	October	November	December
Year 1					Brood Collection (Wells or RR)			Incubation (Eastbank)				
Year 2	Incubation		Early Rearing (Eastbank)							Overwinter (Carlton)		
Year 3	Overwinter	Acclimation (Chewuch or other)										

5.1) Broodstock collection facilities (or methods).

Broodstock may be collected at any of the following locations in a given year: Wells Dam, Rocky Reach Dam Trap, Winthrop National Fish Hatchery and/or Methow Hatchery outfall (in the event sufficient NORs are not available for the program, HORs from the conservation programs could be used for broodstock if collected at the outfalls), or on tributary spawning grounds.

Wells Dam Trap
Trapping at Wells Dam generally occurs at the east and west ladder traps beginning in early May, or at such time as the first spring Chinook are observed passing Wells Dam, and continues through about the third week of June. The trapping schedule consists of 3 days per week (Monday through Wednesday), and up to 16 hours per day. Non-lethal tissue samples (fin clips) for genetic analysis and scale samples will be obtained from adipose present, non-CWT, non-ventral clipped spring Chinook (suspected natural-origin spring Chinook) collected at Wells Dam for origin analysis.

Rocky Reach Trap (RRT)
As one of several broodstocking and adult removal options, Chelan PUD proposes to use the RRT to obtain broodstock for its Methow program (Figure 5-1). Based on the average distribution of the most recent 10 years of data (DART) the first 5 percent of the spring Chinook run passes Rocky Reach by April 18, and the 95 percent passage date is June 17; therefore, 90 percent of the run passes during an approximately 60-day period. Trapping would begin in late April and continue through about the third week in June. Trapping would occur up to 5 days per week (Monday through Friday), and up to 6 hours per day, with unrestricted passage during non-trapping periods.

Winthrop NFH
In 2013, Chelan PUD obtained hatchery origin broodstock from the USFWS Winthrop NFH outfall. In years when low natural-origin returns are expected that would preclude meeting the full conservation program, the Winthrop NFH outfall may be used to collect hatchery-origin adults, as approved by the HCP Hatchery Committees.

Methow Hatchery Outfall In years when low natural-origin returns are expected that would preclude meeting the full conservation program, the Methow Hatchery outfall may be used to collect hatchery-origin adults, as approved by the HCP Hatchery Committees.

Tributary Spawning Grounds
Interim or stopgap measures to collect locally adapted natural-origin broodstock through angling, tangle netting or other method in select tributaries such as the Chewuch River may be implemented, if approved by the HCP Hatchery Committees to increase the likelihood of meeting Chelan's production obligations. Known or suspected spring Chinook spawning locations will be targeted for tangle netting and/or angling. Snorkeling in several pools will be conducted prior to deploying any nets for spring Chinook capture and active spawners will be avoided. Because there is considerable concern over the potential risk via harassment, removal, or displacement of spawning or near spawning condition adults, use of this methodology will only be considered and approved on an annual basis by the HCP Hatchery Committees, and requires a parallel path to develop a long term viable broodstocking methodology.

5.2) Fish transportation equipment (description of pen, tank truck, or container used).

Fish transportation equipment used will ensure safe, water to water transfer of ESA listed fish. Equipment will be mechanically reliable and will allow for ease of disinfection to occur. Dissolved oxygen levels and temperature will be monitored within the tanks and at trapping and receiving locations. Salt will be used as a stress reduction measure when hauling adults.

5.3) Broodstock holding and spawning facilities.

Broodstock holding may occur at Eastbank Hatchery, Wells or Winthrop facilities, all of which have been used historically and safely for listed spring Chinook. These facilities include the following features:

- They allow for safe containment of adults including appropriate temperature regimes
- They provide measures to try to calm adults (e.g. spray system)
- They provide adequate flow of water under normal operating conditions
- They are alarmed for low flow
- They allow separate holding vessels between stocks.

Spawning facilities are integrated into the broodstock holding facilities. The spawning facilities allow for broodstock to be sorted for “ripeness” and then spawned. The spawning area can be cleaned easily.

5.4) Incubation facilities.

Incubation and early rearing is expected to occur primarily at Eastbank Hatchery. Winthrop NFH was used for early incubation for brood year 2013; the use of Winthrop NFH in future years would be contingent upon approvals from the HCP Hatchery Committees.

The incubation facilities:

- Provide adequate flow of pathogen free water under normal operating conditions
- Allow for manipulation of water temperatures
- Are alarmed for low flow
- Provide for individual female segregation throughout viral sampling

5.4.1) Locations

Eastbank Hatchery

The Eastbank Aquifer, a high quality groundwater source with connectivity to the Columbia River, supplies water to the hatchery. Both the Eastbank Hatchery Complex and the Regional Water System, which provides municipal water to the customers of Chelan PUD, the City of Wenatchee, and the East Wenatchee Water District, use the Eastbank Aquifer. The Eastbank Hatchery water right permit provides for 55 cfs of instantaneous water supply. On an annual basis, temperatures range from approximately 45.5°F to 59.0°F. Spring Chinook are held for broodstock, incubated, and early-reared on this water. Water can be chilled during incubation to meet specific growth targets.

At Eastbank, eggs would be incubated in MariSource vertical incubators. The incubators are configured with eight tray units called "half-stacks." Each tray consists of a "water tray" which conducts the water flow through egg trays that are inserted in the water trays. The egg trays have a mesh lid on them. The water flows into the back of the water tray, flows forward through the eggs or fry, flows back down the sides then exits to the back of the next tray below. Each tray is supplied with 2 gallons per minute (gpm) of chilled water and 1 gpm of well water. The chilled water is 38°F and is mixed with well water to meet an incubation temperature of 42°F to 45°F (adjusted based on developmental needs and desired emergence timing). At spawning, the eggs from a single female are added to a single tray. The capacity of a single tray is about 6,500 eggs.

At Eastbank Hatchery, water withdrawal for hatchery use is regulated by the Washington State Department of Ecology under Chapter 90.03 of the RCW (water code). None of the hatchery facilities employed to carry out the proposed artificial propagation programs de-water river reaches used by listed fish for migration, spawning, or rearing. All hatcheries owned and/ or operated by WDFW discharge water in compliance with NPDES General Permit No. WAG 13, valid through August 1, 2015. This permit is administered in Washington by the Washington State Department of Ecology under agreement with the United States Environmental Protection Agency.

Winthrop NFH

All spring Chinook salmon eggs are incubated on 100 percent groundwater. This water source is free of silt, does not create fungus problems, and provides temperatures in the 39°F (chilled) to 52°F (unchilled) range during incubation. Dissolved oxygen is relatively constant at 9 parts per million (ppm) on the inflow and not less than 8 ppm at the outflow. It is not necessary to use formalin during incubation since *Saprolegnia sp.* fungus has not been a problem. Heath trays are loaded at one female per tray through the entire incubation cycle (3000 to 6000 eggs per tray). Flows through the incubation stacks are 1 to 2 gpm to the eyed stage and 3 to 5 gpm from the eyed to button-up fry stage (see Winthrop NFH HGMP).

5.4.2) BKD Management:

Chelan PUD proposes to implement a BKD management approach that relies on HSRG recommendations as well as historic program data (from 1996 to 2008) consistent with agreements in the HCP-HC (2007). At present, many of the decisions in the program will depend on a lethal, enzyme-linked immunosorbent assay (ELISA) to determine the probability of broodstock transmitting BKD vertically to their progeny. In the future, non-lethal screening techniques may offer new opportunities to manage for BKD. Until that time, however, the incidence of BKD in the Methow Spring Chinook Program will be minimized using three management practices: prevention, treatment and replacement.

Prevention

Disinfection and antibiotics: Female (hatchery- and natural-origin) spring Chinook broodstock will be injected before spawning with an appropriate antibiotic (e.g., azithromycin at 40 milligrams per kilogram [mg/kg] fish) and the resulting eggs will be surface disinfected with iodophor consistent with methods in The Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State.

Screening: Female broodstock will be assayed (ELISA) to determine titer level (e.g., OD).

Culling titer progeny of OD ≥ 0.12: Hatchery-origin eggs/progeny with ELISA titers of OD 0.12 or greater will be culled from the program.

Rearing titer progeny of OD ≥ 0.12 ≤ OD 0.19: Wild-origin eggs/progeny with ELISA titers between OD 0.12 and 0.19 will be raised at a lower density of 0.06.

Culling titer progeny of OD > 0.19: All hatchery- and natural-origin eggs/progeny with ELISA titers of OD greater than 0.19 should be culled from the program.

Screening (future): The HCP Hatchery Committees will evaluate emerging technology to provide non-lethal BKD screening (e.g., near infrared spectroscopy and genetic tests) as these tools become commercially available.

Treatment

Antibiotics: At the first signs of infection with BKD, juvenile spring Chinook will be treated with orally administered antibiotics at a type, dosage, and duration as determined by fish health personnel. The treatments may be repeated if there is evidence that the BKD agent has persisted in the hatchlings and fish health determines additional treatment is warranted. For adults, antibiotics are administered to minimize vertical transmission from parent to progeny no less than two weeks prior to spawning and then every four week thereafter during spawning.

Rearing Density: Chelan PUD will provide adequate facilities to rear up to 20 percent of the conservation program at a lower density (0.06 density index). The low density rearing environment would be designated for wild origin fish with titers of 0.12 ≤ OD ≤ 0.19[1]. When less than 5 percent of the program production is in the 0.12 ≤ OD ≤ 0.19 titer range, the HCP Hatchery Committee may elect not to rear these fish to program size and instead utilize the available hatchery space for other purposes.

Replacement

Broodstock Collection: Up to 20 percent extra hatchery-origin spring Chinook females may be collected to meet any production shortfalls related to culling hatchery fish with titers of OD greater than 0.12 and wild fish with titers of OD greater than 0.19. This number of extra hatchery origin fish is also expected to assist with any efforts to reduce pHOS.

[1] These values may change depending on lab technologies and methodologies employed.

5.5) Rearing facilities.

Fish would be transported from Eastbank Hatchery to the Carlton Acclimation Facility (or other locations within the Methow Sub-basin as determined by the HCP Hatchery Committees) in October to allow overwinter rearing to occur in the Methow Sub-basin.

5.5.1) Program Targets

- Target size at transfer to overwinter rearing site: approximately 26 to 30 fish per pound.
- Target transfer date to overwinter rearing site: October to November depending on annual temperature variation and observed temperature differentials between transfer and receiving facilities and pathogen load of receiving water.

5.5.2) Location

Chelan PUD's Carlton facility site is located approximately 2.5 miles south of Twisp, Washington, off the east side of the Twisp-Carlton Road (Methow River; river mile 35 [river kilometer 56]). In 2012, Chelan PUD leased to Grant PUD the portion of unused property directly adjacent to an existing single 84,000 cubic foot pond for the purpose of constructing an overwinter acclimation facility at the Carlton site. Construction of Grant PUD's overwinter acclimation is expected to be completed in 2014. The facility will be comprised of 8, 30-foot diameter circular fiberglass tanks with single pass flow-through.

Currently, surface water supply to the facility is from the Methow River through a screened surface water pumped intake located on the right bank of the Methow River. This system is expected to supply 14.9 cfs to the facility between October and May. The existing screen system consists of a pair of 30-inch diameter tee screens with a high pressure air backwash cleaning system. The screens have a total screened area of 163 square feet, which would allow a maximum intake flow rate of 32.6 cfs at the typical screen approach velocity of 0.4 feet/second.

At Carlton, water withdrawal for hatchery use is regulated by the Washington State Department of Ecology under Chapter 90.03 of the RCW (water code). None of the hatchery facilities employed to carry out the proposed artificial propagation programs de-water river reaches used by listed fish for migration, spawning, or rearing. All hatcheries owned and/ or operated by WDFW discharge water in compliance with NPDES General Permit No. WAG 13, valid through August 1, 2015. This permit is administered in Washington by the Washington State Department of Ecology under agreement with the United States Environmental Protection Agency.

To minimize the likelihood for the take of listed natural fish, Chelan PUD will ensure that water intakes into artificial propagation facilities are properly screened in compliance with 1995 NMFS screening criteria and as per the 1996 addendum to those criteria (NMFS 1996). Water intake screen structures will be inspected and monitored at hatchery facilities to determine if listed salmon and steelhead are being drawn into the facility.

5.6) Acclimation/release facilities.

5.6.1) Program Targets

- Target transfer date to acclimation site: February-March, as determined by WDFW and YN hatchery operators, depending on annual temperature differences between Carlton Acclimation Facility and the final release facility
- Target release size: 15 to 18 fish per pound
- Target release dates: April to May 1
- Release method: volitional

5.6.2) Locations

Final acclimation of Chelan PUD's spring Chinook program may occur within the Yakama Nation Expanded Acclimation sites or other sites approved by the HCP Hatchery Committees. Any one or a combination of (depending on size of the facility), the acclimation facilities described below may be used as a final acclimation site. To encourage hatchery origin spawners to migrate further upstream, YN proposes to acclimate (spring only) 15,000 Chinook pre-smolts at YN's Goat Wall acclimation site and 46,000 at Mid-Valley Pond. The sum of 61,000 would represent Chelan PUD's spring Chinook obligation in the Methow River starting in 2015.

Goat Wall (Yakama Nation): The Goat Wall acclimation site is a disconnected side channel system on the upper Methow River, located near of the mouth of the Lost River (Methow River; river mile 70 [river kilometer 112]). There is a pond at the downstream end of a disconnected side channel. The pond is fed by both surface water and groundwater. Surface water is provided by a diversion on the adjacent Gate Creek, and groundwater is supplied by Cold Creek (a groundwater seep). The estimated capacity is 34,000 spring Chinook.

Mid-Valley (Yakama Nation): A series of large springs originate in the Methow valley floor; ponds have previously been constructed in the past to impound the spring water for irrigation purposes. Habitat restoration efforts are currently underway to provide fish passage into and past the ponds. The pond proposed for acclimation is the most downstream in the spring's complex. The site is located on the Methow River (river mile 54, [river kilometer 87]) and is downstream of the section of the Methow River that annually dewaters. The pond measures approximately 450 feet x 70 feet. A temporary seine system would allow passage by other fish species in the spring system. The adjacent upstream property is WDFW's Big Valley Unit of the Methow Wildlife Area and is managed for riparian habitat protection and wildlife conservation. The site has capacity for up to 122,650 spring Chinook.

Chewuch Acclimation Pond (Yakama Nation and Douglas County PUD): The Chewuch Acclimation Pond is owned by Douglas County PUD and has been operated by the WDFW since 1994 to acclimate spring Chinook (under existing permit 1196). The existing facility is comprised of a Hypalon-lined pond with 24,000 cubic feet of volume (150 feet long by 40 feet wide and 4 feet deep) and receives 2,700 gallons per minute of surface water flow from the Chewuch River.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.

In January 2007, nearly 8 percent of the juveniles from the 2006 brood hatchery by wild (HxW) steelhead component died of asphyxiation at Eastbank Hatchery because of a rare and severe wind storm that knocked out power to the facility (including pumps) for several hours.

In May 1997, 100 percent of the coho reared in the Chewuch acclimation pond died when the intake screens were plugged by detritus. The incident occurred prior to installation of the auto dialer alarm system.

5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

For broodstock collection activities:

- All species will be held for a minimal duration in the traps and holding areas (less than 24 hours).
- Traps and holding areas will be locked or secured against tampering or vandalism.
- All natural-origin spring Chinook in excess of broodstock goals will be released upstream immediately without harm.
- All non-target taxa of concern (NTTOC) will be released upstream immediately without harm.
- Spring Chinook will be transferred using water-to-water techniques.
- Broodstock collection protocols will be developed in coordination with the HCP Hatchery Committees annually.

Broodstock collection specific to the Rocky Reach Trap:

- Utilization of a separation-by-code system to target trapping efforts;
- To improve efficacy of the trap, installation of underwater lighting and an underwater camera that can capture the view of the trap entrance will occur to enable better viewing of the fish as they move into the trap; installation of an electrical control pendant for the technician located above the trapping area to allow additional control of the trap door; and modification of the control pendants for opening and closing the door which will allow pushing the button once to open and close the trap door versus holding the button to open and close the trap door.

Broodstock collection specific to tangle netting and/or hook and line:

- Primary wild spring Chinook spawning areas will be identified using historical NOR spawning data. Only those areas (pools) of the river immediately above and below the spawning areas will be targeted for netting rather than a randomized approach.

- Personnel that have experience capturing Chinook salmon using tangle nets will conduct the tangle netting.
- Targeted pools will be snorkeled to determine what, if any level of bull trout presence exists; if bull trout are not observed or if they are located in an area that can be avoided by the netting while targeting Chinook then the crews will proceed.
- If a bull trout is incidentally caught in the net, it will be immediately removed and released, preferably in an area that it isn't likely to be re-encountered.
- If more bull trout are encountered than is reasonable and prudent, all netting activities will cease.
- Fish transportation equipment will ensure safe transportation of collected broodstock including equipment that is mechanically reliable and that can be disinfected, equipment to monitor dissolved oxygen levels, and salt will be available and used as a stress reduction measure if needed.

For adult holding and rearing activities:
Operational failures due to power/water loss, flooding, freezing, vandalism, predation, and disease may result in catastrophic losses to holding and rearing adults and juveniles. Flow reductions, flooding, and poor fish culture practices may all cause hatchery facility failure or the catastrophic loss of ESA-listed fish under propagation. To protect endangered spring Chinook, all efforts will be made to ensure that the survival of adult spring Chinook held for broodstock collection at the hatchery facility is maximized. Rapid response in the event of power or water loss or freezing is provided by a combination of staffing, automatic alarm paging systems, and redundant power supplies to the facilities. In addition, Chelan PUD has developed an emergency/incident response protocol in the event that activities occur that could result in take. This protocol defines the notification pathway that should occur and ensures that, 24 hours per day, 7 days per week, Chelan PUD hatchery facilities are monitored and supported to minimize take.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Responsibilities: Chelan PUD is responsible for providing the funding for the activities described in this section. WDFW is currently under contract to conduct the activities described in this section. Consistent with these responsibilities, Chelan PUD and WDFW will be co-permit holders for the activities described in this section with WDFW designated as an agent under a current contract between Chelan PUD and WDFW and until this contract expires and is not renewed or renegotiated.

6.1) Source.

The broodstock selected represents natural populations native or adapted to the watersheds in which hatchery fish will be released. Broodstock will be of wild x wild (WxW) parentage or hatchery x wild (HxW) parentage. Hatchery x hatchery (HxH) crosses may be used only in years of very low abundance to meet the production obligation. Wild-origin broodstock collection will not exceed 33 percent of the wild run. Hatchery-origin broodstock will be used to augment wild-origin broodstock to the extent necessary to meet the program production target in the event wild-origin broodstock are not available. The pNOB will be maximized to the extent possible to meet a PNI goal of greater than 0.67 annually.

6.2) Supporting information.

6.2.1 History.

Natural-origin spring Chinook broodstock collections began in 1996 as shown in Table 6-1. Native (natural) Methow spring Chinook were ESA-listed in 1999.

Table 6-1. Collection sites and history for Methow Sub-basin spring Chinook broodstock.

Broodstock Source	Origin	Year(s) Used	
		Begin	End
UCR spring Chinook composite (collected at Wells Dam) (protocol varies annually as to H:W proportion taken)	Natural/Hatchery	1996	Ongoing
Methow River spring Chinook composite (Methow, Twisp, and Chewuch hatchery stocks collected at Winthrop NFH Hatchery or Methow Hatchery outfall	Hatchery	1998	Ongoing

6.2.2) Annual size.

Under the current program, up to 38 fish will be collected for broodstock. Historic broodstock collection is summarized in Table 6-2. The sex ratio of broodstock is expected to be close to 1:1.

Table 6-2. Numbers of wild and hatchery spring Chinook collected for Methow Sub-basin program broodstock, numbers that died before spawning, and numbers of spring Chinook spawned, 1994 to 2008. Unknown origin fish (i.e., undetermined by scale analysis; no elastomer, CWT, or fin clips; and no external evidence of hatchery residence) were considered naturally produced (in part from Snow et al. 2008).

Brood year	Wild spring Chinook					Hatchery spring Chinook					Total number spawned
	Number collected[1]	Pre-spawn loss	Mortality[2]	Number spawned	Number Not Used	Number collected [1]	Pre-spawn loss	Mortality[2]	Number spawned	Number Not Used	
1994	16	0	0	16	0	2	0	0	2	0	18
1995	0	0	0	0	0	11	0	0	11	0	11
1996	117	0	0	117	0	95	4	0	86	5	203
1997	12	0	0	12	0	272	0	0	270	2	282
1998	94	0	0	94	0	88	2	0	79	7	173
1999	49	0	0	49	0	141	14	0	115	12	164
2000	6	0	0	6	0	339	23	0	306	10	312
2001	52	2	0	49	1	357	10	0	228	119	277
2002	0	0	0	0	0	438	21	0	367	50	367
2003	42	1	0	41	0	218	9	0	166	43	207
2004	50	5	0	45	0	304	4	0	299	1	344
2005	9	0	0	9	0	281	2	0	265	14	274
2006	9	1	0	8	0	342	13	0	320	9	328
2007	23	0	0	23	0	204	2	0	169	33	192
2008	56	2	0	52	2	327	4	0	308	15	360
Avg.	36	1	0	35	0.2	228	7	0	199	21	234

Notes:
1 – The sum of broodstock collected at all sites.
2 – Mortality includes fish that died of natural causes typically near the end of spawning and were not needed for the program or were immature fish killed at spawning.

6.2.3) Past and proposed level of natural fish in broodstock.

Based on CWT and scale analysis on brood years 1994 through 2005, 15.9 percent of the 1,581 spring Chinook trapped for the Methow Sub-basin program were natural-origin and 84.1 percent were hatchery-origin (Snow et al. 2008). Annual broodstock contribution from natural-origin fish ranged from 0 to 58 percent during this period. See Section 1.8.2 for proposed broodstock composition. See Table 6-2 for the historical natural and hatchery composition of past overall combined broodstock collections. For the proposed program, the proportion of natural-origin fish will be maximized in an effort to attain 100 percent natural origin broodstock. This requires that the collection of NORs for broodstock does not exceed 33 percent of the NORs to the Methow Sub-basin.

6.2.4) Genetic or ecological differences.

Small et al. (2007) provided a recent review of the genetic characteristics of Methow Sub-basin spring Chinook. Fish samples from 1992 through 2006 were obtained from the Winthrop NFH and both natural and hatchery-origin fish from the Methow, Twisp, and Chewuch rivers. Twisp hatchery and natural-origin collections formed a discrete group distinct from a Methow-Chewuch-Winthrop NFH group. Methow River fish were very similar to the Winthrop NFH collections and differentiated from Chewuch River fish collected in 1992 to 1993. The Methow and Chewuch Rivers fish became more similar after developing the broodstock that combines the Methow and Chewuch River fish. Assignment tests indicated that if natural-origin fish were collected at Wells Dam for broodstock and assigned with a moderate probability threshold (10 times more likely to have come from one collection as from another), there is low risk of incorrectly identifying a Methow-Chewuch fish as a Twisp fish, and even lower risk of incorrectly identifying a Twisp fish as a Methow-Chewuch fish.

In addition to genetic similarity, the broodstocks chosen display morphological and life history traits similar to the natural populations.

The annual adult broodstock collection protocol is keyed on target numbers at various collection sites, currently operated by WDFW, that provide broodstock for Mid-Columbia PUD mitigation program facilities. This adult broodstock collection protocol is an interim and dynamic hatchery broodstock collection plan, which may be altered following HCP Hatchery Committee discussions. As such, there may be significant in-season changes in broodstock numbers, locations, or collection times, brought about through continuing JFP consultation and in-season monitoring of the anadromous fish runs to the Columbia River above Priest Rapids Dam.

6.2.5) Reasons for choosing.

The goal of the program is to rebuild and recover listed UCR spring Chinook in the Methow Sub-basin. Multiple sub-basins have contributed to the UCR spring Chinook genetic makeup. The sources for collection provide broodstock from distinguishable stocks for rebuilding and recovery of the listed UCR spring Chinook in the Methow.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

The broodstock protocols were designed to mitigate for potential genetic effects from hatchery domestication and to avoid introgression with fish from other spawning aggregates.

SECTION 7. BROODSTOCK COLLECTION AND ADULT MANAGEMENT

Responsibilities: Chelan PUD is responsible for providing the funding for the activities described in this section. WDFW is currently contracted to conduct the activities described in this section. Consistent with these responsibilities, Chelan PUD and WDFW will be co-permit holders for the activities described in this section with WDFW designated as an agent under a current contract between Chelan PUD and WDFW and until this contract expires and is not renewed or renegotiated.

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

Only adults will be collected for broodstock.

7.2) Broodstock and adult management collection activities.

7.2.1) Broodstocking activities

WDFW, in coordination with the HCP Hatchery Committee, will annually develop site-based broodstock-collection protocols for NMFS approval. These objectives and protocols may be adjusted in-season to meet changes in the abundance, composition, and location of adult returns, and to minimize impacts on non-target fish. The protocol described below will be used to facilitate the collection of hatchery spring Chinook broodstock throughout the run while achieving the target extraction rate and ensuring full broodstock collection.

Based on forecasted run size, the HCP Hatchery Committees will identify target PNI levels and associated pHOS, pNOB values (also see Section 1.9 of this document), and overall broodstock targets for all of the Methow programs. Based on the target PNI levels and broodstock numbers, WDFW will develop weekly broodstock-collection goals. WDFW and the HCP Hatchery Committee will use in-season data (e.g., dam counts, PIT-tag detections) to verify pre-season estimates of run size and composition to ensure that the selected PNI, pHOS, and broodstock goals are appropriate, and will modify those goals in-season as necessary. Weekly collection goals will target the collection of broodstock distributed throughout the run.

Broodstock will be of WxW or HxW parentage. HxH crosses may be used only in years of very low abundance. Wild-origin broodstock collection will not exceed 33 percent of the wild run. Hatchery-origin broodstock will be used to augment wild-origin broodstock to the extent necessary to meet the program production target. The pNOB will be maximized to the extent possible to meet a PNI goal of greater than 0.67 annually. Adults will be trapped at existing Rocky Reach and Wells traps, as described below.

As described in Section 5.1, broodstock may be collected at any of the following locations in a given year: Wells Dam, Rocky Reach Dam Trap, Winthrop National Fish Hatchery/Methow Hatchery outfalls (in the event sufficient NORs are not available for the program, HORs from the conservation programs could be used for broodstock if collected at Winthrop NFH or Methow Hatchery outfalls), or on tributary spawning grounds as approved by the HCP-HC.

7.2.1 Adult management activities

Broodstock collection: Excess hatchery origin adults from the Methow conservation program may be used as broodstock for the Winthrop NFH spring Chinook program and the CJH spring Chinook program when managing for pHOS. The number of broodstock available for other facilities will decrease commensurately with increasing escapement of hatchery returns to the natural spawning grounds in order to meet spawning escapement goals.

PIT tag and external marks: Chelan will CWT 100 percent of the released smolts. Additionally, up to 25 percent of released smolts from Chelan PUD's program will be PIT tagged to ensure that up to 25 percent of returning adults can be readily identified and potentially removed using non-lethal sorting techniques at any traps located throughout the sub-basin. Chelan PUD will also fund external marking required for conservation and harvest management as agreements allow. Chelan PUD will fund marking as necessary to support the adaptive management and ESA compliance of the program. The JFP will determine the appropriate mark, marking levels and obtain approval from other managers as needed.

Rocky Reach Trap: Based on previous efforts with bull trout and steelhead, the Rocky Reach Trap can effectively remove externally marked fish, one fish at a time, without delaying unmarked fish of those species or causing take of non-target fish. Based on the average distribution of the most recent 10 years of data (DART: http://www.cbr.washington.edu/dart/), the first 5 percent of the spring Chinook run passes Rocky Reach by April 18, and the 95 percent passage date is June 17. Therefore, 90 percent of the run passes during an approximately 60-day period. Under an extremely conservative trapping scenario (40 days of operation and no more than four fish removed per day), up to 160 excess hatchery-origin spring Chinook could be removed annually at Rocky Reach Trap. With the installation of separation-by-code technology, it is expected that additional fish, not externally marked, could also be removed, if desired by managers.

Wells Trap: Hatchery origin returns may be managed at the ladder traps at Wells Dam in years when pHOS requires adjustment and minimum spawning escapement goals have been achieved (Douglas PUD 2010).

Full-time Employee funding to WDFW: In order to ensure that WDFW has the capacity to manage excess hatchery origin spring Chinook from Chelan's program, Chelan PUD will provide funding to WDFW sufficient to support up to a full-time equivalent staff person.

Fishery: Implementation of fisheries may contribute to reducing the number of hatchery-origin adults; however, under present marking strategies in for spring Chinook in the Methow Sub-basin, a fishery would be directed at Winthrop NFH returning adults and not necessarily at fish originating from this program. Therefore, a fishery may help overall adult management in the sub-basin, but may not have a substantial effect on adult management of Chelan PUD's spring Chinook production in the Methow River unless alternative marking strategies were employed.

7.3) Identity.

Through a combination of marking, infrastructure, and FTE funding, Chelan PUD will ensure that WDFW has the tools necessary to successfully remove at least 165 hatchery-origin fish annually (i.e., 100 percent of the expected average number of fish produced by Chelan PUD's program), if necessary. These removals may include Chelan PUD origin fish or other hatchery production groups originating from the Methow Sub-basin depending on prioritization by managers. The funding by Chelan PUD will ensure that WDFW has capacity to remove fish at any facility (not restricted to Chelan PUD owned facilities). WDFW will remove excess hatchery origin fish, as authorized under applicable laws and regulatory frameworks. Attainment of annual pHOS goals will be monitored by the M&E program (Hillman 2013).

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):

- Approximate number of adults collected: not to exceed 38 NORs or up to 45 HORs. The program is focused on using NORs in the brood to maximize pNOB. However, 20 percent more HORs[1] may be collected to make up for production shortfalls resulting from BKD management. The number of brood required to produce 60,516 smolts (i.e., 38) is derived from Douglas PUD (2010) where 142 broodstock were required to produce 225,000 smolts. Chelan PUD's proposed program is 26.9 percent of Douglas PUD's program (i.e., 60,516/225,000), and 26.9 percent of 142 is 38. These values are based on a current, mean age-4 fecundity of 3,714, an egg-to-smolt survival of 90 percent and pre-spawn survival of 95 percent (Douglas PUD 2010).
- Sex Ratio 1:1

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

Table 7-1, below, provides information for broodstock collection for recent years.

Table 7-1. Natural and hatchery-origin broodstock collected at Methow Sub-basin traps, brood years 1992 to 2008.

Brood Year	Chewuch River		Methow River		Twisp River	
	Naturals	Hatchery	Naturals	Hatchery	Naturals	Hatchery
1992	25	5	0	0	20	0
1993	91	9	26	55	30	1
1994	11	1	0	1	5	0
1995	0	0	0	11	0	0
1996	21	45	74	25	22	25

[1] These values may change depending on lab technologies and methodologies employed.

Brood Year	Chewuch River		Methow River		Twisp River	
	Naturals	Hatchery	Naturals	Hatchery	Naturals	Hatchery
1997	1	66	11	191	0	15
1998	0	0	93	77	1	11
1999	0	0	33	117	16	24
2000	0	0	0	276	6	63
2001	18	73	0	250	34	34
2002	0	126	0	297	0	15
2003	2	60	0	126	40	32
2004	1	134	0	145	49	25
2005	2	134	0	130	7	17
2006	1	125	8	189	0	28
2007	0	0	19	168	4	36
2008	0	0	44	296	12	31

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.

Excess hatchery origin adults from the Methow program may be used as broodstock for the Winthrop NFH spring Chinook program, the CJH spring Chinook program when managing for pHOS, and or the Douglas and Grant County PUD hatchery programs. The number of broodstock available for other facilities will decrease commensurate with increasing escapement of hatchery returns to the natural spawning grounds in order to meet spawning escapement goals.

Additional hatchery fish removed as part of adult management may be used for ceremonial/subsistence use by the Tribes, food banks, distribution to minor spawning areas, nutrient enhancement projects or other acceptable use as determined by the Joint Fisheries Parties.

7.6) Fish transportation and holding methods.

Fish will be removed from traps daily or more often as needed to minimize capture and handling effects on listed fish and placed in truck-mounted transport tanks using fish socks or other water-to-water handling methods. The tanks will be supplied with river water from the trapping site, and fish will be transported to adult broodstock ponds at the appropriate facility.

7.7) Describe fish health maintenance and sanitation procedures applied.

Fish health maintenance, management, and sanitation procedures/criteria for all life stages will be consistent with the IHOT, Pacific Northwest Fish Health Protection Committee (PNFHPC), Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State dated July 2006, and WDFW's Fish Health Manual dated November 1996.

7.8) Disposition of carcasses.

IHOT, PNFHPC, state, or tribal guidelines are followed for broodstock fish health inspection, transfer of eggs or adults, and broodstock holding and disposal of carcasses. Carcasses of ESA-listed fish spawned in captivity may be outplanted in the Methow River watershed for nutrient enrichment if disease protocols as determined by the JFP fish health specialists are met, donated for educational purposes, incinerated, buried on-station after completion of spawning, or disposed of at waste disposal facilities.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

Specifically, the following measures will be employed to minimize the likelihood of adverse effects to listed natural fish (NMFS 2003):

- ESA-listed fish must be handled with extreme care and kept in water to the maximum extent possible during sampling and processing procedures. Adequate circulation and replenishment of water in holding units is required. When using methods that capture a mix of species, ESA-listed fish must be processed first. The transfer of ESA-listed fish must be conducted using equipment that holds water during transfer.
- Visual observation protocols must be used instead of intrusive sampling methods whenever possible. This is especially appropriate when merely ascertaining the presence of anadromous fish.
- In trapping operations directed at the collection of broodstock, measures that minimize the risk of harm to listed salmon and steelhead shall be applied. These measures include, but are not limited to, limitations on the duration (hourly, daily, or weekly) of trapping in mainstem river areas to minimize capture and handling effects on listed fish; limits on trap holding duration of listed fish prior to release; application of procedures to allow safe holding, careful handling, and release of listed fish; and allowance for free passage of migrating listed fish through trapping sites in mainstem and tributary river locations when those sites are not being actively operated.
- ESA-listed juvenile fish will not be handled if the water temperature exceeds 21°C at the capture site. Under these conditions, ESA-listed fish will only be identified and counted.
- If water temperature at adult trapping sites exceeds 21°C, the trap operation shall cease pending further consultation with NMFS to determine if continued trap operation poses substantial risk to ESA-listed species.
- Target species that require handling other than visual observation will be anesthetized.
- Annual broodstock collection and spawning protocols shall be developed for the UCR ESA-listed Methow spring Chinook artificial propagation programs. Protocols will be coordinated with the JFP and HCP Hatchery Committees and must be submitted to NMFS Salmon Recovery Division by April 15 of the collection year.
- Monitor the incidence of, and minimize capture, holding, and handling effects on, listed salmon and steelhead encountered during trapping. Incidentally captured listed UCR spring

Chinook salmon adults that are not intended for use as broodstock in concurrently operated and previously authorized listed stock recovery programs shall be carefully handled and immediately released upstream.

- Ensure that the hands of fish handlers are free of sunscreen, lotion, or insect repellent.
- Non-target species will be bypassed, minimally handled, or will be fully recovered (if anesthetized) and immediately released upstream of the trapping site.

SECTION 8. MATING

Responsibilities: Chelan PUD is responsible for providing the funding for the activities described in this section. WDFW is currently contracted to conduct the activities described in Section 8. Consistent with these responsibilities, Chelan PUD and WDFW will be co-permit holders for the activities described in this section with WDFW designated as an agent under a current contract between Chelan PUD and WDFW until this contract expires and is not renewed or renegotiated.

8.1) Selection method.

In situ stock separation of ESA-listed spring Chinook, Carson origin, and out-of-basin stray fish is accomplished through scale sample, genetic analysis, and CWT analysis; only natural-origin and appropriate hatchery origin adults will be spawned. Though not preferred, some HxH crosses may be necessary for the Methow/Chewuch component in some years with very low escapement.

8.2) Males.

Spawning ratio protocols reflect the need to maintain genetic diversity of the Chinook populations. A 1:1 spawning ratio or a factorial mating strategy may be utilized. Wild males may be utilized twice as a primary spawner if required to maximize WxW crosses. Males will not be selected by size and smaller males will be represented in the mating protocol proportional to their presence in the broodstock collected at random from the trapping sites.

8.3) Fertilization.

Prior to fertilization, ovarian fluid from all females will be sampled for regulated and reportable viral pathogens. Kidney and spleen samples from all males and female spawners will be examined for regulated viral pathogens and other pathogens as necessary. As changes in techniques and technology occur, this methodology may be updated if approved by the HCP Hatchery Committees.

Spawning ratio protocols reflect the need to maintain genetic diversity of the Methow spring Chinook populations. A factorial mating strategy to increase (maximize) effective population size will be implemented when possible. In some cases, not enough females, males, or fish of the necessary stock/origin will be available on an individual spawn day, and a standard one-male-to-one-female strategy will be employed. Annual spawning protocols will detail the specifics of the spawning ratios.

After fertilization, eggs will be water hardened in iodophor in pathogen-free well water, according to standard fish health protocols. Individual egg lots will be incubated in isolation until pathogen testing has confirmed them free of pathogens. Any egg lots with regulated viral pathogens will be destroyed in accordance with fish health protocols.

8.4) Cryopreserved gametes.

None.

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

- A 1:1 equivalent mating ratio will be employed.
- Inclusion of natural origin jack Chinook in the run-at-large broodstock collections helps to alleviate occasional low adult male occurrence. The hatchery broodstock will remain genetically similar to, and representative of, the upriver spring Chinook populations. However, when appropriate to do so, hatchery origin age-3 males will be excluded from the broodstock to minimize the risk associated with producing progeny from younger age at maturity fish.
- Fish health procedures used for disease prevention will include biological sampling of spawners. Generally, kidney/spleen samples will be collected from all female spawners to test for the presence of viral pathogens. The ELISA will be conducted on kidney samples from all females. This assay detects the antigen for *Renibacterium salmoninarium*, the causative agent of BKD.
- Factorial mating to increase effective population size.
- Maximize pNOB to decrease the potential effects of domestication selection.

SECTION 9. INCUBATION AND REARING -

Responsibilities: Chelan PUD is responsible for providing the funding for the activities described in Section 9. WDFW is currently contracted to conduct the activities described in Section 9. Consistent with these responsibilities, Chelan PUD and WDFW will be co-permit holders for the activities described in this section with WDFW designated as an agent under a current contract between Chelan PUD and WDFW until this contract expires and is not renewed or renegotiated.

9.1) Incubation:

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

Egg-take goals will vary annually dependent upon the necessary level of over-collection for BKD management. Currently, the over-collection rate is determined annually based on the average of high-titer (ELISA OD ≥ 0.12) females from the previous five brood years; for 2009, the over-collection rate was 12 percent for hatchery origin fish.

Table 9-1. Hatchery life stage survival rate standards and level achieved (%) by stock and brood year for Met-Comp spring Chinook, brood years 1999 to 2008. Standards are in parentheses.

Brood Year	Unfertilized egg to eyed (92.0)	Eyed egg to ponding (98.0)	30 d after ponding (97.0)	100 d after ponding (93.0)	Ponding to release (90.0)	Transport to release (95.0)	Unfertilized egg to release (81.0)
1999	95.4	100.0	99.5	99.5	99.2	---	94.6
2000	96.5	100.0	99.6	99.4	99.0	99.9	92.7
2001	93.2	100.0	99.3	99.1	97.0	99.8	90.8
2002	96.0	100.0	98.6	98.6	96.5	98.5	92.7
2003	90.0	100.0	98.8	98.3	93.0	99.8	77.9
2004	94.8	96.2	99.2	99.2	96.6	99.8	84.6
2005	96.9	96.9	99.6	99.5	90.4	99.6	87.7
2006	93.9	95.0	89.4	89.4	76.5	96.2	68.2
2007	92.9	94.8	99.6	99.3	95.7	99.1	84.2

9.1.2) Cause for, and disposition of surplus egg takes.

To meet production goals and counter the effect of culling related to BKD management, WDFW may collect up to 20 percent extra hatchery-origin spring Chinook females (replacing hatchery fish with titers of OD greater than 0.12 and wild fish with titers of OD greater than0.19). In general, permit conditions specify a maximum number of broodstock that can be collected as determined by expected pre-spawning survival of broodstock, fecundity, and survival-to-release of progeny. To facilitate achievement of the production target of 60,516 smolts while anticipating the need to cull progeny of high-ELISA (BKD) females, current annual protocols for broodstock collection include collection of up to 12 percent additional broodstock above that necessary for the production target. Given the deliberate over-collection for BKD management, culling of hatchery-origin eggs may occur as required to manage BKD and/or maintain production at no more than 60,516 yearling smolts. Under any circumstances, culling will be selective for hatchery-origin egg lots with the highest ELISA OD values. Culling of eggs from natural-origin females will not occur unless their ELISA levels are determined by WDFW Fish Health to be a substantial risk to the program.

9.1.3) Loading densities applied during incubation.

IHOT species-specific incubation recommendations will be followed for water quality, flows, temperature, substrate, and incubator capacities. Fertilized eggs from each female will be incubated in individual iso-buckets to the eyed-egg stage to segregate for ELISA values and then transferred to Heath stack incubators, with the progeny of one female per Heath tray (approximately 4,000 eggs per tray). Incubation conditions will be based on loading densities recommended by Piper et al. (1982).

9.1.4) Incubation conditions.

Eggs may be incubated full-term (green egg to emergence) at either Eastbank Hatchery or Winthrop. At Eastbank Hatchery, eggs will be incubated in MariSource vertical incubators. The incubators are configured with eight-tray units called "half-stacks." Each tray consists of a "water tray," which conducts the water flow through egg trays that are inserted in the water trays. The egg trays have a mesh lid on them. The water flows into the back of the water tray; then flows forward through the eggs or fry; then flows back down the sides; then exits to the back of the next tray below. Each tray is supplied with 2 gpm of chilled water and 1 gpm of well water. The chilled water is 3ºC and is mixed with well water to meet an incubation temperature of 5 to 7º C (adjusted based on developmental needs and desired emergence timing). At spawning, the eggs from a single female will be added to a single tray. The capacity of a single tray is about 6,500 eggs.

9.1.5) Ponding.

Unfed spring Chinook fry are transferred from Heath trays for ponding at swim-up. Ponding generally occurs after the accumulation of 1,650 to 1,750 temperature units. Unfed fry are transferred to rearing ponds from early May through early June.

9.1.6) Fish health maintenance and monitoring.

Eggs will be examined daily by hatchery personnel. Prophylactic treatment of eggs for the control of fungus is prescribed by fish-health specialists, and may include treatment with formalin or other accepted fungicides. Non-viable eggs and sac-fry will be removed by bulb-syringe. Adherence to WDFW, PNFHPC, and IHOT (1995) fish disease-control policies reduces the incidence of diseases in fish produced and released from hatcheries. All lots will be monitored for BKD; no eggs will be retained from hatchery-origin females with ELISA OD values 0.12 or greater. Culling of eggs from natural-origin females will not occur unless their ELISA levels are determined by WDFW Fish Health to be a substantial risk to the program (generally >0.19). Juveniles from natural-origin females with ELISA levels of 0.12 or greater will be differentially tagged for evaluation purposes. If the program is under the target 60,516 goal, some low-ELISA fish may be reared at lower densities.

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

All eggs brought to the facility will be surface-disinfected with iodophor (as per disease policy). Eggs will be incubated in pathogen free, silt-free well water to ensure maximum egg survival and minimize potential loss from disease. All equipment (nets tank and rain gear) will be disinfected with iodophor between different fish/egg lots. Different fish/egg lots will be physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water. Tank trucks will be disinfected between the hauling of different fish lots. Foot baths containing iodophor will be strategically located on the hatchery grounds (i.e., entrance to "clean" or isolated areas of the incubation room) to prevent spread of pathogens. Formalin drips will be applied to prevent fungal spread from dead eggs. Flow, dissolved oxygen, and temperature units will be monitored per IHOT or program guidelines.

In order to minimize the likelihood for adverse genetic and ecological effects as a result of fish mortality, redundant power supplies will be provided to the hatcheries for supplying power to the pumps as well as an alarm to alert hatchery personnel of electrical failure or water flow/elevation changes.

See Section 5.4.2 regarding measures to be applied regarding BKD.

9.2) Rearing:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available.

See Table 9-1 in Section 9.1.1.

9.2.2) Density and loading criteria (goals and actual levels).

Table 9-2, below, represents current density and loading criteria. The HCP Hatchery Committee may adjust criteria as deemed necessary.

Table 9-2. Density and fish loading criteria for spring Chinook

Rearing Criteria	Spring Chinook	
Rearing Criteria	ELISA ≤0.119[1]	ELISA ≥0.12
Density index (lbs/cf-in)	0.12	0.06
Flow index (lbs/gpm-in)	0.75	0.60
Acclimation Criteria	Spring Chinook	
Density index (lbs/cf-in)	0.10	0.06
Flow index (lbs/gpm-in)	1.00	0.60

Note:

1 – The 0.119 threshold was developed jointly by the USFWS and WDFW. Natural origin fish with an ELISA >0.19 will be culled.

9.2.3) Fish rearing conditions

Temperature, dissolved oxygen, and pond turnover rate will be monitored. IHOT standards for water quality, alarm systems, predator control measures (netting) to provide the necessary security for the cultured stock, loading, and density will be followed. Settleable solids, unused feed, and feces will be removed regularly to ensure proper cleanliness of rearing containers. All ponds will be vacuumed weekly for the yearlings. Ponds will be pressure washed between broods. Temperature and dissolved oxygen will be monitored and recorded daily during fish rearing.

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

These data have not been collected monthly at the Methow Hatchery, where this program was historically implemented.

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.

These data have not been collected monthly at the Methow Hatchery, where this program was historically implemented.

9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Table 9-3. Food type information.

Rearing Period	Food Type	Application Schedule (#feedings/day)	Feeding Rate Range (%B.W./day)	Lbs. Fed Per gpm of Inflow	Food Conversion During Period
December-January	BioDiet Starter	3-4	1.0-3.0	0.025	0.8
February-March	BioDiet Starter	2-3	1.0-2.0	0.02	1.0
April-May	BioVita	2	1.0-2.0	0.02	1.0
June-September	BioVita	1-2	1.0-1.5	0.02	1.0
October-April	BioVita	1	1.0	0.02	1.0

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.

Standard fish-health monitoring will be conducted by a fish-health specialist at frequencies appropriate to the life stage and susceptibility to disease. Significant fish mortality attributable to unknown causes will be sampled appropriately for study (i.e., viral assay, bacterial culture, and histopathology). Fish health maintenance strategies are described in IHOT (1995). Incidence of viral pathogens in spring Chinook broodstock will be determined by sampling fish at spawning in accordance with the Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State. Populations of particular concern may be sampled at the 100 percent level and may require segregation of eggs/progeny in early incubation or rearing.

Typical disease treatments include:

- Formalin – prophylactic fungal treatment and post-handling
- Aquamycin – fed for BKD treatment and prophylaxis
- Tulathromycin – fed and injected to manage BKD
- Chloramine T – bath to treat external bacteria

Fish will be monitored daily by staff during rearing for signs of disease, through observations of feeding behavior and monitoring of daily mortality trends. A fish health specialist will monitor fish health often as determined necessary. More frequent care will be provided as needed if disease is noted. Hatchery specialists under the direction of the fish health specialist will provide treatment for disease. Sanitation will consist of raceway cleaning as necessary by brushing, and disinfecting equipment. Fish-health examinations will be performed on all spring Chinook production lots throughout the rearing period and pre-release.

All equipment (nets, tanks, and boots) will be disinfected with iodophor between different fish/egg lots. Tank trucks will be disinfected between the hauling of adult and juvenile fish. Foot baths containing disinfectant will be strategically located on the hatchery grounds to prevent spread of pathogens.

The general policy is to bury dead juvenile fish and eggs to minimize the risk of disease transmission to natural fish. Adult spring Chinook carcasses will be buried or disposed of in an approved landfill if individuals have been treated with antibiotics and died within the withdrawal period. All adults injected with maturation accelerating hormones (such as sGnRHa implants) will be disposed of in an approved landfill, consistent with Investigational New Animal Drug requirements.

9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.

Degree of smoltification will be monitored through monthly collection of data indicating average condition factor (Kfl) of the populations. Gill ATPase levels have been monitored in the past to attempt to indicate degree of smoltification. However, this index has not been found to be a useful tool for determining when to begin releases, due to the delay in obtaining results from sampling and the finding that ATPase levels do not actually increase until the smolts are actively migrating in the Columbia River (Petersen et al. 1999). In general, hatchery staff observe fish behavior and appearance to make fine scale, best professional opinion adjustments to release timing/truck planting within the release window. Behavioral smoltification cues include increased activity and swimming adjacent to the edges of rearing vessels. Appearance cues include loss of parr marks, silvery appearance, caudal fin banding, and scale loss.

9.2.9) Indicate the use of "natural" rearing methods as applied in the program.

Currently, natural rearing methods are approached through the transfer of most Chinook smolts to acclimation ponds at release locations. The acclimation ponds provide lower density rearing vessels for the fish on their natal water prior to release. Additionally, in the case of the Yakama Nation acclimation locations, most of these locations support the concept of rearing smolts in natural ponds. This concept has been tested over the last decade as part of the Yakama Nation's coho restoration project in the Wenatchee and Methow Rivers. The coho restoration project has demonstrated both high survival rates (juveniles and adults) as well as adult returns with SARs comparable or higher than established supplementation program in the Upper Columbia (YN 2010)

9.2.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during propagation

- Marked fish from outside of the Mid-Columbia region will be excluded from the Methow broodstock. Progeny from adults captured at Wells Dam that are from the Entiat or Wenatchee sub-basins will be returned to their tributary of origin, if this action is consistent with fish health protocols. This will require reading of CWTs during spawning.
- Adults may be PIT tagged (or individually marked by some means) to identify them by time of arrival. If too many adults are collected because the actual run size differs substantially from the prediction, adults may be selected for return to the river for natural spawning or, alternatively, removed for control of pHOS. This will be performed in a manner that allows an adequate representation of the gene pool and is consistent with ongoing disease prophylaxis treatments. Origins of late arriving adults (i.e., spring Chinook versus summer Chinook) will be based on timing and morphological and phenotypic differences.
- In-situ stock separation of Methow/Chewuch composite from other or stray fish via genetic analysis, scale analysis, PIT-tag identification, and/or reading of CWTs during spawning operations will continue.

SECTION 10. RELEASE

Responsibilities: Chelan PUD is responsible for providing the funding for the activities described in Section 10. WDFW is currently contracted to conduct the activities described in Section 10. Consistent with these responsibilities, Chelan PUD and WDFW will be co-permit holders for the activities described in this section with WDFW designated as an agent under a current contract between Chelan PUD and WDFW and until this contract expires and is not renewed or renegotiated.

10.1) Proposed fish release levels.

Table 10-1. Approximate size and number targets for production of spring Chinook smolts from Chelan PUD's Methow River spring Chinook Hatchery Program. Targets are subject to change at the discretion of the HCP Hatchery Committees.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs	None	NA	NA	NA
Unfed Fry	None	NA	NA	NA
Fry	None	NA	NA	NA
Fingerling	None	NA	NA	NA
Yearling	60,516 (+/-10%)	15 – 18	April – May	Methow River

10.2) Specific location(s) of proposed release(s).

Table 10-2. Release Locations for Chelan PUD's Methow River Spring Chinook Hatchery Program

Release Location	Waterbody	Release Point (RM)
Carlton Acclimation Pond	Methow River	37.5
Goat Wall Acclimation Sites	Methow River	68.0
Mid Valley Pond	Methow River	54.4
Chewuch River Pond	Chewuch River	8.0
Other locations approved by the HCP Hatchery Committee	Methow Sub-Basin	To be determined

All sites are in the (Upper) Columbia River watershed in WRIA 48. Future acclimation facilities/sites within the Methow Sub-basin may be developed by others and may receive releases of spring Chinook from Chelan PUD's Chinook program at the discretion of the HCP Hatchery Committees.

10.3) Actual numbers and sizes of fish released by age class through the program.

Table 10-3. Methow River yearling spring Chinook smolt releases, 1994 to 2005.

Release Year	Methow River		
	No.	Date (MM/DD)	Avg Size (fpp)
1994	-	-	-
1995	210,849	4/15	15.9
1996	4,477	4/22	14.5
1997	28,878	4/15	14.1
1998	202,947	4/15	18.1
1999	332,484	4/15	18.3
2000	218,499	4/17	16
2001	180,775	4/17	11.0
2002	66,454	4/16	16.9
2003	130,787	4/21	16.0
2004	181,235	4/2-14	15.8
2005	48,831	4/18	16.0

Note:
Data source: Snow et al. (2008), and WDFW unpublished data.

10.4) Actual dates of release and description of release protocols.

See Section 10.3 (Table 10-3) for recent release dates. Historically, releases from the acclimation ponds at the beginning of the release period in April are volitional for approximately 20 days with the remaining fish forced out by May 1.

10.5) Fish transportation procedures, if applicable.

Pre-smolts will be transported from the hatchery to the acclimation sites by tanker truck. Current fish-transport procedures include crowding and loading into distribution trucks via a fish pump. Distribution trucks are reliable and safe, and water is tempered as appropriate. Fish are tempered to within 3°C of the receiving water prior to release into the ponds. Loading densities are from 0.3 to 0.5 pounds of fish per gallon of water. Fish are volitionally released directly from the ponds to the river and do not require additional transportation.

10.6) Acclimation procedures

Transfer date to acclimation sites would range from February to March depending on annual temperature variation and the necessity to temper fish to within 3°C of receiving water. Pre-smolts will be transferred from the Carlton Pond to the acclimation ponds where fish are acclimated for approximately 30 days. Fish will be provided a volitional release and are expected to migrate quickly from the acclimation facilities.

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

All juveniles will be 100 percent CWT marked. All smolts will be marked to distinguish specific program and hatchery crosses and to facilitate removal of hatchery-origin fish in selective fisheries. Additionally 25 percent of the hatchery releases would be PIT-tagged so they can be easily detected and removed at sorting/collection facilities prior to spawning.

10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

Broodstock and egg collections are designed to minimize the potential for egg surpluses. Egg surpluses, if any, will be culled (see Section 9.1.2). Thus, surplus smolts are not expected. If smolt surpluses do exists, transfer to other programs, provided they meet fish health and population acceptance criteria may occur or smolts may be out-planted to a recipient lake (without connectivity to the Columbia River system) for a resident program if supported by the JFP.

10.9) Fish health certification procedures applied pre-release.

Fish health and disease conditions are continuously monitored in compliance with the requirements of the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (Co-managers 1998), requirements of the Section 10 ESA permit issued, and guidelines of IHOT (1995). Spring Chinook will be monitored daily by staff during rearing for signs of disease through observations of feeding behavior and monitoring of daily mortality trends. A fish health specialist will monitor fish health as least monthly; these inspections must adhere to the disease prevention and control guidelines established by the PNFHPC. More frequent care will be provided as needed if disease is noted. Prior to release, the population health and condition will be established by the Area Fish Health Specialist. This is commonly done 1 to 3 weeks before release, and up to 6 weeks before release on systems with pathogen-free water and little or no history of disease.

10.10) Emergency release procedures in response to flooding or water system failure.

Emergency releases shall be allowed in the event of flooding, water loss to raceways, or vandalism that necessitates early release of ESA-listed spring Chinook to prevent catastrophic mortality. Any emergency releases made by the hatchery operators will be reported immediately to the NMFS Salmon Recovery Division in Portland, Oregon.

10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

The risk of ecological hazards to listed species resulting from liberations of hatchery-origin spring Chinook will be minimized through the following measures:

- Hatchery spring Chinook will be reared to sufficient size such that smoltification occurs within nearly the entire population, reducing residence time in the streams after release and promoting rapid seaward migration which can reduce precocious maturation.
- Spring Chinook smolt releases will be timed to improve survival at mainstem dams and to reduce the duration of interactions with wild fish and non-target taxa.
- Acclimation in natal stream water will contribute to smoltification, reducing the residence time in the rivers and mainstem corridors.
- Hatchery spring Chinook smolts will be released when environmental conditions exist that promote rapid emigration.
- Total number of smolts released with expected adult contribution to natural spawning will be managed with consideration of HCP obligations as well as tributary carrying capacity.
- All artificially propagated UCR spring juveniles shall be externally or internally marked prior to release according to the coordinated marking scheme under development by the HCP Hatchery Committees.

Variance from this smolts-only release requirement shall only be allowed in the event of an emergency, such as flooding, water loss to raceways, or vandalism that necessitates early release of ESA-listed spring Chinook to prevent catastrophic mortality. Any emergency spring Chinook releases made by the action agencies will be reported immediately to the NMFS Salmon Recovery Division in Portland, Oregon.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

Monitoring and evaluation plays an important role in helping measure program results and determining future directions (adaptive management). The HCP Hatchery Committee has developed a rigorous monitoring plan and program for the Methow River Spring Chinook Program (Hillman et al. 2013). Currently, the M&E program monitors survival and growth within the hatchery and the effects of hatchery fish on population productivity, genetic diversity, run and spawn timing, spawning distribution, and age and size at maturity. This information is collected directly from or derived from spawning ground surveys, broodstock sampling, stock composition sampling (stock assessment), hatchery juvenile sampling, smolt trapping, precocity sampling, PIT tagging, CWT tagging, genetic sampling, disease sampling, and snorkeling. Importantly, the monitoring and evaluation program is consistent with the draft monitoring and evaluation plan prepared by NMFS for the *Upper Columbia Spring Chinook and Steelhead Recovery Plan* (see Appendix P to the Recovery Plan) and the Ad Hoc Supplementation Monitoring and Evaluation Workgroup recommendations (Galbreath et al. 2008).

11.1.1) Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.

The existing M&E program document (Hillman et al. 2013) describes the data collection effort in detail (see Section 11.1).

11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

Chelan PUD will continue to fund hatchery M&E according to its obligations in the Rock Island and Rocky Reach HCPs. In 2013, Chelan PUD's M&E obligations were updated by the Hatchery Committee (Hillman et al. 2013). It is expected that Chelan, Douglas, and Grant PUDs will proportionally co-fund the M&E activities for spring Chinook in the Methow Sub-basin.

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

The current HCP approved M&E Plan describes this section fully (Hillman et al. 2013).

SECTION 12. RESEARCH

12.1) Objective or purpose.

The RRT was used historically to capture listed steelhead and bull trout (in 2002 and 2005-2007, respectively), as part of studies required for implementation of the Rocky Reach License. Based on these previous efforts with steelhead and bull trout, it was determined that select individual fish can be effectively removed at the RRT, without delaying unmarked fish or non-target species. Additionally, based on a 2013 pilot study, externally marked spring Chinook were successfully removed at the RRT, on an individual basis without delaying non-targeted spring Chinook.

In response to results and observations made from conducting the 2013 spring Chinook pilot study, several trap modifications were identified and have been made in early 2014 in an effort to improve operation of the trap and increase the success of each trapping event:

- Replace the solid trap door with a rectangular 1" diameter vertical bar screen with 1" gaps to reduce the changes in water velocity observed by a solid door, which appeared to deter fish moving into the trap;
- Install underwater lighting and an underwater camera that can capture the view of the trap entrance to enable better viewing of the fish as they move into the trap;
- Install an electrical control pendant for the technician located above the trapping area to allow additional control of the trap door;
- Paint the floor in the viewing window white to create contrast.
- Installation of separation-by-code technology.

2014 will represent a second pilot year to evaluate all of the trap modifications/improvements and to test the efficacy of using separation-by-code technology to target PIT tagged natural origin (NO) adults for broodstock (and hatchery origin [HO] adults to the extent needed, to meet the production target).

Separation-by-Code Technology

The RRT trap is operated by use of a manually operated pneumatic gate that directs individual fish to a collection area and a trapping vessel. The trap design mimics a basket; it is lowered into the fish ladder and can remove one fish at a time. To identify broodstock for collection, the fish ladder directly in front of the counting room will be outfitted with a PIT tag detection array. This will provide a total of three PIT tag detection arrays located downstream of the trap in the fish ladder (baffle four, baffle six, and the entrance into the counting room/trap location). The separation-by-code software will rely on a pre-loaded library of PIT tag codes (Table 1), that when detected by one of the three PIT tag arrays, will send a visual and auditory signal to the trap operator indicating a target fish has been detected. As an identified target fish moves through the baffles of the ladder and subsequent PIT tag arrays (a total distance of roughly 125 feet), three sequential notifications will occur indicating the fish is approaching the trap chamber (Figure 1). Once the last notification occurs, the operator in the counting room will be able to visually observe the target fish, manually open the trap door, and trap the fish. The operator located above the trap will raise the trap and confirm the intended fish was trapped by use of a hand held PIT tag detector loaded with the same library of PIT tag codes.

Upon confirmation that the trapped fish is the intended target fish, the fish will be transferred to a holding tank supplied with recirculating water, directly adjacent to the trap. Eastbank Hatchery staff will be notified that a target fish has been captured and they will transport the fish to the Eastbank hatchery, directly adjacent to Rocky Reach Dam, via truck mounted holding tank supplied with Eastbank Aquifer water and oxygen.

Trapping will occur up to five days per week (Monday through Friday), and up to six hours per day, with unrestricted passage during non-trapping periods. Unless the trap operator is attempting to actively trap a target fish, the ladder will be open to passage. Trapping will begin in late April and will continue through about the third week in June (based on the average distribution of the most recent 10 years of data [DART] the first 5 percent of the spring Chinook run passes Rocky Reach by April 18, and the 95 percent passage date is June 17; therefore, 90 percent of the run passes during an approximately 60-day period).

The following PIT-tag codes will be targeted at the RRT in 2014:

- Chewuch River smolt trap and mark/recapture evaluations (natural spring Chinook)
- Mark/recapture evaluations above the mouth of the Twisp River (natural spring Chinook)
- Methow River smolt trap (natural spring Chinook)
- Methow Hatchery MetComp smolts (brood year 2009 and 2010)

Genetic sampling/assessment will be utilized to differentiate Twisp River and non-Twisp River natural-origin spring Chinook adults that were PIT tagged as juveniles at the Methow smolt trap, once transported to Eastbank Hatchery from the RRT. Any adults that are determined to be of Twisp origin could be provided to Douglas PUD for their Twisp spring Chinook conservation program in exchange for a MetComp NOR trapped at Wells Dam (contingent upon agreement with Douglas PUD). All NORs trapped at the RRT and subsequently held at Eastbank Hatchery for genetic sampling will be retained for broodstock. Additionally, up to 45 HO adults (no age-3 returns would be retained) from the Methow Hatchery MetComp smolt releases will be trapped at the RRT and held at Eastbank Hatchery as contigency broodstock in the event the total number of NORs needed for CPUDs Methow Sub-basin conservation program are not available. If it is determined that these HO adults are not needed to meet Chelan PUD’s Methow spring Chinook obligation, the following options are available (the JFP will be responsible for determining the priority and ultimate disposition of these fish): 1) they will be offered to Grant and/or Douglas PUDs if a shortfall exists in their program; 2) they will be offered to the USFWS Winthrop NFH for utilization in their safety net program; and 3) they will be released above Wells Dam or in the Methow River to offset any delays caused by retaining these fish.

Chiwawa Spring Chinook Stray Management

In an effort to control potential strays from the Chiwawa spring Chinook hatchery program, PIT tag codes from hatchery releases will also be included in the separation-by-code library. If encountered in the Rocky Reach arrays, these fish will be trapped and the disposition of them determined by the JFP. Prior to using the Rocky Reach Trap for routine broodstock collection, Chelan PUD will complete the analysis of the 2014 separation-by-code pilot and obtain any necessary HCP Hatchery Committees approvals either separately or as part of the annual broodstock collection protocol development.

Specifically, Chelan PUD will examine the amount of handling time, potential handling effects of trap operation, and any proposed improvements intended to increase trapping effectiveness.

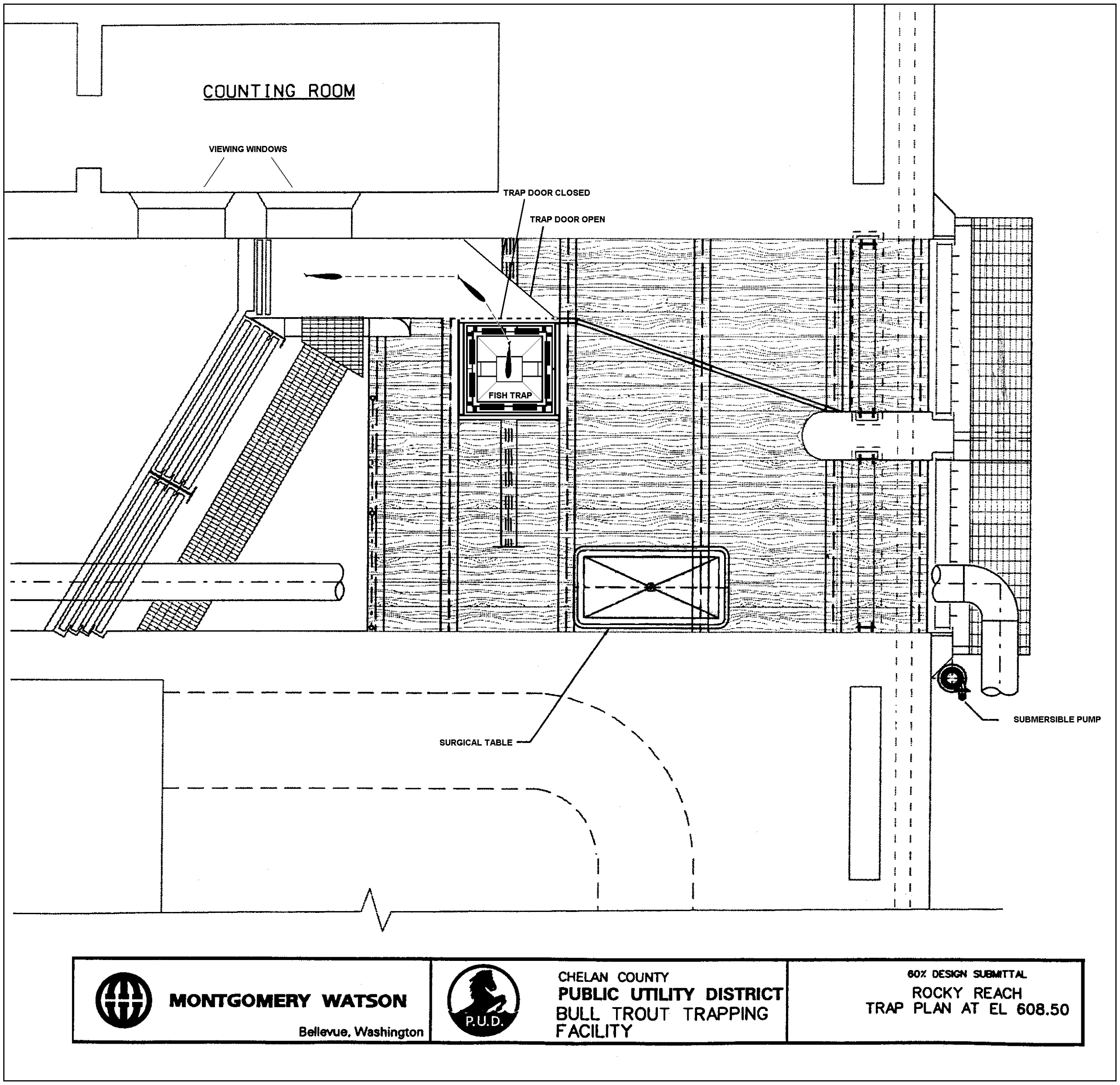

Figure 12-1. Rocky Reach trapping facility.

12.2) Cooperating and funding agencies.

Funding Agency: Chelan PUD

Cooperating Agencies: HCP Hatchery and Coordinating Committees

12.3) Principle investigator or project supervisor and staff.

Alene Underwood – CCPUD, Wenatchee, WA

Mike Tonseth – WDFW, Wenatchee, WA

12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

Described in Section 12.1.

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.

Described in Section 12.1.

12.6) Dates or time period in which research activity occurs.

Described in Section 12.1.

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.

Any target fish caught will be removed from the trap and immediately placed in a holding container. From the holding container the fish will be placed in a truck-mounted transport tank using fish socks or other water-to-water handling methods. The transport tank will be supplied with Eastbank Hatchery aquifer water and fish will be transported to adult holding ponds at Eastbank Hatchery.

12.8) Expected type and effects of take and potential for injury or mortality.

Injury to spring Chinook may occur through trapping and handling. Only target fish will be placed into the holding container. If non-target fish are encountered in the trap, the fish will not be removed from the trap; instead, the trap will be lowered back into the ladder and the fish released. See table 2-19 in this HGMP for potential take.

12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached “take table” (Table 1).

See Table 2-19.

12.10) Alternative methods to achieve project objectives.

As approved by the HCP HC, broodstock for this program may be collected at Wells Dam, Winthrop National Fish Hatchery/Methow Hatchery (in the event sufficient NORs are not available for the program, HORs from the conservation programs could be used for broodstock if collected at Winthrop NFH or Methow Hatchery outfalls), or on tributary spawning grounds.

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

Only fish selected based on PIT-tag code will be targeted for trapping thereby avoiding non-target species.

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the

proposed research activities.

Specifically, the following measures will be employed to minimize the likelihood of adverse effects to listed natural fish (NMFS 2003):

- ESA-listed fish must be handled with extreme care and kept in water to the maximum extent possible during sampling and processing procedures. Adequate circulation and replenishment of water in holding units is required. The transfer of ESA-listed fish must be conducted using equipment that holds water during transfer.
- Visual observation protocols must be used instead of intrusive sampling methods whenever possible. This is especially appropriate when merely ascertaining the presence of anadromous fish.
- Limitations on the duration (hourly, daily, or weekly) of trapping in mainstem river areas to minimize capture and handling effects on listed fish; limits on trap holding duration of listed fish prior to release; application of procedures to allow safe holding, careful handling, and release of listed fish; and allowance for free passage of migrating listed fish through the ladder when a trapping event is not in progress.
- ESA-listed juvenile fish will not be handled if the water temperature exceeds 21°C at the trap.
- If water temperature at the trap exceeds 21°C, the trap operation shall cease pending further consultation with NMFS to determine if continued trap operation poses substantial risk to ESA-listed species.
- Target species that require handling other than visual observation will be anesthetized.
- Annual broodstock collection and spawning protocols shall be developed for the UCR ESA-listed Methow spring Chinook artificial propagation programs. Protocols will be coordinated with the JFP and HCP Hatchery Committees and must be submitted to NMFS Salmon Recovery Division by April 15 of the collection year.
- Ensure that the hands of fish handlers are free of sunscreen, lotion, or insect repellent.
- Non-target species will be bypassed, minimally handled, or will be fully recovered (if anesthetized) and immediately released upstream of the trapping site.

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the information provided is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by_____________________________ Date:_____________

APPENDIX R
ECOLOGICAL RISK ASSESSMENT OF UPPER-COLUMBIA HATCHERY PROGRAMS ON NON-TARGET TAXA OF CONCERN

ECOLOGICAL RISK ASSESSMENT OF UPPER-COLUMBIA HATCHERY PROGRAMS ON NON-TARGET TAXA OF CONCERN

June 2014

Gregory Mackey	Douglas PUD
Todd N. Pearsons	Grant PUD
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Tracy W. Hillman	Bioanalysts, Inc.

Report produced by the Hatchery Evaluation Technical Team (HETT) for the HCP Wells Hatchery Committee, HCP Rocky Reach Hatchery Committee, HCP Rock Island Hatchery Committee, and the Priest Rapids Hatchery Sub-Committee.

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1.0 EXECUTIVE SUMMARY

The largest, most diverse, and intensive quantitative ecological risk assessment of hatchery program effects on non-target taxa of concern (NTTOC) was implemented in the upper Columbia watershed (the Columbia, Wenatchee, Methow, and Okanogan rivers) between 2008 and 2014. The PCD Risk 1 model was used to estimate NTTOC mortality from competitor, predator, and disease interactions from hatchery program fish. Species that were the target of hatchery programs were summer steelhead, coho salmon, and Chinook salmon (spring, summer, and fall). NTTOC were summer steelhead, and Chinook salmon (spring, summer, and fall), cutthroat trout, and Pacific lamprey. The NTTOC ecological risk assessment was developed as a regional objective that would be addressed by collaboration between the Chelan County PUD, Douglas County PUD, Grant County PUD, Washington Department of Fish and Wildlife (WDFW), United States Fish and Wildlife Service (USFWS), Confederated Tribes and Bands of the Yakama Nation (YN), and Confederated Tribes of the Colville Reservation (CCT). An interagency group populated large databases containing information about hatchery programs, NTTOC, and the environment. The 50 hatchery programs and 25 NTTOC populations resulted in 526 interactions (an interaction was a hatchery program effect to an NTTOC) between hatchery programs and NTTOC to be assessed. Of these, 416 interactions were suitable for PCD Risk 1 modelling. The remaining 110 interactions involved Pacific lamprey or westslope cutthroat, neither of which can be modelled in PCD Risk 1 because PCD Risk 1 is not designed to model Pacific lamprey, and both lamprey and cutthroat NTTOC did not have population estimates available. Eighty interactions involved Chief Joseph Hatchery programs and were not included in the modelling effort. This left 336 interactions that were attempted to be modelled in PCD Risk 1. Of these, 202 model runs were successfully run to completion (~60%). The remaining 134 interactions failed to run to completion in PCD-Risk because the program crashed prior to completion of the model run or the model run was taking an excessively long time and was aborted.

None of the NTTOC-hatchery program interactions were estimated to exceed the containment objectives at the within-basin (excluding Columbia River programs) individual program-NTTOC level, the sub-population roll-up level, or the population roll-up level. Therefore, within-basin hatchery programs (that were successfully modelled) acting individually, or combined at the sub-population or population levels are estimated to be within containment objectives. Estimated mortality rates were low, with NTTOC rarely exceeding 1% mortality. NTTOC-hatchery program interactions were estimated to narrowly exceed the 5% containment objectives at the fine-scale individual program-NTTOC level for Twisp River summer steelhead interacting with Chelan Falls yearling summer Chinook (estimated mortality = 5.08%), Omak Creek summer steelhead interacting with Wells Hatchery summer steelhead (estimated mortality = 5.14%), and Chiwawa River summer steelhead interacting with Wells Hatchery summer steelhead (estimated mortality = 5.15%). These programs also continued to exceed the containment objective in the roll-up of the Columbia River programs.

Ecological mechanisms of mortality for different NTTOC differed. Steelhead mortality was mostly confined to competition equivalents and disease, with competition equivalents the dominant source of mortality. However, disease was much higher than for other NTTOC species. The Twisp, Chiwawa, and Omak steelhead NTTOC interactions that exceeded containment objectives had high levels of mortality from competition equivalents and disease. Spring Chinook mortality was dominated by predation, with competition equivalents and disease common, and competition confined to a few NTTOC. Summer Chinook mortality was mostly through predation, with occasional mortality from competition equivalents and disease. Competition equivalents is estimated mortality that is aggregated across multiple competitive individual interactions that did not lead directly to death, and can be viewed as an alternative method to estimate mortality from competition.

The cumulative effects of multiple hatchery programs were also assessed. As NTTOC interact with more hatchery fish through interaction with additional hatchery programs, mortality increased as each additional program is added. With programs that have a small mortality effect, such as the in-basin programs, the NTTOC mortality rate can remain within the containment objective, even when interacting with many hatchery programs.

Two species of NTTOC, westslope cutthroat trout and Pacific lamprey, were not modelled using the PCD Risk 1 model. An alternative risk assessment approach was implemented for cutthroat trout. Ecological risks for Pacific lamprey in the Upper Columbia Watershed were not assessed because sufficient information about lamprey was not available. Local experts estimated spatial overlap of cutthroat trout and hatchery origin fish based upon location of hatchery release locations and the estimated distribution of cutthroat trout. Overlaps were generated for a representative number of programs (n=45) in the Wenatchee, Methow, and Okanogan watersheds and the Columbia River mainstem. Most cutthroat trout occupied areas above hatchery release locations and also in tributaries that did not include hatchery releases. Overlaps ranged from 0% to 3%. The mean overlap was 0.9% with a standard deviation of 0.9%. Because the maximum overlap with cutthroat trout (3%) was considerably less than the containment objective (<41%), we assess the risk to cutthroat trout as very low.

We conclude that the ecological risks provided by PCD-Risk 1 outputs and overlap (cutthroat trout) are within the NTTOC containment objectives for most NTTOC and are slightly outside of containment objectives for three steelhead NTTOC. Ecological risks could not be assessed for Pacific lamprey because of lack of information. We recognize that our assessment is based upon results of a model that has not been tested and that does not include all mechanisms and locations of interactions that are possible. However, the results seem reasonable given the comprehensive scope of the input data to the model, the large number of interactions that were modeled, and the consistently low mortality of NTTOC associated with hatchery releases. Such interactions were based on detailed spatial and temporal information that governs the potential for hatchery fish and NTTOC to physically interact. Furthermore, state of the science behavioral ecology concepts were used in the model to assess what is likely to happen when hatchery fish and NTTOC interact. It is unlikely at this point that a more informed or comprehensive assessment of this topic is possible.

2.0 INTRODUCTION

Non-Target Taxa of Concern (NTTOC) are populations, sub-populations, or segments of populations that have been identified as being potentially at risk from negative interactions with hatchery programs that are designed and implemented to enhance other “target” taxa or population segments or provide harvest opportunity. NTTOC may be different species than the hatchery program, a distinct population of the same species that is separate from the target population, or a distinct population segment or sub-population of the same species that is being managed separately from the target of the hatchery program. Therefore, NTTOC may experience negative ecological consequences from hatchery programs that are designed to enhance a different target.

The NTTOC ecological risk assessment was developed as a regional objective that would be addressed by collaboration between the Chelan County PUD, Douglas County PUD, Grant County PUD, Washington Department of Fish and Wildlife (WDFW), United States Fish and Wildlife Service (USFWS), Confederated Tribes and Bands of the Yakama Nation (YN), and Confederated Tribes of the Colville Reservation (CCT). In 2008 the Wells HCP, Rocky Reach HCP, Rock Island HCP Hatchery Committees, and the Priest Rapids Hatchery Sub-Committee agreed to an approach to evaluate the potential effects of hatchery programs on non-target taxa of concern (NTTOC). The committees originally planned to convene a panel of experts to conduct a preliminary evaluation of the potential effects of Plan supplemented species on NTTOC. At the October 15, 2008 Hatchery Committees meeting, the members agreed to convene an expert panel to conduct a preliminary evaluation of potential effects of supplemented Plan Species on non-target taxa using an approach similar to that used in the Yakima Basin (Pearsons and Hopley 1999; Ham and Pearsons, 2001). The Committees agreed to convene the panel in spring or early summer 2009, and focus this initial effort on HCP Plan Species and the two non-Plan Species, westslope cutthroat trout and lamprey. The Hatchery Committees explicitly discussed the addition of bull trout to the list of species to be considered, but agreed that a recently completed Biological Opinion by USFWS had already considered this species’ interactions with hatchery programs. The Committees set containment objectives, under which impacts of a hatchery program on an NTTOC are acceptable, and did not include a 0% containment category because that would be difficult, if not impossible, to verify. The Committees identified species interactions, containment objectives for non-target species, and fisheries professionals who possessed the expertise to contribute as panel members. However, this expert panel was never assembled, and instead the Committees directed the Hatchery Evaluation Technical Team (HETT; a work group composed of PUD, agency, tribal, and consultant biologists) to pursue assessment of the hatchery programs potential effects on NTTOC.

The HETT evaluated methods to conduct a risk assessment on NTTOC, and proposed using a combined modelling and a Delphi panel approach, whereby the modeling results would be compared and correlated with the Delphi panel results. The concept behind this was that the modelling effort would offer a faster and perhaps simpler avenue to conducting such risk assessments in the future, and if the Delphi and modelling approaches were in agreement, managers could rely on modelling to provide information that would be similar to that of an expert panel. Conversely, dissonant results may indicate shortcomings in either approach, and a careful evaluation may reveal ways to improve risk assessment. Furthermore, the HETT determined that the large number of assessments could not be reasonably done by a panel of experts and that modeling could help to reduce and identify the assessments that could reasonably be done by a panel. The HETT identified the PCD Risk 1 model (Busack et al., 2005; Pearsons and Busack, 2012) to conduct the modelling evaluation. The PCD Risk 1 model is a data intensive, individual-based stochastic model. The HETT determined that the assembled data to be used as inputs for the PCD Risk 1 model would also serve to provide expert panelists the necessary data for them to conduct risk assessments. Hence, the HETT embarked on an extensive effort to gather, organize, and extract the required data from existing datasets, literature, and biologists familiar with the programs and/or particular NTTOC. Ultimately the input data were assembled in a relational database that allowed the data to be output in user-friendly formats for modelling or Delphi panel use. The database also served to hold the modeling results, which could be extracted and summarized as needed.

In October 2013, the HCP Hatchery Committees agreed to accept a report on the modelling results to date to fulfill the NTTOC risk assessment objective under the HCP Monitoring and Evaluation Plans. The results in this report represent a very extensive, but incomplete, effort to model the risk of all the upper Columbia hatchery programs for the identified NTTOC. The Committees agreed that the effort to date is substantial and upon review of this report, further steps, if any, will be determined.

3.0 METHODS

The Hatchery Committees originally defined the scope of the risk analysis, identifying the hatchery programs and NTTOC that would be included in the assessment. The HETT later modified this scope to reflect changes in the hatchery programs, and to insure a comprehensive approach. In, some cases, such as Coho salmon and White River spring Chinook, hatchery release numbers and locations do not reflect the current program. Rather, in some instances planned future numbers and locations may have not yet or are no longer planned to be implemented. The hatchery programs, life stage at release, and number released are presented in Table 1 and the NTTOC with estimated population sizes are presented in Table 2. The Hatchery Committees also identified containment objectives for the NTTOC and hatchery programs interactions (Tables 3-8). These containment objectives were completed prior to development of the more extensive lists of programs and NTTOC by the HETT, but containment objectives consistent with those in tables 3-8 were applied to all additional analogous NTTOC. These containment objectives were used to test if programs were operating within the containment objectives. Furthermore, cumulative program effects on each NTTOC population were also compared to the containment objectives.

The context of the risk assessment was biologically, spatially, and temporally defined to increase precision of and minimize confusion regarding the assessments. The assessment was constrained to include only the naturally produced component of the NTTOC. The spatial context of fish released in the tributaries to the Columbia River (e.g., Wenatchee, Methow, and Okanogan) included the tributary to the river mouth. Fish released into the Columbia River included the Columbia River from the point of release downstream to McNary Dam. This spatial context was selected because: it was relevant to the PCD Risk model (e.g., freshwater), it had the most information available, was subject to future testing, was most likely influenced by the hatchery programs of interest, and avoided areas where other hatchery programs would confound the risk assessment. Other potentially important ecological risks that might occur in portions of the migration corridor, estuary, and ocean were not considered in this assessment. The time frame of the risk assessment was constrained between 2013 and 2023. These years were selected because hatchery fish abundances are adjusted every decade as part of the public utility districts' mitigation and this time period is the main focus of adaptive management decisions. Furthermore, most of the new or expanded hatchery programs will be implemented during this period.

Table 1. Upper Columbia Hatchery Programs Identified for NTTOC Risk Analysis

Hatchery	Program Owner	Species	Drainage	Stream	Life Stage	Release Number
Chief Joe	CCT	Spring Chinook	Columbia	Columbia River	yearling	650,000
Chief Joe	CCT	Summer Chinook	Columbia	Columbia River	subyearling	400,000
Chief Joe	CCT	Summer Chinook	Columbia	Columbia River	yearling	500,000
Chief Joe	CCT	Spring Chinook	Okanogan	Okanogan River	yearling	200,000
Chief Joe	CCT	Summer Chinook	Okanogan	Okanogan River	subyearling	300,000
Chief Joe	CCT	Summer Chinook	Okanogan	Okanogan River	yearling	400,000
Chief Joe	CCT	Summer Chinook	Okanogan	Okanogan River	yearling	400,000
Chief Joe	CCT	Summer Chinook	Okanogan	Okanogan River	yearling	200,000
Chief Joe	CCT	Spring Chinook	Okanogan	Omak Creek	yearling	50,000
Chief Joe	CCT	Spring Chinook	Okanogan	Salmon Creek	yearling	50,000
Chelan Falls	CPUD	Summer Chinook	Columbia	Columbia River	yearling	576,000
Eastbank	CPUD	Summer Chinook	Okanogan	Okanogan River	yearling	79,156
Eastbank	CPUD	Summer Chinook	Okanogan	Okanogan River	yearling	555,494
Eastbank	CPUD	Spring Chinook	Wenatchee	Chiwawa River	yearling	144,026
Eastbank	CPUD	Summer Steelhead	Wenatchee	Chiwawa River	yearling	49,460
Eastbank	CPUD	Summer Steelhead	Wenatchee	Nason Creek	yearling	74,190
Eastbank	CPUD	Summer Chinook	Wenatchee	Wenatchee River	yearling	499,816
Eastbank	CPUD	Summer Steelhead	Wenatchee	Wenatchee River	yearling	24,730
Eastbank	CPUD	Summer Steelhead	Wenatchee	Wenatchee River	yearling	98,920
Lake Wenatchee Net Pens	CPUD	Sockeye	Wenatchee	Wenatchee River	yearling	281,000
Skaha	CPUD	Sockeye	Okanogan	Okanogan River	fry	4,550,000
Methow	DPUD	Spring Chinook	Methow	Chewuch River	yearling	225,000
Methow	DPUD	Spring Chinook	Methow	Methow River	yearling	173,765
Methow	DPUD	Spring Chinook	Methow	Twisp River	yearling	50,000
Wells	DPUD	Summer Chinook	Columbia	Columbia River	subyearling	438,680
Wells	DPUD	Summer Chinook	Columbia	Columbia River	yearling	301,056
Wells	DPUD	Summer Steelhead	Columbia	Columbia River	yearling	160,000
Wells	DPUD	Summer steelhead	Methow	Methow River	yearling	100,000
Wells	DPUD	Summer steelhead	Methow	Twisp River	yearling	48,000
Eastbank	GPUD	Summer Chinook	Methow	Methow	yearling	200,000
Nason Creek	GPUD	Spring Chinook	Wenatchee	Nason Creek	yearling	149,114
Priest Rapids	GPUD	Summer Fall Chinook	Columbia	Columbia River	subyearling	7,700,000
Wells	GPUD	Summer Steelhead	Okanogan	Okanogan River	yearling	60,000
Wells	GPUD	Summer Steelhead	Okanogan	Omak Creek	yearling	20,000
Wells	GPUD	Summer Steelhead	Okanogan	Salmon Creek	yearling	20,000
White River	GPUD	Spring Chinook	Wenatchee	White River	yearling	74,556
Leavenworth	USFWS	Spring Chinook	Wenatchee	Icicle Creek	yearling	1,200,000
Winthrop	USFWS	Spring Chinook	Methow	Methow River	yearling	400,000
Winthrop	USFWS	Summer steelhead	Methow	Methow River	two year	50,000
Winthrop	USFWS	Summer steelhead	Methow	Methow River	yearling	50,000
YN-various	YN	Coho	Methow	Beaver Creek	yearling	27,000
YN-various	YN	Coho	Methow	Chewuch River	yearling	163,000
YN-various	YN	Coho	Methow	Methow River	yearling	254,000
YN-various	YN	Coho	Methow	Twisp River	yearling	142,857
YN-various	YN	Coho	Wenatchee	Chiwawa River	yearling	190,000
YN-various	YN	Coho	Wenatchee	Chumstick Creek	yearling	35,000
YN-various	YN	Coho	Wenatchee	Icicle Creek	yearling	126,000
YN-various	YN	Coho	Wenatchee	Little Wenatchee River	yearling	65,143
YN-various	YN	Coho	Wenatchee	Nason Creek	yearling	185,000
YN-various	YN	Coho	Wenatchee	White River	yearling	114,000

Table 2. Upper Columbia Non-Target Taxa of Concern (NTTOC) Identified for Risk Analysis

			Population Estimate		
Species	**Drainage**	**Stream**	**Minimum**	**Mean**	**Maximum**
Pacific Lamprey	Methow	Methow River	--	--	--
Pacific Lamprey	Okanogan	Okanogan River	--	--	--
Pacific Lamprey	Wenatchee	Wenatchee River	--	--	--
Sockeye	Okanogan	Okanogan River	1,345,247	4,599,270	10,083,376
Sockeye	Wenatchee	Wenatchee River	591,869	3,019,789	7,035,398
Spring Chinook	Methow	Chewuch River	59,040	264,811	607,043
Spring Chinook	Wenatchee	Chiwawa River	273,921	1,022,141	1,884,433
Spring Chinook	Wenatchee	Little Wenatchee River	20,827	93,132	174,719
Spring Chinook	Methow	Methow River	147,553	571,608	1,265,748
Spring Chinook	Wenatchee	Nason Creek	100,687	450,132	913,576
Spring Chinook	Methow	Twisp River	27,977	139,831	329,092
Spring Chinook	Wenatchee	White River	20,510	111,402	232,651
Summer Chinook	Methow	Methow River	50,696	378,973	1,552,196
Summer Chinook	Okanogan	Okanogan River	897,681	1,841,855	3,029,050
Summer Chinook	Wenatchee	Wenatchee River	153,645	3,910,598	12,841,906
Summer Steelhead	Methow	Chewuch River	21,786	34,730	43,226
Summer Steelhead	Wenatchee	Chiwawa River	7,430	15,156	19,365
Summer Steelhead	Wenatchee	Lower Wenatchee River	47,284	74,049	109,621
Summer Steelhead	Methow	Methow River	143,165	198,791	237,769
Summer Steelhead	Wenatchee	Nason Creek	47,491	51,150	53,946
Summer Steelhead	Okanogan	Okanogan River	125,298	236,016	330,309
Summer Steelhead	Okanogan	Omak Creek	7,262	14,357	20,940
Summer Steelhead	Methow	Twisp River	55,389	71,410	103,051
Westslope Cutthroat	Methow	Methow River	--	--	--
Westslope Cutthroat	Wenatchee	Wenatchee River	--	--	--

The 50 hatchery programs and 25 NTTOC populations resulted in 526 interactions between hatchery programs and NTTOC to be assessed. Of these, 416 interactions were suitable for PCD Risk 1 modelling. The remaining 110 interactions involved Pacific lamprey or westslope cutthroat, neither of which can be modelled in PCD Risk 1 because PCD Risk 1 is not designed to model Pacific lamprey, and both lamprey and cutthroat NTTOC did not have population estimates available. Eighty interactions involved Chief Joseph Hatchery programs and were not included in the modelling effort. This left 336 interactions that were attempted to be modelled in PCD Risk 1. Of these, 202 model runs were successfully run to completion (~60%). The remaining 134 interactions failed to run to completion in PCD Risk 1 because the program crashed prior to completion of the model run or the model run was taking an excessively long time and was aborted.

The information needed to conduct the PCD Risk 1 modeled risk assessments was provided by resource and technical committees, and by invited local experts. This standardized information was assembled into three templates that contain the information needed for the risk assessment: 1) hatchery program size and biological data, 2) NTTOC population and biological data, and 3) data describing ecological interactions between NTTOC and hatchery fish. The local experts developed rules, equations, and standards to populate templates (Tables 4-6). We used in order of priority: 1) best available data, 2) literature values if local data were not available, and 3) best professional judgment to populate data templates. Sources of data were recorded on each of the templates and included published values, unpublished data, and expert opinion. Assumptions were also documented. Where necessary, the minimum, most probable, and maximum values were estimated. This provided a description of the uncertainty associated with a variable, as well as annual variability. The data compiled for the PCD Risk 1 model were extensive and are explained more fully in Busack et al. (2005) and Pearsons et al. (2012). Tables 4-6 presents the PCD Risk 1 model input variables and the data types used for the hatchery programs, NTTOC populations, and interactions.

Information was generated so that ecological risks could be assessed for each hatchery program and NTTOC interaction. This approach allows for the possibility to combine risk assessments for multiple hatchery programs. For instance, risks could be evaluated by hatchery species (e.g., all spring Chinook salmon hatchery programs combined), by funding entity (e.g., all programs funded by Grant PUD), by tributary (e.g., Wenatchee), by NTTOC (e.g., all programs that affect Methow cutthroat), or all programs combined.

Table 3. Containment Objectives set by the Hatchery Committees in 2009 (adapted from the "FINAL Rocky Reach, Rock Island, and Wells HCP Hatchery Committees Summary and Strategy for Monitoring and Evaluation Plan Objective 10 (NTTOC)", August 19, 2009)

		Containment Objective	
Hatchery Program	**NTTOC**	**Category**	**% Mortality**
Wenatchee steelhead			
	Chiwawa spring Chinook[1]	Low	5
	Nason spring Chinook[1]	Low	5
	Westslope cutthroat	Moderate	41
	Summer Chinook	Low	10
	Pacific lamprey	Very Low	5
	Little Wenatchee spring Chinook	Very Low	5
	Wenatchee sockeye	Low	10
Chiwawa, Nason, White spring Chinook			
	Chiwawa steelhead	Very Low	5
	Nason spring Chinook	Very Low	5
	Westslope cutthroat	Moderate	41
	Summer Chinook	Low	10
	Pacific lamprey	Very Low	5
	Little Wenatchee spring Chinook	Very Low	5
	Wenatchee sockeye	Low	10
Wenatchee sockeye, Skaha sockeye			
	Wenatchee steelhead	Very Low	5
	White spring Chinook	Very Low	5
	Little Wenatchee spring Chinook	Very Low	5
	Westslope cuttroat	Moderate	41
	Summer Chinook	Low	10
Turtle Rock summer Chinook			
	Summer Chinook	Low	10
	Wenatchee summer Chinook	Low	10
	Wenatchee steelhead	Very Low	5
	Wen. spring Chinook	Very Low	5
	Westslope cutthroat	Moderate	41

Hatchery Program	NTTOC	Containment Objective	
		Category	% Mortality
	Little Wenatchee spring Chinook	Very Low	5
	Pacific lamprey	Very Low	5
	Wenatchee sockeye	Low	10
Methow summer Chinook			
	Methow steelhead	Very Low	5
	Methow spring Chinook	Very Low	5
	Westslope cutthroat	Moderate	41
	Pacific lamprey	Very Low	5
Okanogan summer Chinook, spring Chinook			
	Okanogan steelhead	Very Low	5
	Pacific lamprey	Very Low	5
	Okanogan sockeye	Low	10
Upper Columbia coho (by basin)			
	Spring Chinook	Very Low	5
	Steelhead	Very Low	5
	Little Wenatchee spring Chinook	Very Low	5
	Wenatchee sockeye	Low	10
Twisp spring Chinook			
	Methow spring Chinook	Very Low	5
	Chewuch spring Chinook	Very Low	5
	Methow steelhead	Very Low	5
	Summer Chinook	Low	10
	Westslope cutthroat	Moderate	41
	Pacific lamprey	Very Low	5
MetComp spring Chinook			
	Twisp spring Chinook	Very Low	5
	Summer Chinook	Low	10
	Methow steelhead	Very Low	5
	Westslope cutthroat	Moderate	41
	Pacific lamprey	Very Low	5
Wells steelhead, Okanogan steelhead			
	Methow spring Chinook	Very Low	5
	Chewuch spring Chinook	Very Low	5
	Twisp spring Chinook	Very Low	5
	Summer Chinook	Low	10
	Methow steelhead	Very Low	5
	Okanogan steelhead	Very Low	5
	Okanogan sockeye	Low	10
	Westslope cutthroat	Moderate	41
	Pacific lamprey	Very Low	5
Wells summer Chinook			
	Spring Chinook	Very Low	5
	Summer Chinook	Low	10
	Methow steelhead	Very Low	5
	Okanogan steelhead	Very Low	5
	Okanogan sockeye	Low	10
	Westslope cutthroat	Moderate	41
	Pacific lamprey	Very Low	5

[1] The HCP HCs initially specified 10% for the containment objective, but 5% was used in this analysis to be consistent with other ESA listed populations.

Table 4. Definitions of variables related to the hatchery programs based on PCD Risk 1 model inputs that were used to create the hatchery templates (adapted from Pearsons et al., 2012).

Variable	Definition	Methods
Hatchery program	Name of the hatchery program.	Identified by the resource managers
Species and race	Species and race (e.g. Spring Chinook) of the program.	Identified by the resource managers
Release location(s)	Locations where fish are released to the natural environment.	Empirical information
Release date(s)	Dates fish are typically released.	Empirical information
Number of hatchery fish	Number of hatchery-origin fish released into the natural environment.	Empirical information
Mean, minimum, CV fork length	Mean fork length (mm), minimum fork length (mm), and coefficient of variation (CV) of fork length of hatchery-origin fish (SD/Mean). CV is expressed as a proportion.	Estimates from monitoring and evaluation programs
Hatchery fish survival rate	Survival rate of hatchery-origin fish in freshwater from release to an area below natural-origin fish interactions (e.g., mouth of river).	Estimates from monitoring and evaluation programs. Based primarily on PIT-tag data.
Hatchery fish residence time (days)	Average number of days interactions will occur.	Estimates from monitoring and evaluation programs. Calculated using travel time information (PIT-tag data) and the proportion of fish that residualize.
% residuals	Percentage of hatchery fish that do not migrate and take up residency.	Used data as available and best professional judgment based on other observations of similar situations.

Table 5. Definitions of variables related to NTTOC based on PCD Risk 1 model inputs that were used to create the NTTOC templates (adapted from Pearsons et al., 2012).

Variable	Definition	Methods
NTTOC	Non-target taxa of concern (NTTOC) population as defined by species, race and geographic location.	Identified by the resource managers
Number (minimum, mean, maximum)	Population estimates that indicate the likely range and mean of the NTTOC population at the time of hatchery fish release.	Estimates from monitoring and evaluation programs and life cycle models developed based on empirical data and values from literature
Age class, proportion in age class	Proportion of total fish abundance in each age class.	Estimates from monitoring and evaluation programs and life cycle models developed based on empirical data and values from literature
Mean, minimum, and CV fork length	Mean fork length (mm), minimum fork length (mm), and coefficient of variation (CV) of fork length of NTTOC fish (SD/Mean). CV is expressed as a proportion.	Estimates from monitoring and evaluation programs

Table 6. Input variables and definitions related to interactions for PCD RISK 1 (adapted from Pearsons et al., 2012).

Variable	Definition	Methods
Percentage population overlap	Percentage of natural-origin population available for interaction because of spatial or temporal overlap. For example, 100% overlap occurs if hatchery fish are released above and before emigration of wild occurs and they totally overlap the entire wild fish distribution. Greater overlap increases opportunity for ecological interactions.	The sum of population overlap across life stages (fry, parr, smolt): ∑p*s*t; where p = the proportion of each life stage in the population, s = spatial overlap of hatchery and wild fish, and t = temporal overlap of hatchery and wild fish.
Percentage habitat complexity	Percentage of natural-origin population in overlap protected by habitat from competitive interactions (i.e., visual isolation). An environment with high visual isolation has many physical features (e.g., wood, rocks) that preclude fish from seeing and competing with each other. Greater complexity can reduce the opportunity for ecological interactions.	Estimate percentage for the pairing(s) using the best available information and incorporating best professional judgment. Based on these estimates, percentages were adjusted for pairings with less information.
Percentage habitat segregation	Percentage of hatchery-origin population in overlap that are excluded from competitive interactions because they occupy different habitats (e.g., deeper and faster water). Habitat segregation can reduce the opportunity for ecological interactions.	Estimate percentage for each type of NTTOC-to-hatchery program pairing(s) based on body size and habitat preference.

Variable	Definition	Methods
Probability dominance results in body weight loss	Probability that a fish that is dominated will have a 'Body Weight Loss' that is equal to one day of no feeding (e.g., the proportion of daily body weight loss that occurs from being dominated). Dominated fish may have reduced growth or be more susceptible to disease.	Hypothetical range developed using best professional judgment.
Dominance mode	Dominance mode for hatchery-origin fish competing with natural-origin fish. Dominance is a function of relative size of hatchery- and natural-origin fish and the relative behavioral dominance when they are the same size (e.g., aggression, prior residence). Defines the likely outcome (mode) of competitive interactions.	Dominance mode was selected based on literature review. Dominance mode = 3 was used for all interactions.
Percentage of body weight loss that results in death	Percentage of body mass lost due to competitive encounters that will cause death. Threshold for death resulting from competitive interactions.	Based on a range from 11 fish species presented in Letcher et al. 1996.
Maximum daily encounters per hatchery fish	Maximum number of encounters, predatory or competitive, a hatchery-origin fish is allowed to have with natural-origin fish in one day (excluding fish that are protected or segregated by habitat). Encounters will increase as the capacity of the environment is filled. Increasing number of encountered will increase the opportunity for ecological interactions.	Calculated by: pHK*pWK*10; where pHK = proportion of river carrying capacity used by hatchery fish (in the absence of wild fish), and pWK = proportion of the river carrying capacity used by wild fish (in the absence of hatchery fish) (from Busack et al. 2005).
Piscivory rate	Proportion of hatchery-origin fish that will feed on NTTOC fish. This proportion will be allowed to eat to capacity and the rest will not eat at all. (e.g., gut fullness of average hatchery-origin fish). Higher rate of piscivory may result in a greater mortality of NTTOC.	Based primarily on literature values, with best professional judgment used to fill data gaps.
Temperature	Average water temperature during the duration of interaction (^{o}C). Used for bioenergetics input in the PCD Risk 1 model. In general, higher water temperatures will increase fish metabolism.	Mean, min, and max temperatures, derived from the nearest water temperature gauge to a release site, for the time period starting with release date and spanning the average residence time for the hatchery fish.
Disease mortality rate for fish with no dominance encounters	Hatchery induced disease mortality rate of natural-origin fish that have not been competitively dominated by hatchery-origin fish. Factors that influence mortality rate are pathogen density, pathogen virulence, and susceptibility of natural-origin fish. Mortality is likely to be delayed. Greater disease mortality rate may result in greater mortality of NTTOC.	Hypothetical range: 0 (minimum), 0 (most likely), and 0.0001 (maximum) developed using best professional judgment based on Busack et al., 2005.
Disease mortality rate for fish with max dominance	Hatchery induced disease mortality rate of natural-origin fish that have been competitively dominated up to the point of death by hatchery-origin fish. Factors that influence mortality rate are pathogen density, pathogen virulence, and susceptibility of natural-origin fish. Mortality is likely to be delayed. Greater disease mortality rate may result in greater mortality of NTTOC.	Hypothetical range: 0 (minimum), 0.01 (most likely), and 1.0 (maximum) developed using best professional judgment based on Busack et al., 2005.

3.1 Additional details related to establishing or deriving certain variables

Some variables related to hatchery-NTTOC interactions (Table 6) were not readily available in a form that could be used for this risk analysis. The methods used to derive these variables are described below.

Percent Population Overlap: Population overlap integrates the potential overlap of NTTOC and hatchery program fish in space and time. The time period of interest for this variable was April through June, the period during which hatchery releases occur. For each hatchery program, an estimate of the NTTOC population abundance for each life history stage (i.e., fry, parr, or smolt) was generated using redd count data (5-year mean) or smolt population estimates generated from smolt trap data (5-year mean). Estimates of fry (Chinook and sockeye) were calculated using the estimated egg deposition (mean number of redds multiplied by mean fecundity), and an estimated 65% egg-to-fry survival rate for Chinook (mean observed values for the Wenatchee population) and 9.4% egg-to-fry survival rate for sockeye (Hyatt et al., 2009). Age specific survival rates for sockeye were derived from Hyatt et al. (2009) and for steelhead were based on Quinn (2005) and data from the Yakima River (G. Temple, WDFW, unpublished data). We used the mean value of each NTTOC life stage abundance (derived from from a mean spawner abundance level and life stage specific survival rates) in the temporal overlap aspect of the model. Spatial overlap for fry and parr was calculated using spatially distributed mean redd abundance in relation to a hatchery release location. We assumed the overlap of smolts from NTTOC and hatchery programs was 100% because all smolts from a NTTOC must pass through a spatial area in common with hatchery fish. For example, if 75% of NTTOC steelhead redds were downstream of a spring Chinook program location, then the program had spatial overlap with 75% of the steelhead parr and 100% of the steelhead smolts. Steelhead young-of-year (age 0) emerge after hatchery spring Chinook have been released and emigrated from the river, so they had no temporal overlap. Temporal overlap for NTTOC smolts was calculated using the cumulative 5-year mean run timing compared to hatchery release timing and estimated residence/migratory time. Temporal overlap of Chinook and sockeye fry was based on the cumulative run timing of Chinook or sockeye fry captured at smolt traps located immediately downstream of spawning areas compared to hatchery release timing and estimated residence/migratory time.

In order to estimate run timing for Okanogan sockeye in the Okanogan River, we used run timing at Rock Island Dam and estimated travel time for sockeye smolts (26 km/day) using PIT tags. From this, we estimated it would take five days for sockeye from the Okanogan to reach Rock Island Dam, so we simply used Rock Island run timing minus five days to estimate run timing. We assumed temporal overlap of parr was 100% because parr would be present throughout the hatchery release period.

For hatchery programs that release fish directly into the Columbia River, run timing of NTTOC at Rock Island Dam by species (subyearling and yearling Chinook, steelhead, and sockeye) compared to hatchery release timing and estimated residence/migratory time was used to estimate temporal overlap.

For each NTTOC-hatchery program interaction we calculated the population overlap by multiplying the spatial and temporal overlap proportions for each life stage of the NTTOC, and summed these integrated spatiotemporal overlap for each life stage to generate the total population overlap for the interaction (Table 7).

Table 7. Population overlap calculation for NTTOC-hatchery program interactions

Life stage	Estimated abundance	Proportion of population at release	Spatial overlap	Temporal overlap	Life stage subtotal
Fry	A	D = A/(A+B+C)	G	J	M = D*G*J
Parr	B	E = B/(A+B+C)	H	K	N = E*H*K
Smolts	C	F = C/(A+B+C)	I	L	O = F*I*L
Total Population Overlap (P)					P = M+N+O

After modeling runs were completed, it was recognized that in certain instances, the youngest NTTOC life stage would not interact with the hatchery program due to spatial isolation. Temporal segregation that would prevent interaction had already been accounted for in the model input data. In these cases, as identified in Table 8, we removed the modeled estimated mortality incurred by the youngest life stage from the risk analysis to more realistically analyze the effect of these interactions. For NTTOC steelhead populations, age 0 fish were not included in any of the analyses because they emerge well after hatchery fish have been released.

Table 8. NTTOC and hatchery program interactions where the youngest NTTOC age class (age 0) was removed from the risk analysis after modeling was completed.

NTTOC	Hatchery Program	NTTOC	Hatchery Program
Sockeye (Okanogan)	Bonaparte Pond Summer Chinook (CCPUD)	Spring Chinook (Chiwawa River)	Columbia Spring Chinook (Chief Joe)
Sockeye (Okanogan)	Bonaparte Pond Summer Chinook (Chief Joe Hatchery)	Spring Chinook (Chiwawa River)	Columbia Subyearling Summer Chinook (Chief Joe)
Sockeye (Okanogan)	Columbia Hatchery Fall Chinook (Priest Rapids)	Spring Chinook (Chiwawa River)	Columbia Subyearling Summer Chinook (Wells)
Sockeye (Okanogan)	Columbia Spring Chinook (Chief Joe)	Spring Chinook (Chiwawa River)	Columbia Summer Chinook (Turtle Rock)
Sockeye (Okanogan)	Columbia Subyearling Summer Chinook (Chief Joe)	Spring Chinook (Chiwawa River)	Columbia Summer Steelhead (Wells)
Sockeye (Okanogan)	Columbia Subyearling Summer Chinook (Wells)	Spring Chinook (Chiwawa River)	Columbia Yearling Summer Chinook (Wells)
Sockeye (Okanogan)	Columbia Summer Chinook (Turtle Rock)	Spring Chinook (Chiwawa River)	Columbia Yearling Summer Chinook (Chief Joe)
Sockeye (Okanogan)	Columbia Summer Steelhead (Wells)	Spring Chinook (Little Wenatchee River)	Columbia Hatchery Fall Chinook (Priest Rapids)
Sockeye (Okanogan)	Columbia Yearling Summer Chinook (Wells)	Spring Chinook (Little Wenatchee River)	Columbia Spring Chinook (Chief Joe)
Sockeye (Okanogan)	Columbia Yearling Summer Chinook (Chief Joe)	Spring Chinook (Little Wenatchee River)	Columbia Subyearling Summer Chinook (Chief Joe)
Sockeye (Okanogan)	Okanogan Summer Steelhead	Spring Chinook (Little Wenatchee River)	Columbia Subyearling Summer Chinook (Wells)
Sockeye (Okanogan)	Omak Pond Subyearling Summer Chinook (Chief Joe Hatchery)	Spring Chinook (Little Wenatchee River)	Columbia Summer Chinook (Turtle Rock)
Sockeye (Okanogan)	Omak Pond Yearling Summer Chinook (Chief Joe Hatchery)	Spring Chinook (Little Wenatchee River)	Columbia Summer Steelhead (Wells)
Sockeye (Okanogan)	Omak Spring Chinook (Chief Joe Hatchery)	Spring Chinook (Little Wenatchee River)	Columbia Yearling Summer Chinook (Wells)
Sockeye (Okanogan)	Omak Summer Steelhead	Spring Chinook (Little Wenatchee River)	Columbia Yearling Summer Chinook (Chief Joe)
Sockeye (Okanogan)	Riverside Pond Summer Chinook (Chief Joe Hatchery)	Spring Chinook (Methow River)	Columbia Hatchery Fall Chinook (Priest Rapids)
Sockeye (Okanogan)	Salmon Spring Chinook (Chief Joe Hatchery)	Spring Chinook (Methow River)	Columbia Spring Chinook (Chief Joe)
Sockeye (Okanogan)	Salmon Summer Steelhead	Spring Chinook (Methow River)	Columbia Subyearling Summer Chinook (Chief Joe)
Sockeye (Okanogan)	Similkameen Pond Summer Chinook (CCPUD)	Spring Chinook (Methow River)	Columbia Subyearling Summer Chinook (Wells)
Sockeye (Wenatchee River)	Chiwawa Coho	Spring Chinook (Methow River)	Columbia Summer Chinook (Turtle Rock)
Sockeye (Wenatchee River)	Chiwawa Spring Chinook	Spring Chinook (Methow River)	Columbia Summer Steelhead (Wells)
Sockeye (Wenatchee River)	Chiwawa Summer Steelhead	Spring Chinook (Methow River)	Columbia Yearling Summer Chinook (Wells)
Sockeye (Wenatchee River)	Chumstick Coho	Spring Chinook (Methow River)	Columbia Yearling Summer Chinook (Chief Joe)
Sockeye (Wenatchee River)	Columbia Hatchery Fall Chinook (Priest Rapids)	Spring Chinook (Nason Creek)	Columbia Hatchery Fall Chinook (Priest Rapids)
Sockeye (Wenatchee River)	Columbia Spring Chinook (Chief Joe)	Spring Chinook (Nason Creek)	Columbia Spring Chinook (Chief Joe)
Sockeye (Wenatchee River)	Columbia Subyearling Summer Chinook (Chief Joe)	Spring Chinook (Nason Creek)	Columbia Subyearling Summer Chinook (Chief Joe)

Sockeye (Wenatchee River)	Columbia Subyearling Summer Chinook (Wells)	Spring Chinook (Nason Creek)	Columbia Subyearling Summer Chinook (Wells)
Sockeye (Wenatchee River)	Columbia Summer Chinook (Turtle Rock)	Spring Chinook (Nason Creek)	Columbia Summer Chinook (Turtle Rock)
Sockeye (Wenatchee River)	Columbia Summer Steelhead (Wells)	Spring Chinook (Nason Creek)	Columbia Summer Steelhead (Wells)
Sockeye (Wenatchee River)	Columbia Yearling Summer Chinook (Wells)	Spring Chinook (Nason Creek)	Columbia Yearling Summer Chinook (Wells)
Sockeye (Wenatchee River)	Columbia Yearling Summer Chinook (Chief Joe)	Spring Chinook (Nason Creek)	Columbia Yearling Summer Chinook (Chief Joe)
Sockeye (Wenatchee River)	Icicle Coho Salmon	Spring Chinook (Twisp River)	Columbia Hatchery Fall Chinook (Priest Rapids)
Sockeye (Wenatchee River)	Icicle Spring Chinook	Spring Chinook (Twisp River)	Columbia Spring Chinook (Chief Joe)
Sockeye (Wenatchee River)	Nason Coho	Spring Chinook (Twisp River)	Columbia Subyearling Summer Chinook (Chief Joe)
Sockeye (Wenatchee River)	Nason Spring Chinook	Spring Chinook (Twisp River)	Columbia Subyearling Summer Chinook (Wells)
Sockeye (Wenatchee River)	Nason Summer Steelhead	Spring Chinook (Twisp River)	Columbia Summer Chinook (Turtle Rock)
Sockeye (Wenatchee River)	Wenatchee Summer Chinook	Spring Chinook (Twisp River)	Columbia Summer Steelhead (Wells)
Sockeye (Wenatchee River)	Wenatchee Summer Steelhead (HxH)	Spring Chinook (Twisp River)	Columbia Yearling Summer Chinook (Wells)
Sockeye (Wenatchee River)	Wenatchee Summer Steelhead (WxW)	Spring Chinook (Twisp River)	Columbia Yearling Summer Chinook (Chief Joe)
Spring Chinook (Chewuch River)	Columbia Hatchery Fall Chinook (Priest Rapids)	Spring Chinook (White River)	Columbia Hatchery Fall Chinook (Priest Rapids)
Spring Chinook (Chewuch River)	Columbia Spring Chinook (Chief Joe)	Spring Chinook (White River)	Columbia Spring Chinook (Chief Joe)
Spring Chinook (Chewuch River)	Columbia Subyearling Summer Chinook (Chief Joe)	Spring Chinook (White River)	Columbia Subyearling Summer Chinook (Chief Joe)
Spring Chinook (Chewuch River)	Columbia Subyearling Summer Chinook (Wells)	Spring Chinook (White River)	Columbia Subyearling Summer Chinook (Wells)
Spring Chinook (Chewuch River)	Columbia Summer Chinook (Turtle Rock)	Spring Chinook (White River)	Columbia Summer Chinook (Turtle Rock)
Spring Chinook (Chewuch River)	Columbia Summer Steelhead (Wells)	Spring Chinook (White River)	Columbia Summer Steelhead (Wells)
Spring Chinook (Chewuch River)	Columbia Yearling Summer Chinook (Wells)	Spring Chinook (White River)	Columbia Yearling Summer Chinook (Wells)
Spring Chinook (Chewuch River)	Columbia Yearling Summer Chinook (Chief Joe)	Spring Chinook (White River)	Columbia Yearling Summer Chinook (Chief Joe)
Spring Chinook (Chiwawa River)	Columbia Hatchery Fall Chinook (Priest Rapids)		

Dominance Mode: Dominance mode was established based on literature review values (Table 9). However, for the model runs, dominance mode was held constant using dominance mode 3, where hatchery and natural origin fish are equally dominant, because the HETT did not have a compelling reason to choose a dominance mode where either hatchery or NTTOC fish would be dominant. PCD Risk 1 does not allow a stochastic range to be entered for dominance mode, so only one value could be used. In order to expedite the modeling effort, one dominance mode was chosen for all model runs.

Table 9. Dominance Mode based on size differential between hatchery and natural origin fish.

Mode and Scenario	Difference in size (hatchery fish size relative to wild fish)						
	<-25	**-25 to -15**	**-15 to -5**	**-5 to 5**	**5 to 15**	**15 to 25**	**>25**
1 – Hatchery fish is always dominant over wild fish (e.g., complete dominance)	100	100	100	100	100	100	100
2 - Hatchery fish is more dominant than wild fish (e.g., more aggressive)	10	20	30	70	90	95	100
3 - Hatchery fish is equally dominant as wild fish (e.g., natural style rearing)	0	10	20	50	70	90	100
4 - Hatchery fish is less dominant than wild fish (e.g., prior residence advantage)	0	5	10	30	70	80	90
5 – Hatchery fish is never dominant over wild fish (e.g., no interactions, migrator)	0	0	0	0	0	0	0
6 – User specified							

Maximum daily encounters: The maximum daily encounters variable is discussed in detail in Busack et al. (2005). The basic premise is that it uses the estimated carrying capacity of the river to estimate the maximum number of encounters with hatchery fish a natural origin fish would experience given the carrying capacity, and the number of hatchery and natural origin (NTTOC) fish. We use the best available estimates of intrinsic potential (i.e. carrying capacity) to calculate maximum daily encounters (Table 10). The formula given by Busack et al. (2005) is:

$$MDE = pHK * pWK * 10$$

where pHK = proportion of river carrying capacity used by hatchery fish (in the absence of wild fish), and pWK = proportion of the river carrying capacity used by wild fish (in the absence of hatchery fish). This expression is multiplied by a constant (10) to meet PCD Risk 1 data entry requirements.

To calculate this we used the following approach: pHK was calculated by dividing the number of hatchery fish released by the mean number of territories available in the river. The mean number of territories was established by dividing the stream area (estimated in a GIS) by territory size. The territory size was estimated based on fish size (fork length) according to the work by Grant and Kramer (1990) where:

$$\text{territory size} = 2.61*\log(\text{fish length})-2.83$$

This approach was used because hatchery fish do not necessarily occupy the full extent of a stream, so using estimates of carrying capacity or intrinsic potential could not be applied to hatchery fish. Therefore, we chose to estimate the proportion of the carrying capacity of a river occupied by hatchery fish based on the number of territories required by a hatchery program divided by the total number of territories in the section of the river occupied by hatchery fish.

pWK was calculated by dividing the population estimates of NTTOC by the intrinsic potential (Table 10) of that population (river).

Table 10. Intrinsic Potential for NTTOC with source or method information

Drainage	Species	Intrinsic Potential	Comment
Methow	Pacific Lamprey	--	No population estimates are available
Okanogan	Pacific Lamprey	--	No population estimates are available
Wenatchee	Pacific Lamprey	--	No population estimates are available
Okanogan	Sockeye	2,581,004	Surface-Area Basis from the "Lake Osoyoos Sockeye Smolt Capacity" document by T. Hillman
Wenatchee	Sockeye	2,250,968	Surface-Area Basis from the "Lake Wenatchee Sockeye Smolt Capacity" document by T. Hillman
Methow	Spring Chinook	296,162	Beverton-Holt model using Total stream area weighted by intrinsic potential and temp limited (km2). By T. Hillman
Wenatchee	Spring Chinook	308,695	Beverton-Holt model using Total stream area weighted by intrinsic potential and temp limited (km2). By T. Hillman
Methow	Summer Chinook	17,106,265	Based on Wenatchee 458,613 fry/km, @ 37.3 km spawning habitat in the Methow River. From T. Hillman, 2011.
Okanogan	Summer Chinook	13,850,113	Based on Wenatchee 458,613 fry/km, @ 30.2 km spawning habitat in the Okanoagn and Similkameen rivers. From T. Hillman, 2011.
Wenatchee	Summer Chinook	20,500,000	Maximum observed migrant fry count. Wenatchee has 44.7 km spawning habitat, resulting in 458,613 fry/km. From T. Hillman, 2011.
Methow	Summer Steelhead	90,238	The upper total smolt estimate based on intrinsic potential (km^2): Mullan et al. (1992) reported total steelhead smolt production at RI Dam as 232,401 to 299,503. This converts to about 258,223-332,781 smolts leaving the mouths of tributary subbasins if we assume a 10% loss between the subbasins and RI Dam. In turn, this estimate converts to 17,546-22,612 smolts per km^2 of stream area weighted by intrinsic potential and temperature limited.
Okanogan	Summer	124,529	The upper total smolt estimate based on intrinsic potential (km^2):

Drainage	Species	Intrinsic Potential	Comment
	Steelhead		Mullan et al. (1992) reported total steelhead smolt production at RI Dam as 232,401 to 299,503. This converts to about 258,223-332,781 smolts leaving the mouths of tributary subbasins if we assume a 10% loss between the subbasins and RI Dam. In turn, this estimate converts to 17,546-22,612 smolts per km^2 of stream area weighted by intrinsic potential and temperature limited.
Wenatchee	Summer Steelhead	97,779	The upper total smolt estimate based on intrinsic potential (km^2): Mullan et al. (1992) reported total steelhead smolt production at RI Dam as 232,401 to 299,503. This converts to about 258,223-332,781 smolts leaving the mouths of tributary subbasins if we assume a 10% loss between the subbasins and RI Dam. In turn, this estimate converts to 17,546-22,612 smolts per km^2 of stream area weighted by intrinsic potential and temperature limited.
Methow	Westslope Cutthroat	--	No population estimates are available
Wenatchee	Westslope Cutthroat	--	No population estimates are available
Wenatchee	Coho	386,491	We used two methods to estimate the capacity of naturally produced smolts in the Wenatchee and Methow basins: 1) the smolt production model described by Zillges (1977) and 2) Ecosystem Diagnosis and Treatment (EDT) (Mobrand et. al. 1997). In some cases, such as in the Little Wenatchee and the White River, the two estimates were almost identical, lending confidence to the estimates in these tributaries. In other cases, such as Icicle Creek and Nason Creek, the EDT estimates appeared unrealistically low, based on data collected to date, and the Zillges (1977) method appeared unrealistically high. In cases with a discrepancy between the estimates, we used the mid-point between the two values to estimate capacity. Zillges, G. 1977. Methodology for determining Puget Sound coho escapement goals, escapement estimates, 1977 pre-season run size prediction and in-season run assessment. Washington State Department of Fisheries, Technical Report No. 28. 66 pgs.
Methow	Coho	503,193	We used two methods to estimate the capacity of naturally produced smolts in the Wenatchee and Methow basins: 1) the smolt production model described by Zillges (1977) and 2) Ecosystem Diagnosis and Treatment (EDT) (Mobrand et. al. 1997). In some cases, such as in the Little Wenatchee and the White River, the two estimates were almost identical, lending confidence to the estimates in these tributaries. In other cases, such as Icicle Creek and Nason Creek, the EDT estimates appeared unrealistically low, based on data collected to date, and the Zillges (1977) method appeared unrealistically high. In cases with a discrepancy between the estimates, we used the mid-point between the two values to estimate capacity. Zillges, G. 1977. Methodology for determining Puget Sound coho escapement goals, escapement estimates, 1977 pre-season run size prediction and in-season run assessment.

Drainage	Species	Intrinsic Potential	Comment
			Washington State Department of Fisheries, Technical Report No. 28. 66 pgs.

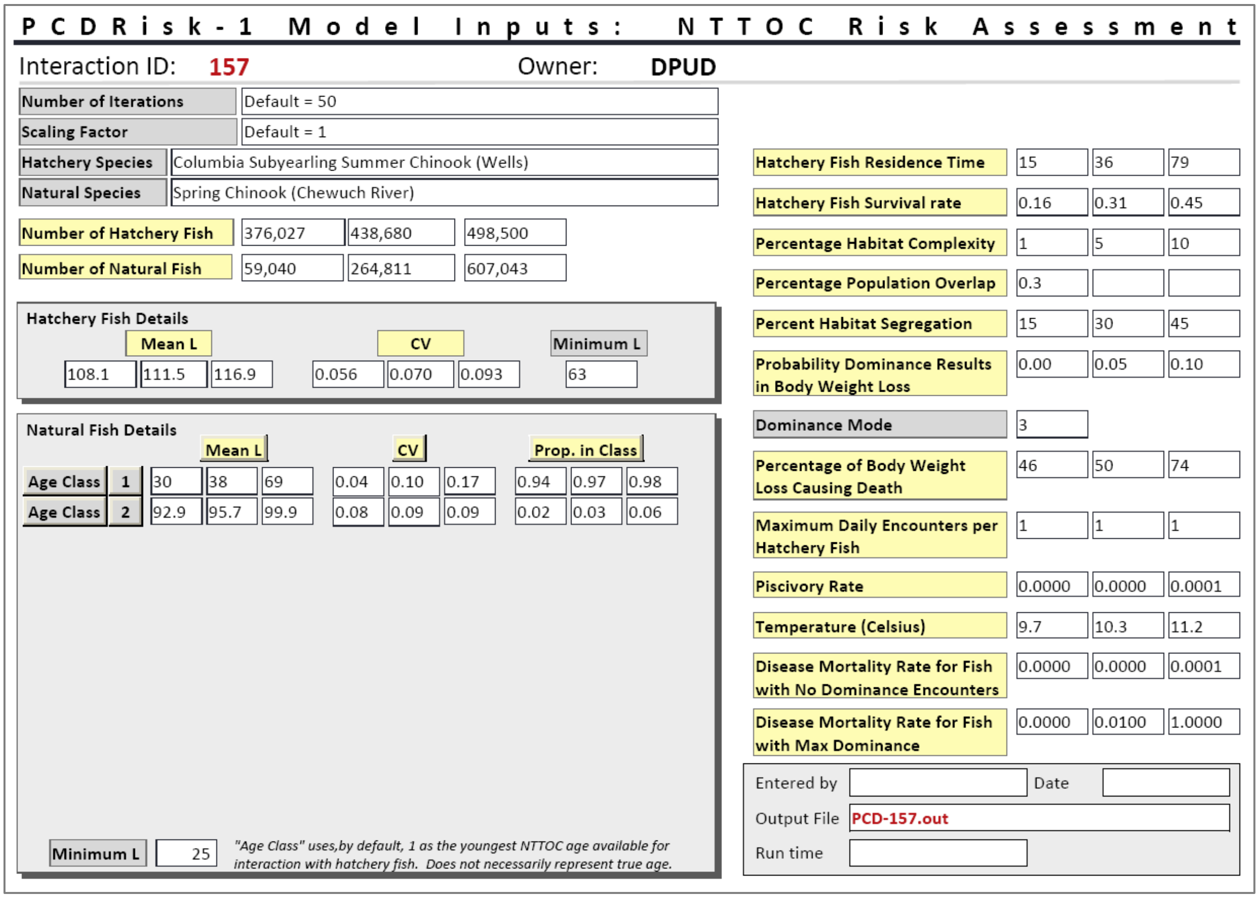
Best Professional Judgment: Best professional judgment was used to populate several variables (Habitat Segregation, Habitat Complexity, Piscivory Rate [in part – also used literature values], Dominance Mode, Probability Dominance Results in Body Weight Loss, Disease Mortality Rate for Fish with No Dominance Encounters, Disease Mortality Rate for Fish with Max Dominance) for which no data or literature values were available. Scientists familiar with the hatchery programs, the NTTOC populations, and the upper Columbia basin watersheds contributed to this effort (Table 11).

Table 11. Scientists who contributed best professional judgment to populate PCD Risk 1 input variables

Name	Affiliation	HETT Member
John Arterburn	Coleville Confederated Tribes	no
Charles Snow	WDFW	no
John Crandall	Wild Fish Conservancy	no
Kirk Truscott	Coleville Confederated Tribes	no
David Hopkins	USFWS	no
Matt Cooper	USFWS	yes
Tracy Hillman	BioAnalysts	yes
Keely Murdoch	Yakama Nation	yes
Todd Pearsons	Grant PUD	yes
Andrew Murdoch	WDFW	yes
Greg Mackey	Douglas PUD	yes
Joe Miller	Chelan PUD	yes

3.2 Model Runs

The "owners" of hatchery programs (Table 1) each ran the PCD Risk 1 model for interactions that were identified between their hatchery programs and NTTOC. Each participant was provided a PDF document that contained all the data required to enter and run PCD Risk 1 for their programs' interactions (see Figure 1 for an example). Data were manually entered into PCD Risk 1 (PCD Risk 1 does not allow batch data entry).



PCDRisk-1 Model Inputs: NTTOC Risk Assessment

Interaction ID: 157 Owner: DPUD

Number of Iterations	Default = 50		
Scaling Factor	Default = 1		
Hatchery Species	Columbia Subyearling Summer Chinook (Wells)		
Natural Species	Spring Chinook (Chewuch River)		
Number of Hatchery Fish	376,027	438,680	498,500
Number of Natural Fish	59,040	264,811	607,043

Hatchery Fish Details

Mean L			CV			Minimum L
108.1	111.5	116.9	0.056	0.070	0.093	63

Natural Fish Details

	Mean L			CV			Prop. in Class		
Age Class 1	30	38	69	0.04	0.10	0.17	0.94	0.97	0.98
Age Class 2	92.9	95.7	99.9	0.08	0.09	0.09	0.02	0.03	0.06

Minimum L 25

"Age Class" uses,by default, 1 as the youngest NTTOC age available for interaction with hatchery fish. Does not necessarily represent true age.

Hatchery Fish Residence Time	15	36	79
Hatchery Fish Survival rate	0.16	0.31	0.45
Percentage Habitat Complexity	1	5	10
Percentage Population Overlap	0.3		
Percent Habitat Segregation	15	30	45
Probability Dominance Results in Body Weight Loss	0.00	0.05	0.10
Dominance Mode	3		
Percentage of Body Weight Loss Causing Death	46	50	74
Maximum Daily Encounters per Hatchery Fish	1	1	1
Piscivory Rate	0.0000	0.0000	0.0001
Temperature (Celsius)	9.7	10.3	11.2
Disease Mortality Rate for Fish with No Dominance Encounters	0.0000	0.0000	0.0001
Disease Mortality Rate for Fish with Max Dominance	0.0000	0.0100	1.0000

Entered by Date

Output File PCD-157.out

Run time

Figure 1. Example of PCD Risk 1 data entry form provided to program owners.

Participants conducted their model runs and provided the output data in a template format that was ready for transfer to the NTTOC database (Figure 2). This database housed all the model input data, standard lookup values, and model-run results. It was also used to generate the data entry forms (Figure 1). This approach reduced data errors by providing a stabile database to provide data for entry into the model, house the model output and relate it to the model input data, and perform complex queries for data analysis.

Model runs were conducted using 50 iterations as the standard, and a scaling factor of 1. Modelers were allowed to modify these parameters if the model was running too slowly (some PCD Risk 1 model runs can takes days to run to completion). The vast majority of runs were completed using 50 iterations and a scaling factor of 1. Participants running the model could deviate from the provided data to: 1) reduce the number of iterations for very slow running models (this was rarely done), 2) reduce the scaling factor to speed up the model run, and 3) omit an age class that represented a proportion of the NTTOC population less than 0.01 (PCD Risk 1 only allows two decimal places [Figure 1] in the Proportion in Age Class fields and does not allow an age class to occupy 0.00 of the population). Omitting an age class that made up an extremely low proportion of the population would have negligible effect on the model results. Participants kept track of which program ran and which failed to run or ran extremely slowly.

Any deviations from the default model parameters were noted in case deviating from the standard parameters effected results.

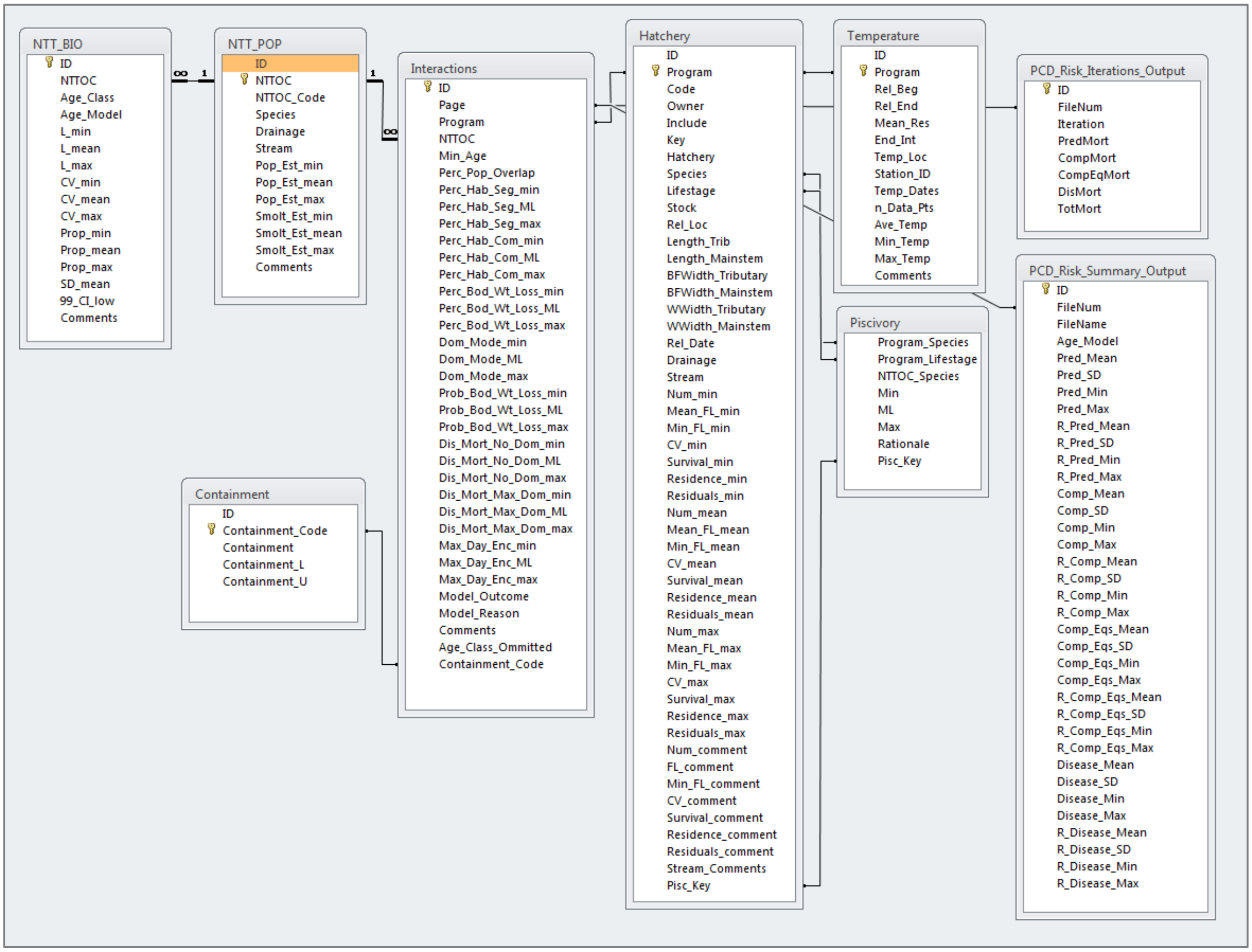


Figure 2. NTTOC Database Schema

3.3 Analysis

PCD Risk 1 model output was analyzed first to assess if individual programs exceeded their containment objectives, second to estimate the cumulative effects of multiple hatchery programs on a NTTOC population, and third, in cases where the containment objectives were exceeded, to test input variables to identify the factor(s) that most influenced effects of hatchery programs on NTTOC. The data are presented at the lowest NTTOC population level, which arguably is often at a finer scale than that of independent NTTOC populations. However, this scale allowed us to perform a more targeted investigation of the effects of individual hatchery programs on NTTOC. We then conducted "roll-up" analyses, where the interactions between cumulative hatchery programs and NTTOC were analyzed at the sub-population level (e.g., major tributary or reach within a basin, such as the Chiwawa River within the Wenatchee Basin), and at the population (basin) level (e.g., Wenatchee steelhead). This offers a more holistic view of the interactions between hatchery programs and NTTOC. Finally, we analyzed the effect of the programs on NTTOC in the Columbia River downstream to McNary Dam. We assumed that the effects of interactions were additive. For example, if one hatchery program resulted in 10 mortalities and another hatchery program resulted in 15 mortalities, then the two programs combined would result in 25 mortalities. Additional analyses explored the variability in the results, the sources of mortality, and examined trends or patterns in the results

4.0 RESULTS

Results are split into three sections based on geography (Figure 3). First, the results from interactions that occur between programs that release fish within the NTTOC basin are presented, second, results from interactions between NTTOC and hatchery programs that release fish in the Columbia River are presented, and third, results of the combined interactions between programs that release fish in-basin and in the Columbia River are presented. Within these hierarchical categories, results are presented with the finest scale modelling (every identified interaction) presented first, followed by roll-up results where the fine-scale modelling results are integrated at the sub-population (tributary or reach within a basin) and then the population (basin) level. For simplicity, the fine-scale results are omitted from the In-Basin plus Columbia River results.

Geographic Scope	
	NTTOC Population Level
In-Basin	
	Fine Scale
	Sub-Population
	Population (basin level)
Columbia River	
	Fine Scale
	Sub-Population
	Population (basin level)
In-Basin + Columbia River	
	Sub-Population
	Population (basin level)

Figure 3. Geographic hierarchy of hatchery program interactions with NTTOC population level structure of interactions.

All interaction results for each program and associated roll-up levels are presented tables 12-23.

4.1 In-Basin Results

None of the NTTOC-hatchery program interactions were estimated to exceed the containment objectives at the within-basin (excluding Columbia River programs) individual program-NTTOC level (Tables 12-14), the sub-population roll-up level (Table 15), or the population roll-up level (Table 16). Therefore, within-basin hatchery programs (that were successfully modelled) acting individually, or combined at the sub-population or population levels are estimated to be within containment objectives. Estimated mortality rates were low, with NTTOC rarely exceeding 1% mortality.

4.2 Columbia River Results

NTTOC-hatchery program interactions were estimated to narrowly exceed the 5% containment objectives at the fine-scale individual program-NTTOC level for Twisp River summer steelhead interacting with Chelan Falls yearling summer Chinook (estimated mortality = 5.08%, Table 17), Omak Creek summer steelhead interacting with Wells Hatchery summer steelhead (estimated mortality = 5.14%, Table 18), and Chiwawa River summer steelhead interacting with Wells Hatchery summer steelhead (estimated mortality = 5.15%, Table 19). These programs also continued to exceed the containment objective in the roll-up of the Columbia River programs (Tables 20 and 24). This is to be expected because additional mortality is additive to the initial mortality rate that exceeded the containment objective.

4.3 Combined In-Basin and Columbia River Results

When the in-basin hatchery releases and Columbia River releases were combined, at the sub-population roll-up level, the same three steelhead NTTOC exceeded the containment objectives (Tables 22 and 23). This is to be expected because additional mortality is additive to the initial mortality rate that exceeded the containment objective. No additional NTTOC exceeded containment objectives.

Table 12. PCD Risk 1 modelling results for interactions between Methow Basin NTTOC and hatchery programs releasing fish within the Methow Basin.

NTTOC Population			Hatchery Program							
Species	Drainage	Stream	Species	Life Stage	Hatchery	Drainage	Stream	Estimated Mortality (%)	Containment Objective (%)	Result
Spring Chinook	Methow	Chewuch River	Coho	yearling	YN	Methow	Methow River	0.03	5	Within
Spring Chinook	Methow	Chewuch River	Coho	yearling	YN	Methow	Twisp River	0.01	5	Within
Spring Chinook	Methow	Chewuch River	Spring Chinook	yearling	Methow	Methow	Methow River	0.05	5	Within
Spring Chinook	Methow	Chewuch River	Spring Chinook	yearling	Methow	Methow	Twisp River	0.04	5	Within
Spring Chinook	Methow	Chewuch River	Spring Chinook	yearling	Winthrop	Methow	Methow River	0.05	5	Within
Spring Chinook	Methow	Chewuch River	Summer steelhead	yearling	Wells	Methow	Methow River	0.01	5	Within
Spring Chinook	Methow	Chewuch River	Summer steelhead	yearling	Wells	Methow	Twisp River	0.01	5	Within
Spring Chinook	Methow	Chewuch River	Summer steelhead	yearling	Winthrop	Methow	Methow River	0.03	5	Within
Spring Chinook	Methow	Chewuch River	Summer steelhead	two year	Winthrop	Methow	Methow River	0.03	5	Within
Spring Chinook	Methow	Methow River	Coho	yearling	YN	Methow	Methow River	0.04	5	Within
Spring Chinook	Methow	Methow River	Coho	yearling	YN	Methow	Twisp River	0.01	5	Within
Spring Chinook	Methow	Methow River	Spring Chinook	yearling	Methow	Methow	Twisp River	0.02	5	Within
Spring Chinook	Methow	Methow River	Summer steelhead	yearling	Wells	Methow	Methow River	0.01	5	Within
Spring Chinook	Methow	Methow River	Summer steelhead	yearling	Wells	Methow	Twisp River	0.01	5	Within
Spring Chinook	Methow	Methow River	Summer steelhead	yearling	Winthrop	Methow	Methow River	0.01	5	Within
Spring Chinook	Methow	Methow River	Summer steelhead	two year	Winthrop	Methow	Methow River	0.01	5	Within

NTTOC Population			Hatchery Program							
Species	Drainage	Stream	Species	Life Stage	Hatchery	Drainage	Stream	Estimated Mortality (%)	Containment Objective (%)	Result
Spring Chinook	Methow	Twisp River	Coho	yearling	YN	Methow	Beaver Creek	0.00	5	Within
Spring Chinook	Methow	Twisp River	Coho	yearling	YN	Methow	Methow River	0.05	5	Within
Spring Chinook	Methow	Twisp River	Coho	yearling	YN	Methow	Twisp River	0.01	5	Within
Spring Chinook	Methow	Twisp River	Spring Chinook	yearling	Methow	Methow	Methow River	0.24	5	Within
Spring Chinook	Methow	Twisp River	Spring Chinook	yearling	Winthrop	Methow	Methow River	0.23	5	Within
Spring Chinook	Methow	Twisp River	Summer steelhead	yearling	Wells	Methow	Methow River	0.01	5	Within
Spring Chinook	Methow	Twisp River	Summer steelhead	yearling	Wells	Methow	Twisp River	0.13	5	Within
Spring Chinook	Methow	Twisp River	Summer steelhead	two year	Winthrop	Methow	Methow River	0.09	5	Within
Spring Chinook	Methow	Twisp River	Summer steelhead	yearling	Winthrop	Methow	Methow River	0.04	5	Within
Summer Chinook	Methow	Methow River	Coho	yearling	YN	Methow	Beaver Creek	0.29	10	Within
Summer Chinook	Methow	Methow River	Coho	yearling	YN	Methow	Methow River	0.35	10	Within
Summer Chinook	Methow	Methow River	Coho	yearling	YN	Methow	Twisp River	1.06	10	Within
Summer Chinook	Methow	Methow River	Spring Chinook	yearling	Methow	Methow	Methow River	0.15	10	Within
Summer Chinook	Methow	Methow River	Spring Chinook	yearling	Methow	Methow	Twisp River	0.09	10	Within
Summer Chinook	Methow	Methow River	Spring Chinook	yearling	Winthrop	Methow	Methow River	0.16	10	Within
Summer Chinook	Methow	Methow River	Summer steelhead	yearling	Wells	Methow	Methow River	0.01	10	Within

NTTOC Population			Hatchery Program							
Species	Drainage	Stream	Species	Life Stage	Hatchery	Drainage	Stream	Estimated Mortality (%)	Containment Objective (%)	Result
Summer Chinook	Methow	Methow River	Summer steelhead	yearling	Wells	Methow	Twisp River	0.03	10	Within
Summer Chinook	Methow	Methow River	Summer steelhead	yearling	Winthrop	Methow	Methow River	0.04	10	Within
Summer Chinook	Methow	Methow River	Summer steelhead	two year	Winthrop	Methow	Methow River	0.02	10	Within
Summer Steelhead	Methow	Chewuch River	Spring Chinook	yearling	Methow	Methow	Methow River	0.44	5	Within
Summer Steelhead	Methow	Chewuch River	Spring Chinook	yearling	Methow	Methow	Twisp River	0.13	5	Within
Summer Steelhead	Methow	Chewuch River	Summer steelhead	yearling	Wells	Methow	Methow River	0.14	5	Within
Summer Steelhead	Methow	Chewuch River	Summer steelhead	yearling	Wells	Methow	Twisp River	0.20	5	Within
Summer Steelhead	Methow	Chewuch River	Summer steelhead	two year	Winthrop	Methow	Methow River	0.20	5	Within
Summer Steelhead	Methow	Chewuch River	Summer steelhead	yearling	Winthrop	Methow	Methow River	0.22	5	Within
Summer Steelhead	Methow	Methow River	Summer steelhead	yearling	Wells	Methow	Twisp River	0.20	5	Within
Summer Steelhead	Methow	Twisp River	Spring Chinook	yearling	Methow	Methow	Methow River	0.27	5	Within
Summer Steelhead	Methow	Twisp River	Spring Chinook	yearling	Methow	Methow	Twisp River	0.07	5	Within
Summer Steelhead	Methow	Twisp River	Spring Chinook	yearling	Winthrop	Methow	Methow River	1.07	5	Within
Summer Steelhead	Methow	Twisp River	Summer steelhead	yearling	Wells	Methow	Methow River	0.07	5	Within
Summer Steelhead	Methow	Twisp River	Summer steelhead	yearling	Winthrop	Methow	Methow River	0.15	5	Within
Summer Steelhead	Methow	Twisp River	Summer steelhead	two year	Winthrop	Methow	Methow River	0.11	5	Within

Table 13. PCD Risk 1 modelling results for interactions between Okanogan Basin NTTOC and hatchery programs releasing fish within the Okanogan Basin.

NTTOC Population			Hatchery Program							
Species	Drainage	Stream	Species	Life Stage	Hatchery	Drainage	Stream	Estimated Mortality (%)	Containment Objective (%)	Result
Sockeye	Okanogan	Okanogan River	Summer Steelhead	yearling	Wells	Okanogan	Okanogan River	0.00	10	Within
Sockeye	Okanogan	Okanogan River	Summer Steelhead	yearling	Wells	Okanogan	Omak Creek	0.00	10	Within
Sockeye	Okanogan	Okanogan River	Summer Steelhead	yearling	Wells	Okanogan	Salmon Creek	0.00	10	Within
Summer Chinook	Okanogan	Okanogan River	Summer Steelhead	yearling	Wells	Okanogan	Okanogan River	0.01	10	Within
Summer Chinook	Okanogan	Okanogan River	Summer Steelhead	yearling	Wells	Okanogan	Omak Creek	0.01	10	Within
Summer Chinook	Okanogan	Okanogan River	Summer Steelhead	yearling	Wells	Okanogan	Salmon Creek	0.01	10	Within
Summer Steelhead	Okanogan	Okanogan River	Summer Steelhead	yearling	Wells	Okanogan	Omak Creek	0.01	5	Within
Summer Steelhead	Okanogan	Okanogan River	Summer Steelhead	yearling	Wells	Okanogan	Salmon Creek	0.01	5	Within
Summer Steelhead	Okanogan	Omak Creek	Summer Steelhead	yearling	Wells	Okanogan	Okanogan River	0.37	5	Within
Summer Steelhead	Okanogan	Omak Creek	Summer Steelhead	yearling	Wells	Okanogan	Salmon Creek	0.14	5	Within

Table 14. PCD Risk 1 modelling results for interactions between Wenatchee Basin NTTOC and hatchery programs releasing fish within the Wenatchee Basin.

NTTOC Population			Hatchery Program							
Species	Drainage	Stream	Species	Life Stage	Hatchery	Drainage	Stream	Estimated Mortality (%)	Containment Objective (%)	Result
Sockeye	Wenatchee	Wenatchee River	Coho	yearling	YN	Wenatchee	Chiwawa River	0.00	10	Within
Sockeye	Wenatchee	Wenatchee River	Coho	yearling	YN	Wenatchee	Chumstick Creek	0.00	10	Within
Sockeye	Wenatchee	Wenatchee River	Coho	yearling	YN	Wenatchee	Icicle Creek	0.01	10	Within
Sockeye	Wenatchee	Wenatchee River	Coho	yearling	YN	Wenatchee	Little Wenatchee River	0.05	10	Within
Sockeye	Wenatchee	Wenatchee River	Coho	yearling	YN	Wenatchee	White River	0.07	10	Within
Sockeye	Wenatchee	Wenatchee River	Spring Chinook	yearling	Eastbank	Wenatchee	Chiwawa River	0.00	10	Within
Sockeye	Wenatchee	Wenatchee River	Spring Chinook	yearling	Leavenworth	Wenatchee	Icicle Creek	0.11	10	Within
Sockeye	Wenatchee	Wenatchee River	Spring Chinook	yearling	Nason Creek	Wenatchee	Nason Creek	0.00	10	Within
Sockeye	Wenatchee	Wenatchee River	Spring Chinook	yearling	White River	Wenatchee	White River	0.04	10	Within
Sockeye	Wenatchee	Wenatchee River	Summer Chinook	yearling	Eastbank	Wenatchee	Wenatchee River	0.83	10	Within
Sockeye	Wenatchee	Wenatchee River	Summer Steelhead	yearling	Eastbank	Wenatchee	Chiwawa River	0.00	10	Within
Sockeye	Wenatchee	Wenatchee River	Summer Steelhead	yearling	Eastbank	Wenatchee	Nason Creek	0.01	10	Within
Sockeye	Wenatchee	Wenatchee River	Summer Steelhead	yearling	Eastbank	Wenatchee	Wenatchee River	0.01	10	Within
Sockeye	Wenatchee	Wenatchee River	Summer Steelhead	yearling	Eastbank	Wenatchee	Wenatchee River	0.00	10	Within
Spring Chinook	Wenatchee	Chiwawa River	Coho	yearling	YN	Wenatchee	Icicle Creek	0.13	5	Within
Spring Chinook	Wenatchee	Chiwawa River	Coho	yearling	YN	Wenatchee	Nason Creek	0.04	5	Within

NTTOC Population			Hatchery Program							
Species	**Drainage**	**Stream**	**Species**	**Life Stage**	**Hatchery**	**Drainage**	**Stream**	**Estimated Mortality (%)**	**Containment Objective (%)**	**Result**
Spring Chinook	Wenatchee	Chiwawa River	Coho	yearling	YN	Wenatchee	White River	0.05	5	Within
Spring Chinook	Wenatchee	Chiwawa River	Sockeye	yearling	Lake Wenatchee Net Pens	Wenatchee	Wenatchee River	0.09	5	Within
Spring Chinook	Wenatchee	Chiwawa River	Spring Chinook	yearling	Leavenworth	Wenatchee	Icicle Creek	0.09	5	Within
Spring Chinook	Wenatchee	Chiwawa River	Spring Chinook	yearling	Nason Creek	Wenatchee	Nason Creek	0.07	5	Within
Spring Chinook	Wenatchee	Chiwawa River	Spring Chinook	yearling	White River	Wenatchee	White River	0.05	5	Within
Spring Chinook	Wenatchee	Chiwawa River	Summer Chinook	yearling	Eastbank	Wenatchee	Wenatchee River	0.29	5	Within
Spring Chinook	Wenatchee	Chiwawa River	Summer Steelhead	yearling	Eastbank	Wenatchee	Chiwawa River	0.01	5	Within
Spring Chinook	Wenatchee	Chiwawa River	Summer Steelhead	yearling	Eastbank	Wenatchee	Nason Creek	0.03	5	Within
Spring Chinook	Wenatchee	Chiwawa River	Summer Steelhead	yearling	Eastbank	Wenatchee	Wenatchee River	0.02	5	Within
Spring Chinook	Wenatchee	Chiwawa River	Summer Steelhead	yearling	Eastbank	Wenatchee	Wenatchee River	0.05	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	Coho	yearling	YN	Wenatchee	Chiwawa River	0.01	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	Coho	yearling	YN	Wenatchee	Chumstick Creek	0.04	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	Coho	yearling	YN	Wenatchee	Icicle Creek	0.04	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	Coho	yearling	YN	Wenatchee	Little Wenatchee River	0.05	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	Coho	yearling	YN	Wenatchee	Nason Creek	0.20	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	Coho	yearling	YN	Wenatchee	White River	0.05	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	Sockeye	yearling	Lake Wenatchee Net Pens	Wenatchee	Wenatchee River	0.20	5	Within

NTTOC Population			Hatchery Program							
Species	**Drainage**	**Stream**	**Species**	**Life Stage**	**Hatchery**	**Drainage**	**Stream**	**Estimated Mortality (%)**	**Containment Objective (%)**	**Result**
Spring Chinook	Wenatchee	Little Wenatchee River	Spring Chinook	yearling	Eastbank	Wenatchee	Chiwawa River	0.07	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	Spring Chinook	yearling	Leavenworth	Wenatchee	Icicle Creek	0.08	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	Spring Chinook	yearling	Nason Creek	Wenatchee	Nason Creek	0.03	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	Spring Chinook	yearling	White River	Wenatchee	White River	0.03	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	Summer Chinook	yearling	Eastbank	Wenatchee	Wenatchee River	0.44	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	Summer Steelhead	yearling	Eastbank	Wenatchee	Chiwawa River	0.05	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	Summer Steelhead	yearling	Eastbank	Wenatchee	Nason Creek	0.06	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	Summer Steelhead	yearling	Eastbank	Wenatchee	Wenatchee River	0.07	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	Summer Steelhead	yearling	Eastbank	Wenatchee	Wenatchee River	0.04	5	Within
Spring Chinook	Wenatchee	Nason Creek	Coho	yearling	YN	Wenatchee	Chiwawa River	0.03	5	Within
Spring Chinook	Wenatchee	Nason Creek	Coho	yearling	YN	Wenatchee	Chumstick Creek	0.03	5	Within
Spring Chinook	Wenatchee	Nason Creek	Coho	yearling	YN	Wenatchee	Icicle Creek	0.03	5	Within
Spring Chinook	Wenatchee	Nason Creek	Coho	yearling	YN	Wenatchee	Little Wenatchee River	0.03	5	Within
Spring Chinook	Wenatchee	Nason Creek	Coho	yearling	YN	Wenatchee	Nason Creek	0.33	5	Within
Spring Chinook	Wenatchee	Nason Creek	Coho	yearling	YN	Wenatchee	White River	0.03	5	Within
Spring Chinook	Wenatchee	Nason Creek	Sockeye	yearling	Lake Wenatchee Net Pens	Wenatchee	Wenatchee River	0.13	5	Within
Spring Chinook	Wenatchee	Nason Creek	Spring Chinook	yearling	Eastbank	Wenatchee	Chiwawa River	0.03	5	Within

NTTOC Population			Hatchery Program							
Species	Drainage	Stream	Species	Life Stage	Hatchery	Drainage	Stream	Estimated Mortality (%)	Containment Objective (%)	Result
Spring Chinook	Wenatchee	Nason Creek	Spring Chinook	yearling	Leavenworth	Wenatchee	Icicle Creek	0.11	5	Within
Spring Chinook	Wenatchee	Nason Creek	Spring Chinook	yearling	White River	Wenatchee	White River	0.03	5	Within
Spring Chinook	Wenatchee	Nason Creek	Summer Chinook	yearling	Eastbank	Wenatchee	Wenatchee River	0.52	5	Within
Spring Chinook	Wenatchee	Nason Creek	Summer Steelhead	yearling	Eastbank	Wenatchee	Chiwawa River	0.02	5	Within
Spring Chinook	Wenatchee	Nason Creek	Summer Steelhead	yearling	Eastbank	Wenatchee	Nason Creek	0.08	5	Within
Spring Chinook	Wenatchee	Nason Creek	Summer Steelhead	yearling	Eastbank	Wenatchee	Wenatchee River	0.01	5	Within
Spring Chinook	Wenatchee	White River	Coho	yearling	YN	Wenatchee	Chiwawa River	0.03	5	Within
Spring Chinook	Wenatchee	White River	Coho	yearling	YN	Wenatchee	Chumstick Creek	0.04	5	Within
Spring Chinook	Wenatchee	White River	Coho	yearling	YN	Wenatchee	Icicle Creek	0.10	5	Within
Spring Chinook	Wenatchee	White River	Coho	yearling	YN	Wenatchee	Little Wenatchee River	0.05	5	Within
Spring Chinook	Wenatchee	White River	Coho	yearling	YN	Wenatchee	Nason Creek	0.04	5	Within
Spring Chinook	Wenatchee	White River	Sockeye	yearling	Lake Wenatchee Net Pens	Wenatchee	Wenatchee River	0.18	5	Within
Spring Chinook	Wenatchee	White River	Spring Chinook	yearling	Eastbank	Wenatchee	Chiwawa River	0.04	5	Within
Spring Chinook	Wenatchee	White River	Spring Chinook	yearling	Leavenworth	Wenatchee	Icicle Creek	0.13	5	Within
Spring Chinook	Wenatchee	White River	Spring Chinook	yearling	Nason Creek	Wenatchee	Nason Creek	0.04	5	Within
Spring Chinook	Wenatchee	White River	Summer Chinook	yearling	Eastbank	Wenatchee	Wenatchee River	0.25	5	Within
Spring Chinook	Wenatchee	White River	Summer Steelhead	yearling	Eastbank	Wenatchee	Chiwawa River	0.06	5	Within

NTTOC Population			Hatchery Program							
Species	Drainage	Stream	Species	Life Stage	Hatchery	Drainage	Stream	Estimated Mortality (%)	Containment Objective (%)	Result
Spring Chinook	Wenatchee	White River	Summer Steelhead	yearling	Eastbank	Wenatchee	Nason Creek	0.07	5	Within
Spring Chinook	Wenatchee	White River	Summer Steelhead	yearling	Eastbank	Wenatchee	Wenatchee River	0.07	5	Within
Summer Chinook	Wenatchee	Wenatchee River	Coho	yearling	YN	Wenatchee	Nason Creek	0.03	10	Within
Summer Chinook	Wenatchee	Wenatchee River	Sockeye	yearling	Lake Wenatchee Net Pens	Wenatchee	Wenatchee River	0.02	10	Within
Summer Chinook	Wenatchee	Wenatchee River	Spring Chinook	yearling	Eastbank	Wenatchee	Chiwawa River	0.01	10	Within
Summer Chinook	Wenatchee	Wenatchee River	Spring Chinook	yearling	Nason Creek	Wenatchee	Nason Creek	0.00	10	Within
Summer Chinook	Wenatchee	Wenatchee River	Spring Chinook	yearling	White River	Wenatchee	White River	0.01	10	Within
Summer Chinook	Wenatchee	Wenatchee River	Summer Steelhead	yearling	Eastbank	Wenatchee	Chiwawa River	0.00	10	Within
Summer Chinook	Wenatchee	Wenatchee River	Summer Steelhead	yearling	Eastbank	Wenatchee	Nason Creek	0.00	10	Within
Summer Chinook	Wenatchee	Wenatchee River	Summer Steelhead	yearling	Eastbank	Wenatchee	Wenatchee River	0.00	10	Within
Summer Steelhead	Wenatchee	Chiwawa River	Summer Steelhead	yearling	Eastbank	Wenatchee	Nason Creek	1.58	5	Within
Summer Steelhead	Wenatchee	Chiwawa River	Summer Steelhead	yearling	Eastbank	Wenatchee	Wenatchee River	0.51	5	Within
Summer Steelhead	Wenatchee	Lower Wenatchee River	Summer Steelhead	yearling	Eastbank	Wenatchee	Chiwawa River	0.14	5	Within
Summer Steelhead	Wenatchee	Lower Wenatchee River	Summer Steelhead	yearling	Eastbank	Wenatchee	Nason Creek	0.32	5	Within
Summer Steelhead	Wenatchee	Nason Creek	Summer Steelhead	yearling	Eastbank	Wenatchee	Chiwawa River	0.24	5	Within

NTTOC Population			Hatchery Program							
Species	Drainage	Stream	Species	Life Stage	Hatchery	Drainage	Stream	Estimated Mortality (%)	Containment Objective (%)	Result
Summer Steelhead	Wenatchee	Nason Creek	Summer Steelhead	yearling	Eastbank	Wenatchee	Wenatchee River	0.15	5	Within

Table 15. PCD Risk 1 modelling roll-up results for interactions between NTTOC and hatchery programs releasing fish within the tributary basin at the NTTOC sub-population level.

NTTOC Population						
Species	Drainage	Stream	Number of Interactions	Mortality (%)	Containment Objective (%)	Results
Sockeye	Okanogan	Okanogan River	3	0.00	10	Within
Sockeye	Wenatchee	Wenatchee River	14	1.15	10	Within
Spring Chinook	Methow	Chewuch River	9	0.26	5	Within
Spring Chinook	Methow	Methow River	7	0.11	5	Within
Spring Chinook	Methow	Twisp River	9	0.80	5	Within
Spring Chinook	Wenatchee	Chiwawa River	12	0.91	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	16	1.44	5	Within
Spring Chinook	Wenatchee	Nason Creek	14	1.39	5	Within
Spring Chinook	Wenatchee	White River	13	1.09	5	Within
Summer Chinook	Methow	Methow River	10	2.19	10	Within

NTTOC Population						
Species	**Drainage**	**Stream**	**Number of Interactions**	**Mortality (%)**	**Containment Objective (%)**	**Results**
Summer Chinook	Okanogan	Okanogan River	3	0.03	10	Within
Summer Chinook	Wenatchee	Wenatchee River	8	0.07	10	Within
Summer Steelhead	Methow	Chewuch River	6	1.33	5	Within
Summer Steelhead	Methow	Methow River	1	0.20	5	Within
Summer Steelhead	Methow	Twisp River	6	1.73	5	Within
Summer Steelhead	Okanogan	Okanogan River	2	0.02	5	Within
Summer Steelhead	Okanogan	Omak Creek	2	0.52	5	Within
Summer Steelhead	Wenatchee	Chiwawa River	2	2.09	5	Within
Summer Steelhead	Wenatchee	Lower Wenatchee River	2	0.46	5	Within
Summer Steelhead	Wenatchee	Nason Creek	2	0.39	5	Within

Table 16. PCD Risk1 modelling roll-up results for interactions between NTTOC and hatchery programs releasing fish within the tributary basin at the NTTOC population level.

Species	Drainage	Number of Interactions	Mortality (%)	Containment Objective	Results
Sockeye	Okanogan	3	0.00	10	Within
Sockeye	Wenatchee	14	1.15	10	Within
Spring Chinook	Methow	25	0.25	5	Within
Spring Chinook	Wenatchee	55	1.08	5	Within
Summer Chinook	Methow	10	2.19	10	Within
Summer Chinook	Okanogan	3	0.03	10	Within
Summer Chinook	Wenatchee	8	0.07	10	Within
Summer Steelhead	Methow	13	0.69	5	Within
Summer Steelhead	Okanogan	4	0.05	5	Within
Summer Steelhead	Wenatchee	6	0.61	5	Within

Table 17. PCD Risk 1 modelling results for interactions between Methow Basin NTTOC and hatchery programs releasing fish in the Columbia River (downstream to McNary Dam) at the NTTOC population level.

NTTOC Population			Hatchery Program							
Species	Drainage	Stream	Species	Life Stage	Hatchery	Drainage	Stream	Estimated Mortality (%)	Containment Objective (%)	Result
Spring Chinook	Methow	Chewuch River	Summer Chinook	yearling	Chelan Falls	Columbia	Columbia River	0.02	5	Within
Spring Chinook	Methow	Chewuch River	Summer Chinook	subyearling	Wells	Columbia	Columbia River	0.01	5	Within
Spring Chinook	Methow	Chewuch River	Summer Fall Chinook	subyearling	Priest Rapids	Columbia	Columbia River	0.00	5	Within
Spring Chinook	Methow	Chewuch River	Summer Steelhead	yearling	Wells	Columbia	Columbia River	0.01	5	Within
Spring Chinook	Methow	Methow River	Summer Chinook	yearling	Chelan Falls	Columbia	Columbia River	0.01	5	Within
Spring Chinook	Methow	Methow River	Summer Chinook	subyearling	Wells	Columbia	Columbia River	0.00	5	Within
Spring Chinook	Methow	Methow River	Summer Fall Chinook	subyearling	Priest Rapids	Columbia	Columbia River	0.00	5	Within
Spring Chinook	Methow	Methow River	Summer Steelhead	yearling	Wells	Columbia	Columbia River	0.00	5	Within
Spring Chinook	Methow	Twisp River	Summer Chinook	yearling	Chelan Falls	Columbia	Columbia River	0.24	5	Within
Spring Chinook	Methow	Twisp River	Summer Chinook	subyearling	Wells	Columbia	Columbia River	0.00	5	Within
Spring Chinook	Methow	Twisp River	Summer Fall Chinook	subyearling	Priest Rapids	Columbia	Columbia River	0.00	5	Within
Spring Chinook	Methow	Twisp River	Summer Steelhead	yearling	Wells	Columbia	Columbia River	0.03	5	Within
Summer Chinook	Methow	Methow River	Summer Chinook	subyearling	Wells	Columbia	Columbia River	0.36	10	Within
Summer Chinook	Methow	Methow River	Summer Fall Chinook	subyearling	Priest Rapids	Columbia	Columbia River	6.54	10	Within
Summer Chinook	Methow	Methow River	Summer Steelhead	yearling	Wells	Columbia	Columbia River	0.30	10	Within

NTTOC Population			Hatchery Program							
Species	Drainage	Stream	Species	Life Stage	Hatchery	Drainage	Stream	Estimated Mortality (%)	Containment Objective (%)	Result
Summer Steelhead	Methow	Chewuch River	Summer Chinook	yearling	Chelan Falls	Columbia	Columbia River	0.97	5	Within
Summer Steelhead	Methow	Chewuch River	Summer Steelhead	yearling	Wells	Columbia	Columbia River	2.66	5	Within
Summer Steelhead	Methow	Methow River	Summer Chinook	yearling	Chelan Falls	Columbia	Columbia River	1.63	5	Within
Summer Steelhead	Methow	Methow River	Summer Steelhead	yearling	Wells	Columbia	Columbia River	0.38	5	Within
Summer Steelhead	Methow	Twisp River	Summer Chinook	yearling	Chelan Falls	Columbia	Columbia River	5.08	5	EXCEEDS
Summer Steelhead	Methow	Twisp River	Summer Steelhead	yearling	Wells	Columbia	Columbia River	1.07	5	Within

Table 18. PCD Risk 1 modelling results for interactions between Okanogan Basin NTTOC and hatchery programs releasing fish in the Columbia River (downstream to McNary Dam) at the NTTOC population level.

NTTOC Population			Hatchery Program							
Species	Drainage	Stream	Species	Life Stage	Hatchery	Drainage	Stream	Estimated Mortality (%)	Containment Objective (%)	Result
Sockeye	Okanogan	Okanogan River	Summer Chinook	yearling	Chelan Falls	Columbia	Columbia River	0.01	10	Within
Sockeye	Okanogan	Okanogan River	Summer Chinook	subyearling	Wells	Columbia	Columbia River	0.07	10	Within
Sockeye	Okanogan	Okanogan River	Summer Steelhead	yearling	Wells	Columbia	Columbia River	0.01	10	Within
Summer Chinook	Okanogan	Okanogan River	Summer Chinook	yearling	Chelan Falls	Columbia	Columbia River	2.39	10	Within
Summer Chinook	Okanogan	Okanogan River	Summer Chinook	subyearling	Wells	Columbia	Columbia River	0.08	10	Within
Summer Chinook	Okanogan	Okanogan River	Summer Fall Chinook	subyearling	Priest Rapids	Columbia	Columbia River	0.25	10	Within
Summer Chinook	Okanogan	Okanogan River	Summer Steelhead	yearling	Wells	Columbia	Columbia River	0.04	10	Within
Summer Steelhead	Okanogan	Okanogan River	Summer Chinook	yearling	Chelan Falls	Columbia	Columbia River	1.91	5	Within
Summer Steelhead	Okanogan	Okanogan River	Summer Fall Chinook	subyearling	Priest Rapids	Columbia	Columbia River	0.10	5	Within
Summer Steelhead	Okanogan	Okanogan River	Summer Steelhead	yearling	Wells	Columbia	Columbia River	0.33	5	Within
Summer Steelhead	Okanogan	Omak Creek	Summer Fall Chinook	subyearling	Priest Rapids	Columbia	Columbia River	0.13	5	Within
Summer Steelhead	Okanogan	Omak Creek	Summer Steelhead	yearling	Wells	Columbia	Columbia River	5.14	5	EXCEEDS

Table 19. PCD Risk1 modelling results for interactions between Wenatchee Basin NTTOC and hatchery programs releasing fish in the Columbia River.

NTTOC Population			Hatchery Program							
Species	Drainage	Stream	Species	Life Stage	Hatchery	Drainage	Stream	Estimated Mortality (%)	Containment Objective (%)	Result
Sockeye	Wenatchee	Wenatchee River	Summer Chinook	yearling	Chelan Falls	Columbia	Columbia River	0.10	10	Within
Sockeye	Wenatchee	Wenatchee River	Summer Chinook	subyearling	Wells	Columbia	Columbia River	0.14	10	Within
Sockeye	Wenatchee	Wenatchee River	Summer Steelhead	yearling	Wells	Columbia	Columbia River	0.02	10	Within
Spring Chinook	Wenatchee	Chiwawa River	Summer Chinook	yearling	Chelan Falls	Columbia	Columbia River	0.04	5	Within
Spring Chinook	Wenatchee	Chiwawa River	Summer Chinook	subyearling	Wells	Columbia	Columbia River	0.01	5	Within
Spring Chinook	Wenatchee	Chiwawa River	Summer Fall Chinook	subyearling	Priest Rapids	Columbia	Columbia River	0.00	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	Summer Chinook	yearling	Chelan Falls	Columbia	Columbia River	0.06	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	Summer Chinook	subyearling	Wells	Columbia	Columbia River	0.01	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	Summer Fall Chinook	subyearling	Priest Rapids	Columbia	Columbia River	0.00	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	Summer Steelhead	yearling	Wells	Columbia	Columbia River	0.02	5	Within
Spring Chinook	Wenatchee	Nason Creek	Summer Chinook	yearling	Chelan Falls	Columbia	Columbia River	0.11	5	Within
Spring Chinook	Wenatchee	Nason Creek	Summer Chinook	subyearling	Wells	Columbia	Columbia River	0.01	5	Within
Spring Chinook	Wenatchee	Nason Creek	Summer Fall Chinook	subyearling	Priest Rapids	Columbia	Columbia River	0.00	5	Within
Spring Chinook	Wenatchee	Nason Creek	Summer Steelhead	yearling	Wells	Columbia	Columbia River	0.01	5	Within

NTTOC Population			Hatchery Program							
Species	Drainage	Stream	Species	Life Stage	Hatchery	Drainage	Stream	Estimated Mortality (%)	Containment Objective (%)	Result
Spring Chinook	Wenatchee	White River	Summer Chinook	yearling	Chelan Falls	Columbia	Columbia River	0.06	5	Within
Spring Chinook	Wenatchee	White River	Summer Chinook	subyearling	Wells	Columbia	Columbia River	0.02	5	Within
Spring Chinook	Wenatchee	White River	Summer Fall Chinook	subyearling	Priest Rapids	Columbia	Columbia River	0.00	5	Within
Spring Chinook	Wenatchee	White River	Summer Steelhead	yearling	Wells	Columbia	Columbia River	0.02	5	Within
Summer Chinook	Wenatchee	Wenatchee River	Summer Chinook	yearling	Chelan Falls	Columbia	Columbia River	4.65	10	Within
Summer Chinook	Wenatchee	Wenatchee River	Summer Fall Chinook	subyearling	Priest Rapids	Columbia	Columbia River	0.12	10	Within
Summer Chinook	Wenatchee	Wenatchee River	Summer Steelhead	yearling	Wells	Columbia	Columbia River	0.06	10	Within
Summer Steelhead	Wenatchee	Chiwawa River	Summer Chinook	yearling	Chelan Falls	Columbia	Columbia River	0.90	5	Within
Summer Steelhead	Wenatchee	Chiwawa River	Summer Fall Chinook	subyearling	Priest Rapids	Columbia	Columbia River	0.13	5	Within
Summer Steelhead	Wenatchee	Chiwawa River	Summer Steelhead	yearling	Wells	Columbia	Columbia River	5.15	5	EXCEEDS
Summer Steelhead	Wenatchee	Lower Wenatchee River	Summer Fall Chinook	subyearling	Priest Rapids	Columbia	Columbia River	0.11	5	Within
Summer Steelhead	Wenatchee	Lower Wenatchee River	Summer Steelhead	yearling	Wells	Columbia	Columbia River	1.08	5	Within
Summer Steelhead	Wenatchee	Nason Creek	Summer Fall Chinook	subyearling	Priest Rapids	Columbia	Columbia River	0.11	5	Within
Summer Steelhead	Wenatchee	Nason Creek	Summer Steelhead	yearling	Wells	Columbia	Columbia River	1.61	5	Within

Table 20. PCD Risk1 modelling roll-up results for interactions between NTTOC sub-populations and hatchery programs releasing fish in the Columbia River (downstream to McNary Dam).

Species	Drainage	Stream	Number of Interactions	Estimated Mortality (%)	Containment Objective (%)	Result
Sockeye	Okanogan	Okanogan River	3	0.08	10	Within
Sockeye	Wenatchee	Wenatchee River	3	0.26	10	Within
Spring Chinook	Methow	Chewuch River	4	0.03	5	Within
Spring Chinook	Methow	Methow River	4	0.02	5	Within
Spring Chinook	Methow	Twisp River	4	0.28	5	Within
Spring Chinook	Wenatchee	Chiwawa River	3	0.05	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	4	0.10	5	Within
Spring Chinook	Wenatchee	Nason Creek	4	0.14	5	Within
Spring Chinook	Wenatchee	White River	4	0.10	5	Within
Summer Chinook	Methow	Methow River	3	7.20	10	Within
Summer Chinook	Okanogan	Okanogan River	4	2.76	10	Within
Summer Chinook	Wenatchee	Wenatchee River	3	4.83	10	Within
Summer Steelhead	Methow	Chewuch River	2	3.63	5	Within
Summer Steelhead	Methow	Methow River	2	2.01	5	Within

Species	Drainage	Stream	Number of Interactions	Estimated Mortality (%)	Containment Objective (%)	Result
Summer Steelhead	Methow	Twisp River	2	6.15	5	EXCEEDS
Summer Steelhead	Okanogan	Okanogan River	3	2.34	5	Within
Summer Steelhead	Okanogan	Omak Creek	2	5.27	5	EXCEEDS
Summer Steelhead	Wenatchee	Chiwawa River	3	6.18	5	EXCEEDS
Summer Steelhead	Wenatchee	Lower Wenatchee River	2	1.20	5	Within
Summer Steelhead	Wenatchee	Nason Creek	2	1.72	5	Within

Table 21. PCD Risk1 modelling roll-up results for interactions between NTTOC populations (basin level) and hatchery programs releasing fish in the Columbia River (downstream to McNary Dam).

Species	Drainage	Number of Interactions	Estimated Mortality (%)	Containment Objective (%)	Result
Sockeye	Okanogan	3	0.08	10	Within
Sockeye	Wenatchee	3	0.26	10	Within
Spring Chinook	Methow	12	0.06	5	Within
Spring Chinook	Wenatchee	15	0.08	5	Within
Summer Chinook	Methow	3	7.20	10	Within
Summer Chinook	Okanogan	4	2.76	10	Within
Summer Chinook	Wenatchee	3	4.83	10	Within

Species	Drainage	Number of Interactions	Estimated Mortality (%)	Containment Objective (%)	Result
Summer Steelhead	Methow	6	3.16	5	Within
Summer Steelhead	Okanogan	5	2.51	5	Within
Summer Steelhead	Wenatchee	7	1.93	5	Within

Table 22. PCD Risk1 modelling roll-up results for interactions between NTTOC sub-populations and hatchery programs releasing fish in the NTTOC natal basin and Columbia River (downstream to McNary Dam).

Species	Drainage	Stream	Number of Interactions	Estimated Mortality (%)	Containment Objective (%)	Result
Sockeye	Okanogan	Okanogan River	6	0.09	10	Within
Sockeye	Wenatchee	Wenatchee River	17	1.41	10	Within
Spring Chinook	Methow	Chewuch River	13	0.29	5	Within
Spring Chinook	Methow	Methow River	11	0.13	5	Within
Spring Chinook	Methow	Twisp River	13	1.07	5	Within
Spring Chinook	Wenatchee	Chiwawa River	15	0.96	5	Within
Spring Chinook	Wenatchee	Little Wenatchee River	20	1.54	5	Within
Spring Chinook	Wenatchee	Nason Creek	18	1.54	5	Within
Spring Chinook	Wenatchee	White River	17	1.19	5	Within
Summer Chinook	Methow	Methow River	13	9.39	10	Within

Species	Drainage	Stream	Number of Interactions	Estimated Mortality (%)	Containment Objective (%)	Result
Summer Chinook	Okanogan	Okanogan River	7	2.79	10	Within
Summer Chinook	Wenatchee	Wenatchee River	11	4.90	10	Within
Summer Steelhead	Methow	Chewuch River	8	4.96	5	Within
Summer Steelhead	Methow	Methow River	3	2.21	5	Within
Summer Steelhead	Methow	Twisp River	8	7.88	5	EXCEEDS
Summer Steelhead	Okanogan	Okanogan River	5	2.36	5	Within
Summer Steelhead	Okanogan	Omak Creek	4	5.78	5	EXCEEDS
Summer Steelhead	Wenatchee	Chiwawa River	5	8.27	5	EXCEEDS
Summer Steelhead	Wenatchee	Lower Wenatchee River	4	1.65	5	Within
Summer Steelhead	Wenatchee	Nason Creek	4	2.11	5	Within

Table 23. PCD Risk1 modelling roll-up results for interactions between NTTOC populations (basin level) and hatchery programs releasing fish in the NTTOC natal basin and Columbia River (downstream to McNary Dam).

Species	Drainage	Number of Interactions	Estimated Mortality (%)	Containment Objective (%)	Result
Sockeye	Okanogan	6	0.09	10	Within
Sockeye	Wenatchee	17	1.41	10	Within
Spring Chinook	Methow	37	0.31	5	Within

Species	Drainage	Number of Interactions	Estimated Mortality (%)	Containment Objective (%)	Result
Spring Chinook	Wenatchee	70	1.16	5	Within
Summer Chinook	Methow	13	9.39	10	Within
Summer Chinook	Okanogan	7	2.79	10	Within
Summer Chinook	Wenatchee	11	4.90	10	Within
Summer Steelhead	Methow	19	3.85	5	Within
Summer Steelhead	Okanogan	9	2.56	5	Within
Summer Steelhead	Wenatchee	13	2.53	5	Within

Table 24. PCD Risk 1 modelling results that exceeded containment objectives for interactions between NTTOC and hatchery programs.

NTTOC Level		Interaction Level	
Population	**Sub-Population**	**Hatchery Program(s)**	**% Mortality**
Methow Basin Summer Steelhead			
	Twisp River Summer Steelhead	Natal basin + Columbia releases roll-up	7.88
	Twisp River Summer Steelhead	Columbia releases roll-up	6.15
	Twisp River Summer Steelhead	Chelan Falls Hatchery Summer Chinook	5.08
Wenatchee Basin Summer Steelhead			
	Chiwawa Summer Steelhead	Natal basin + Columbia releases roll-up	8.27
	Chiwawa Summer Steelhead	Columbia releases roll-up	6.18
	Chiwawa Summer Steelhead	Wells Hatchery summer steelhead	5.15
Okanogan Basin Summer Steelhead			
	Omak Creek Summer Steelhead	Natal basin + Columbia releases roll-up	5.78
	Omak Creek Summer Steelhead	Columbia releases roll-up	5.27
	Omak Creek Summer Steelhead	Wells Hatchery summer steelhead	5.14

4.4 Variability in model results

The variability in modeling results is presented in Figures 4-14. The results of each iteration (N=~50) for each modeling run are presented with box and whisker graphs. The predominant pattern is that the variability in the modeling results is confined close to zero percent mortality for most interactions between NTTOC and in-basin hatchery programs, with occasional higher outlier iteration results, although these rarely exceed the containment objective (Figures 4,5,7,8,9,11,13). Figures 6,10,12,14 show the results of interactions with Columbia River hatchery programs, and these contain greater variability while still remaining within containment objectives except for those interactions presented in Table 24. Note that the three steelhead NTTOC (Twisp, Chiwawa, Omak) that exceeded containment objectives when interacting with Columbia River releases had the highest variability in modeling results (Figure 10).

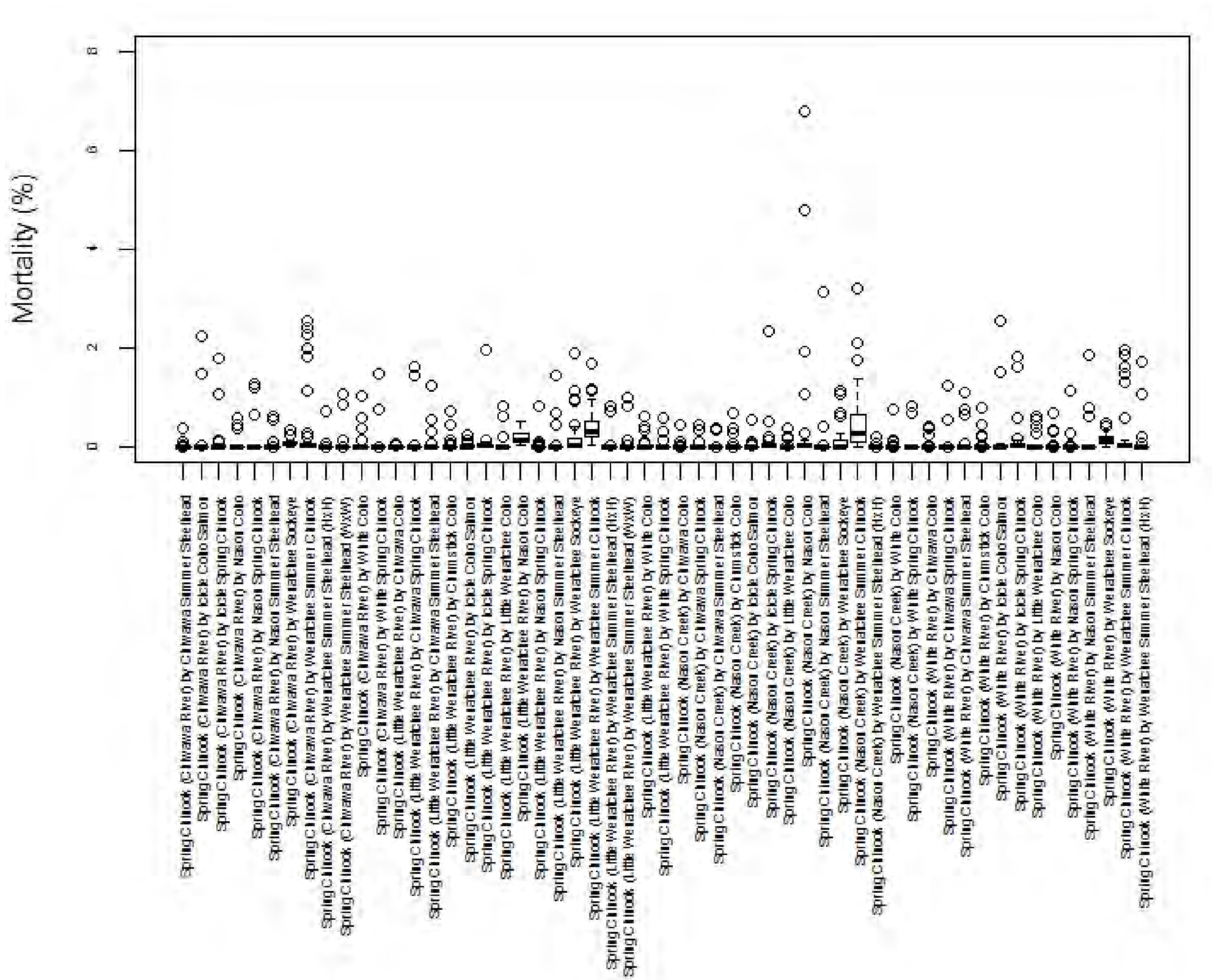


Figure 4. Box and whisker plot of Wenatchee spring Chinook NTTOC percent mortality through interactions with in-basin hatchery programs.

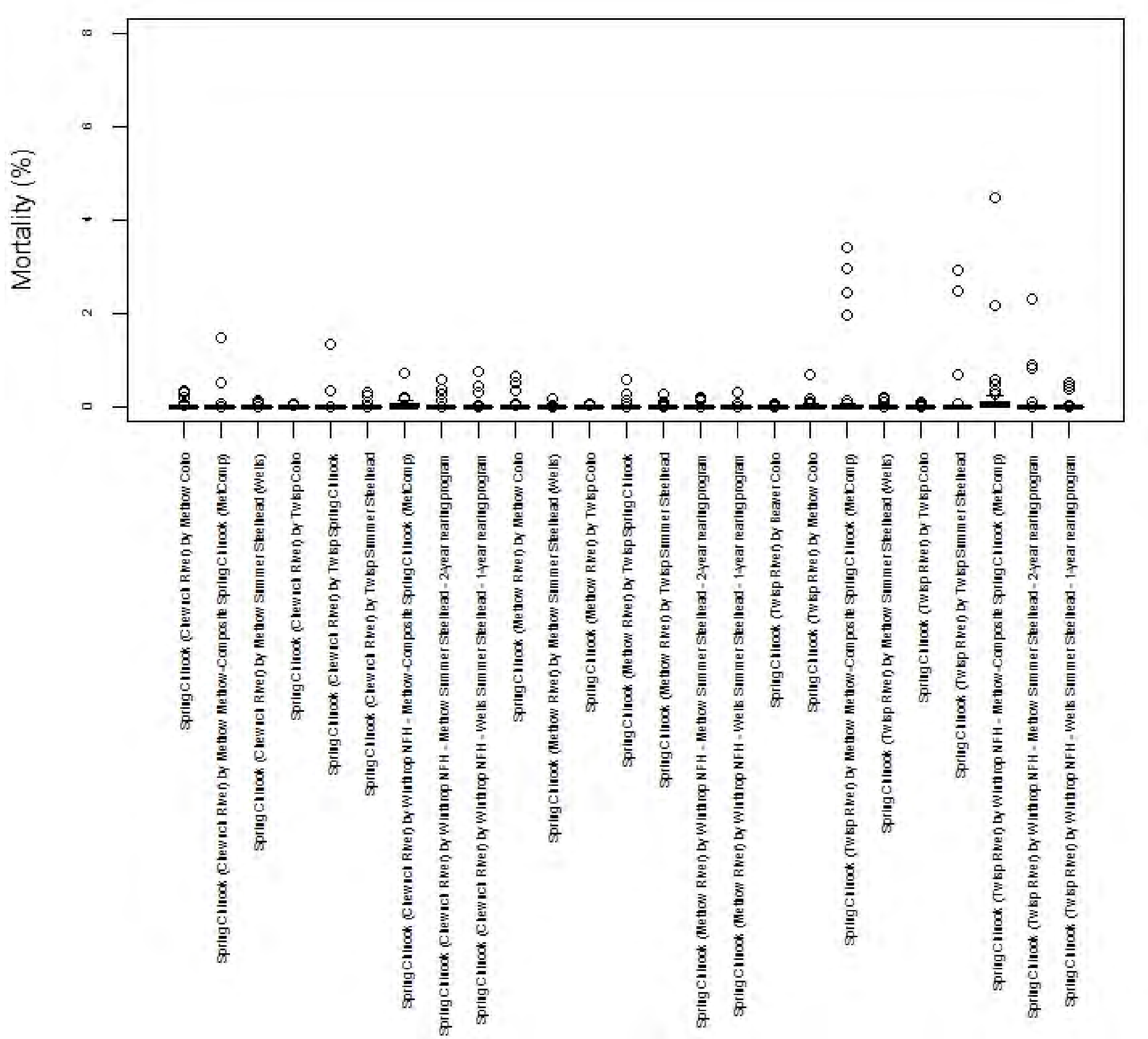


Figure 5. Box and whisker plot of Methow spring Chinook NTTOC percent mortality through interactions with in-basin hatchery programs.

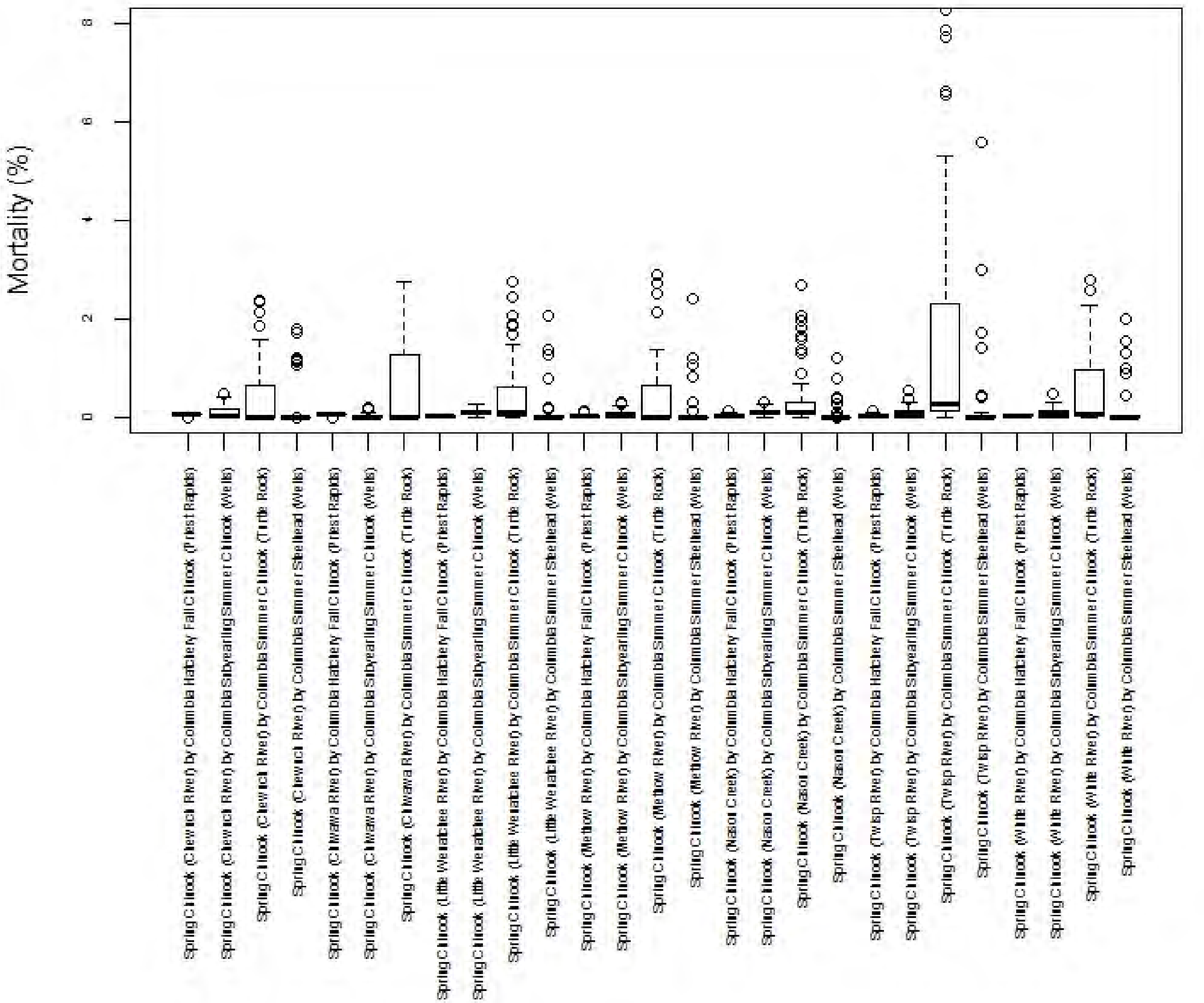


Figure 6. Box and whisker plot of Wenatchee and Methow spring Chinook NTTOC percent mortality through interactions with Columbia River hatchery programs.

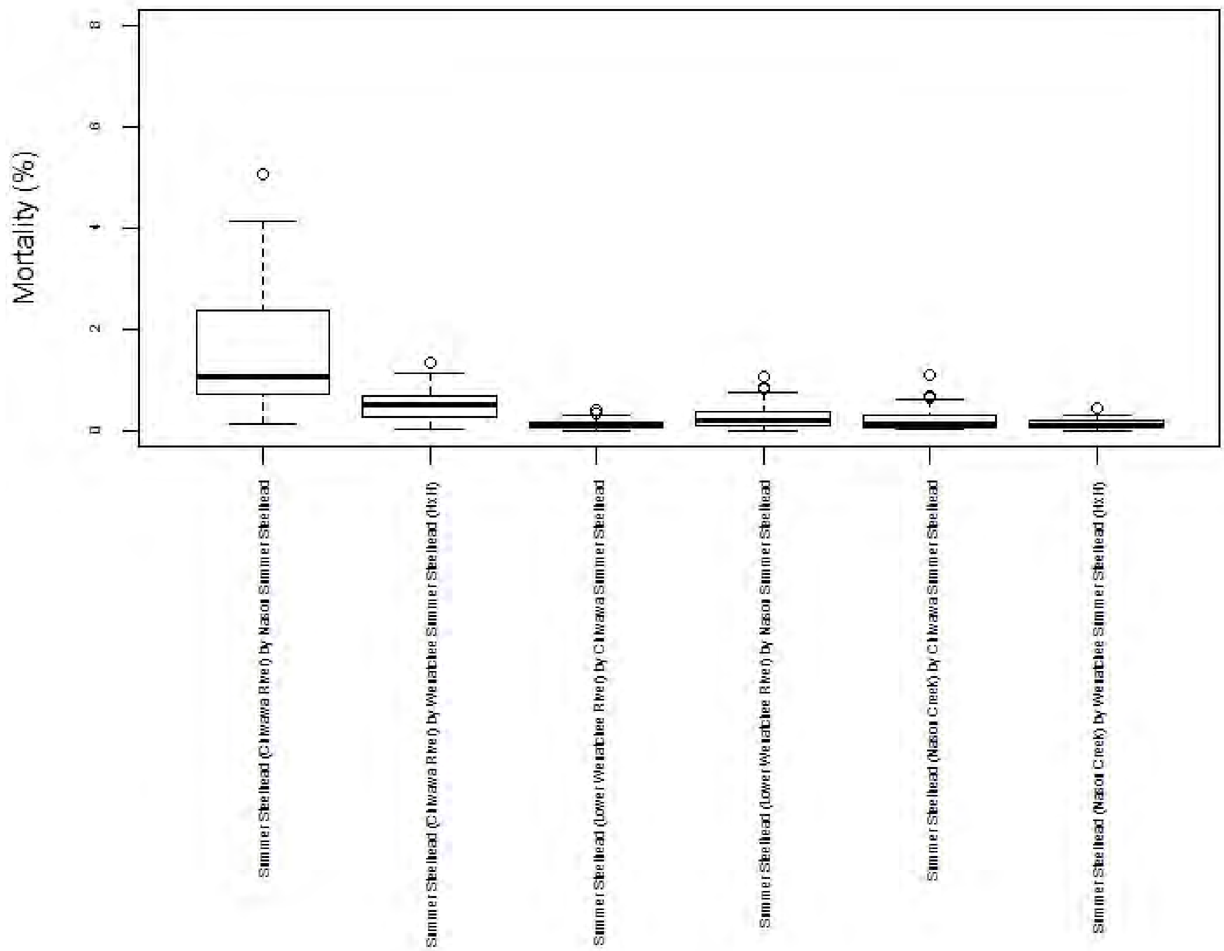


Figure 7. Box and whisker plot of Wenatchee summer steelhead NTTOC percent mortality through interactions with in-basin hatchery programs.

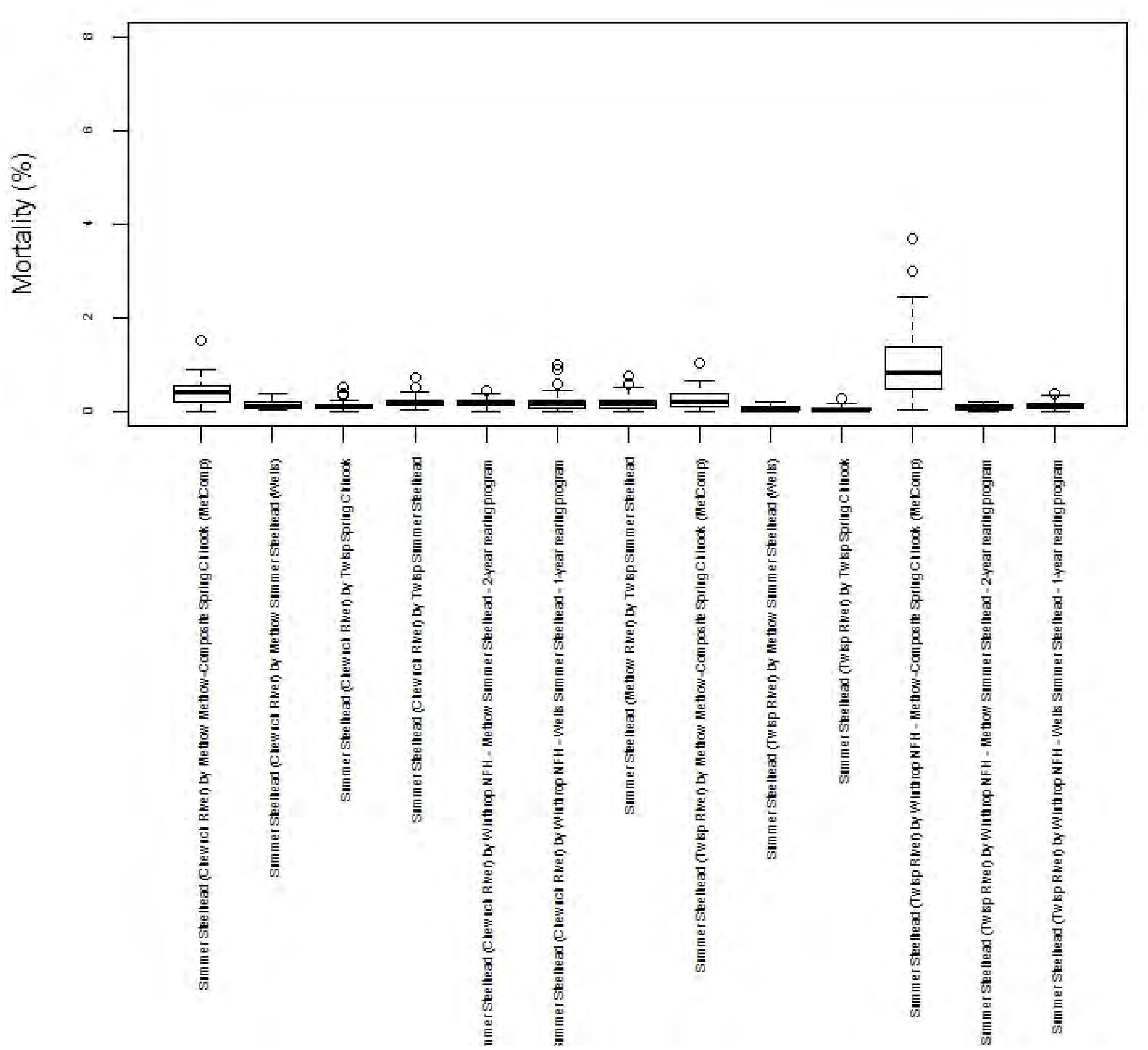


Figure 8. Box and whisker plot of Methow summer steelhead NTTOC percent mortality through interactions with in-basin hatchery programs.

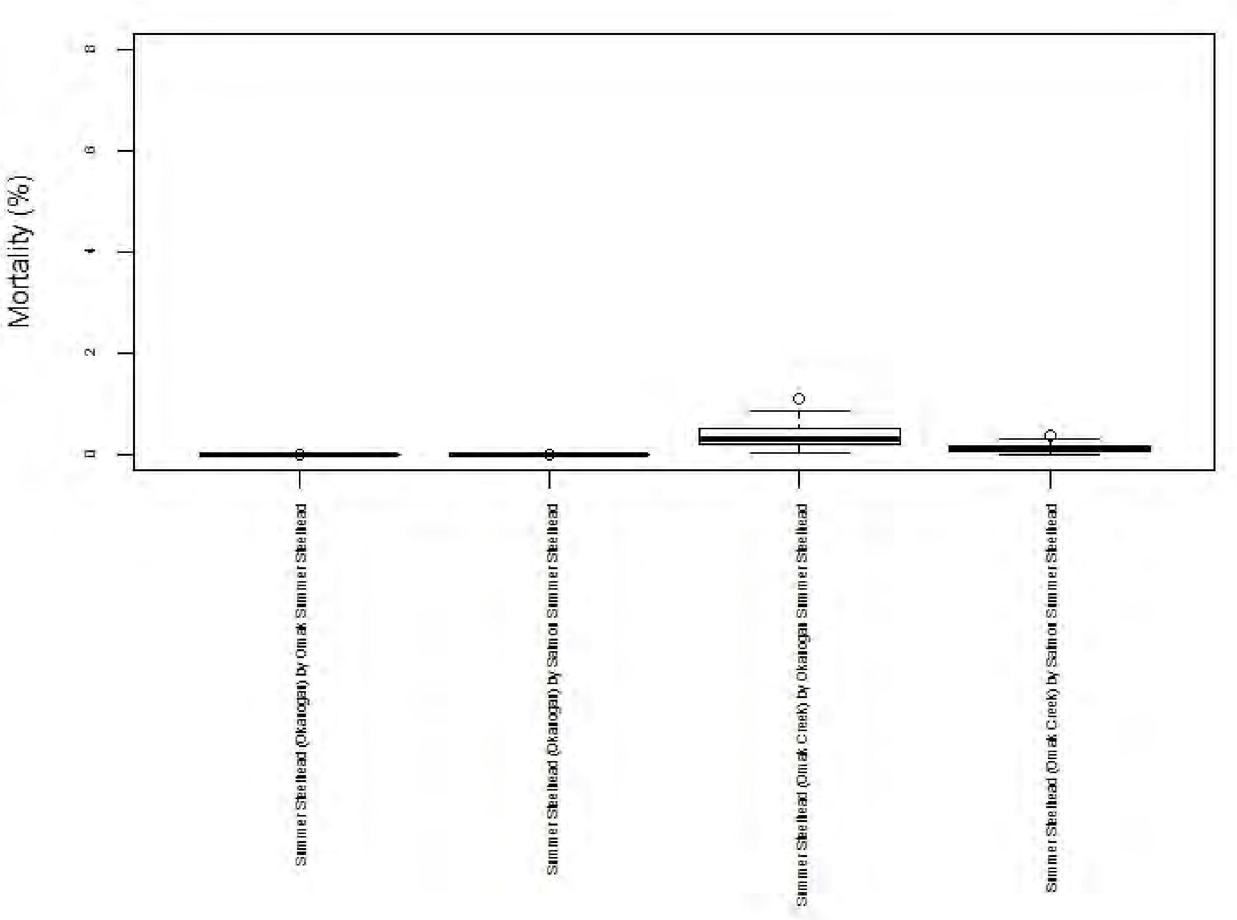


Figure 9. Box and whisker plot of Okanogan summer steelhead NTTOC percent mortality through interactions with in-basin hatchery programs.

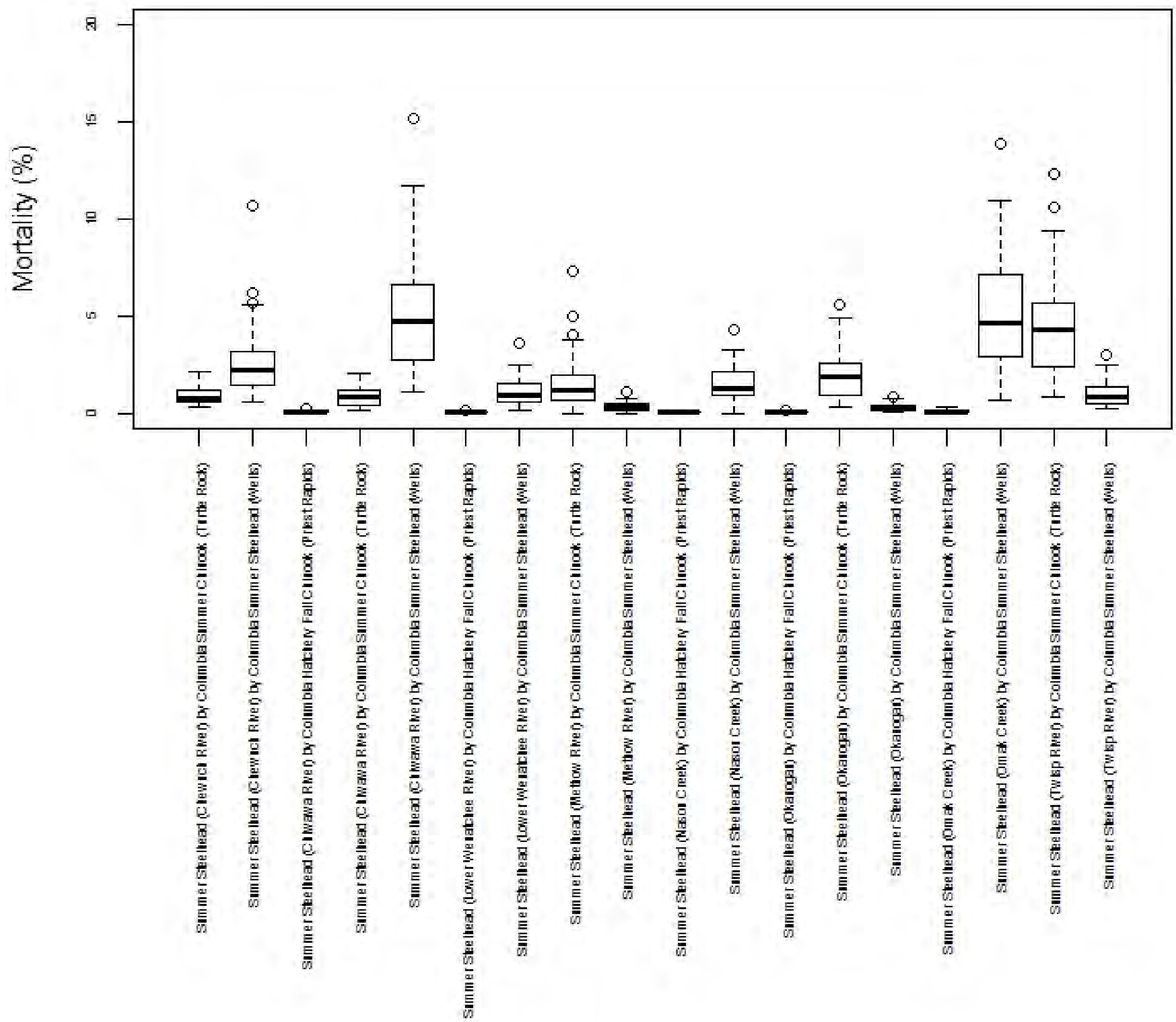


Figure 10. Box and whisker plot of Wenatchee, Methow and Okanogan summer steelhead NTTOC percent mortality through interactions with Columbia River hatchery programs.

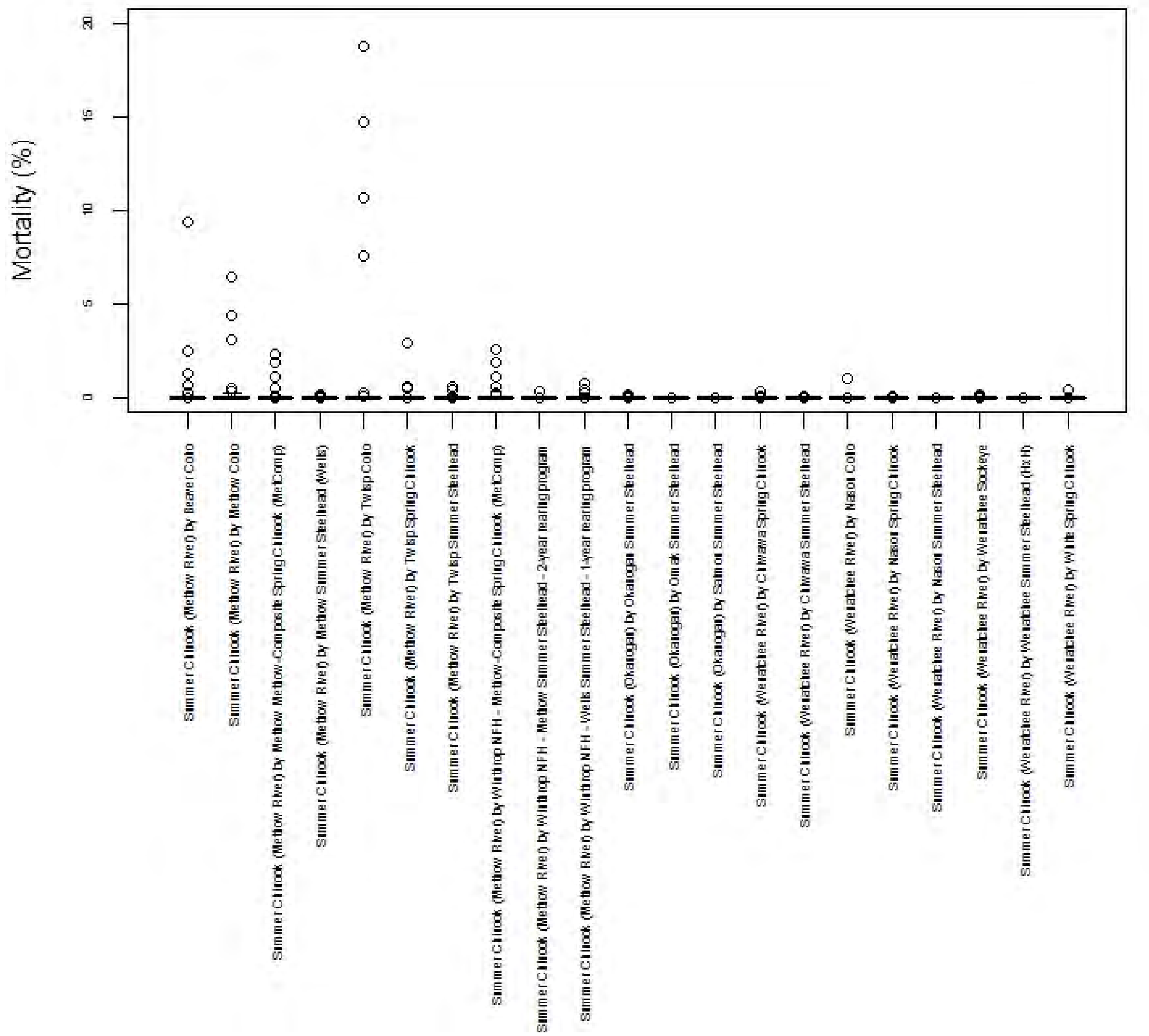


Figure 11. Box and whisker plot of Wenatchee, Methow, Okanogan summer Chinook NTTOC percent mortality through interactions with in-basin hatchery programs.

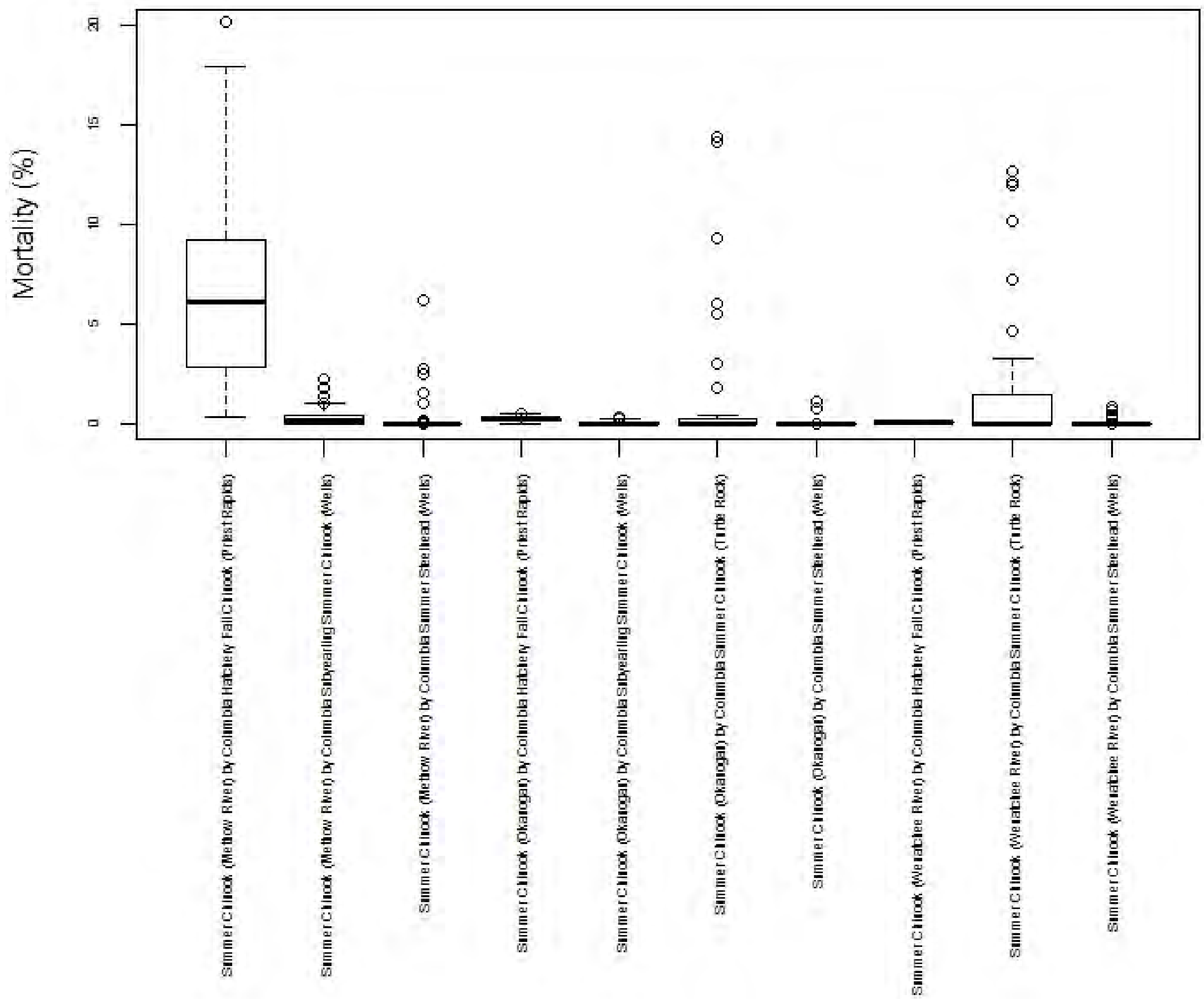


Figure 12. Box and whisker plot of Wenatchee, Methow, and Okanogan summer Chinook NTTOC percent mortality through interactions with Columbia River hatchery programs.

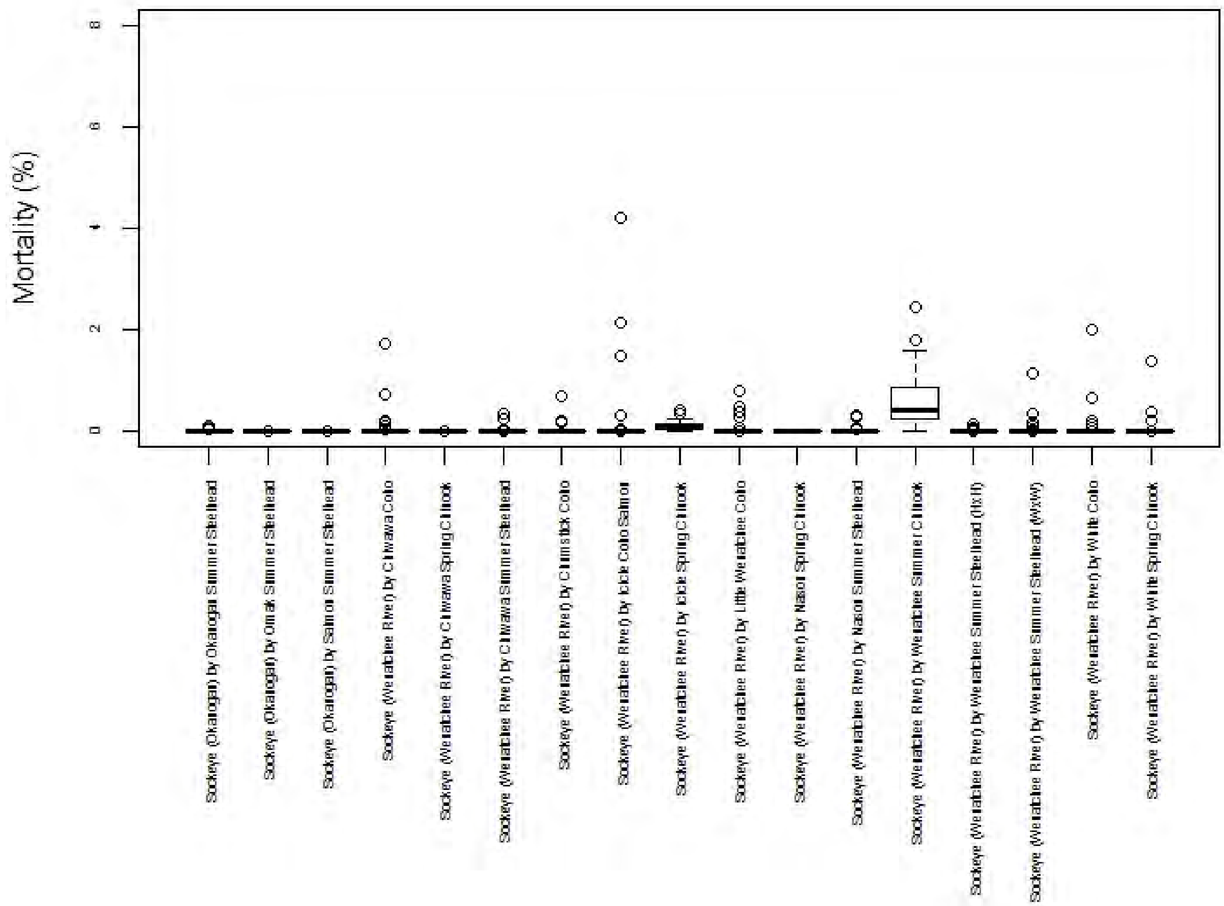


Figure 13. Box and whisker plot of Wenatchee and Okanogan sockeye NTTOC percent mortality through interactions with in-basin hatchery programs.

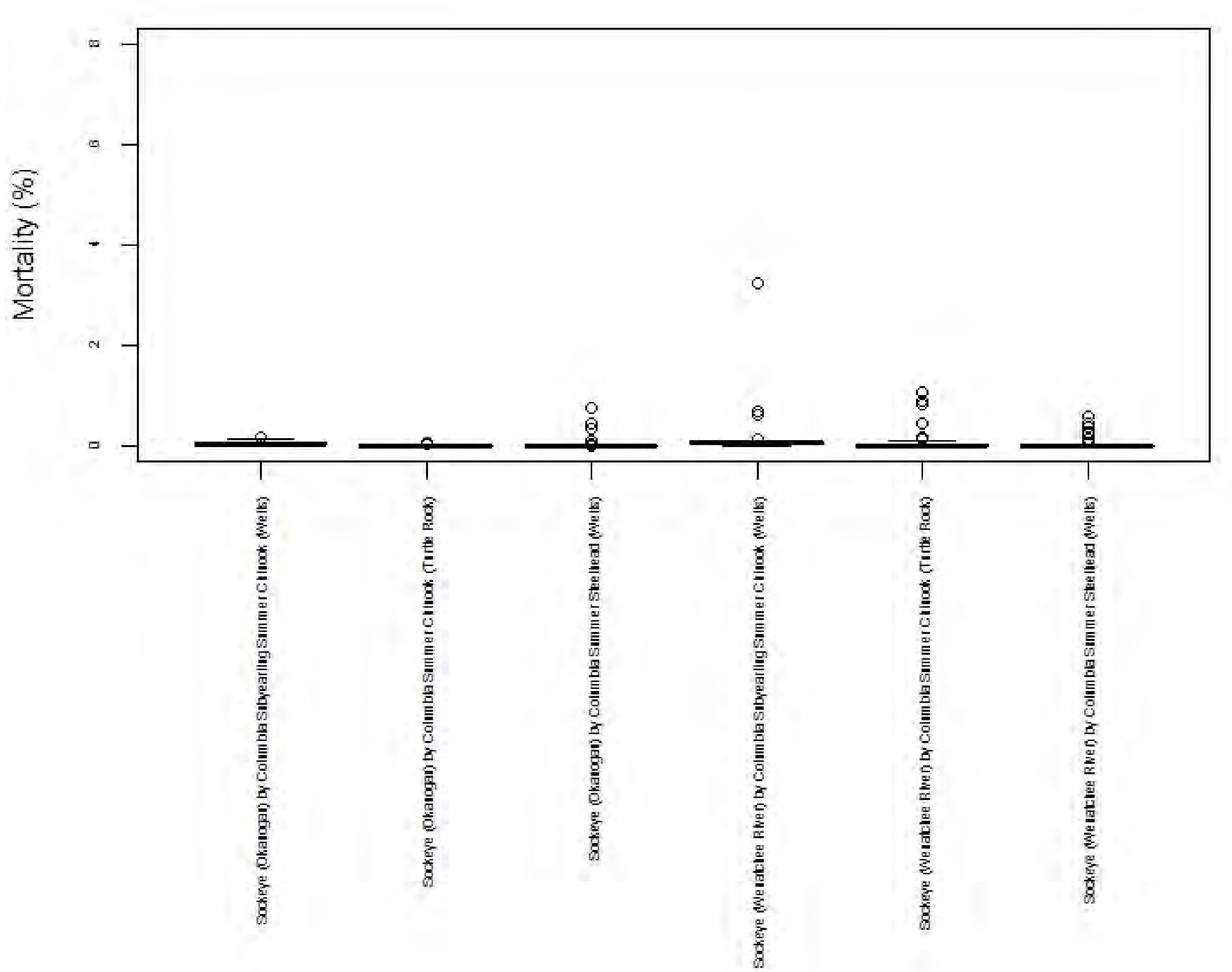


Figure 14. Box and whisker plot of Wenatchee and Okanogan sockeye NTTOC percent mortality through interactions with in-basin hatchery programs.

4.5 Sources of Mortality by Category

Although mortality overall was within containment objectives, except for the three NTTOC discussed above, the categorical sources of mortality are presented for each interaction in Figures 15-27. Competition equivalents is estimated mortality that is aggregated across multiple competitive individual interactions that did not lead directly to death, and can be viewed as an alternative method to estimate mortality from competition. Steelhead mortality was mostly confined to competition equivalents and disease, with competition equivalents the dominant source of mortality (Figures 15-18). However, disease was much higher than for other NTTOC species. The Twisp, Chiwawa, and Omak steelhead NTTOC interactions that exceeded containment objectives had high levels of mortality from competition equivalents and disease. Spring Chinook mortality was dominated by predation, with competition equivalents and disease common, and competition confined to a few NTTOC (Figures 18-24). Summer Chinook mortality was mostly through predation, with occasional mortality from competition equivalents and disease (Figures 25-27).

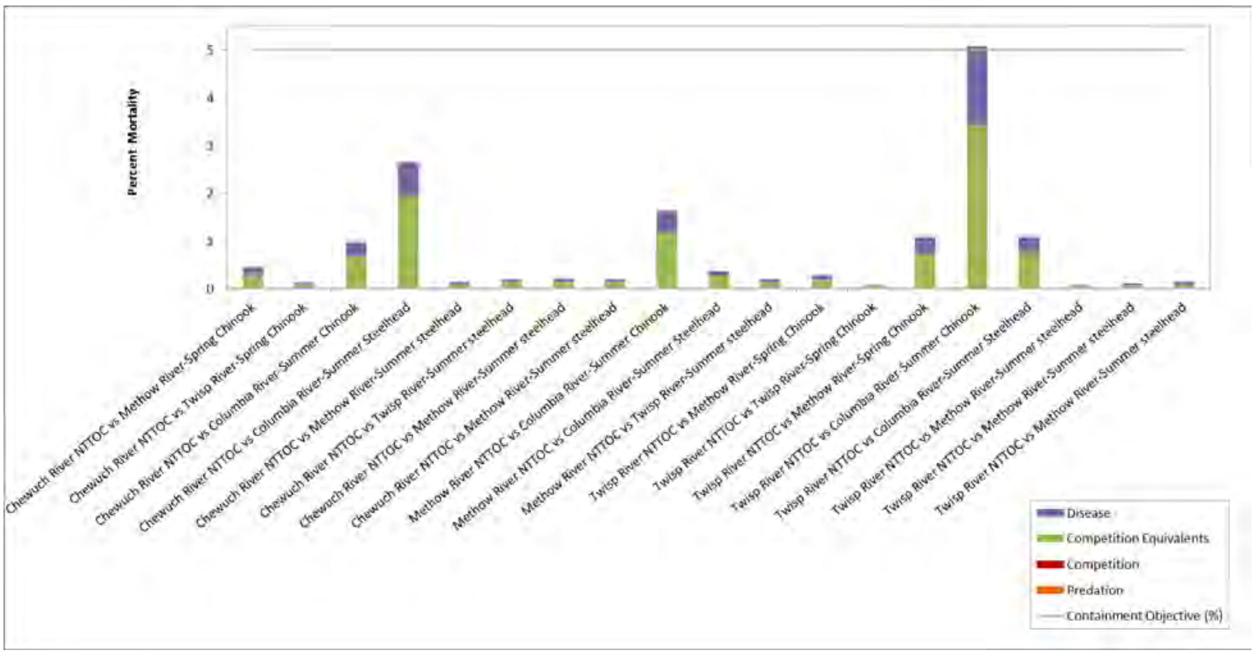


Figure 15. Methow Basin Summer Steelhead NTTOC sources of mortality by ecological category

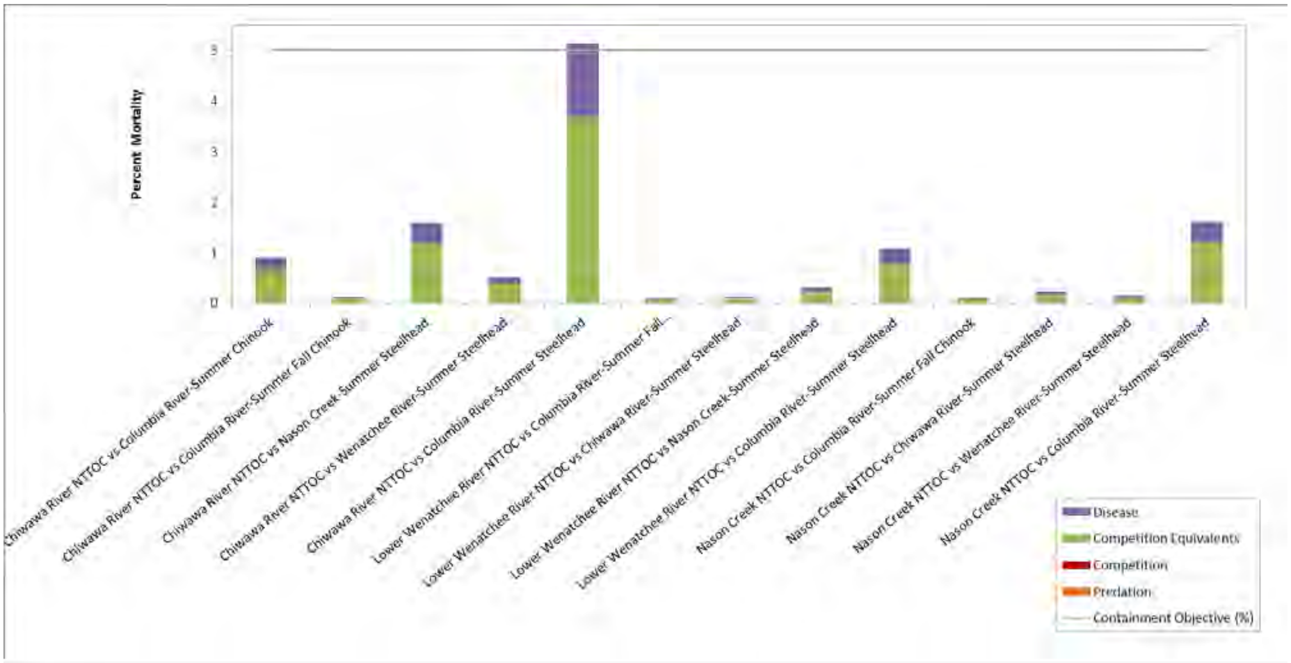


Figure 16. Wenatchee Summer Steelhead NTTOC sources of mortality by ecological category

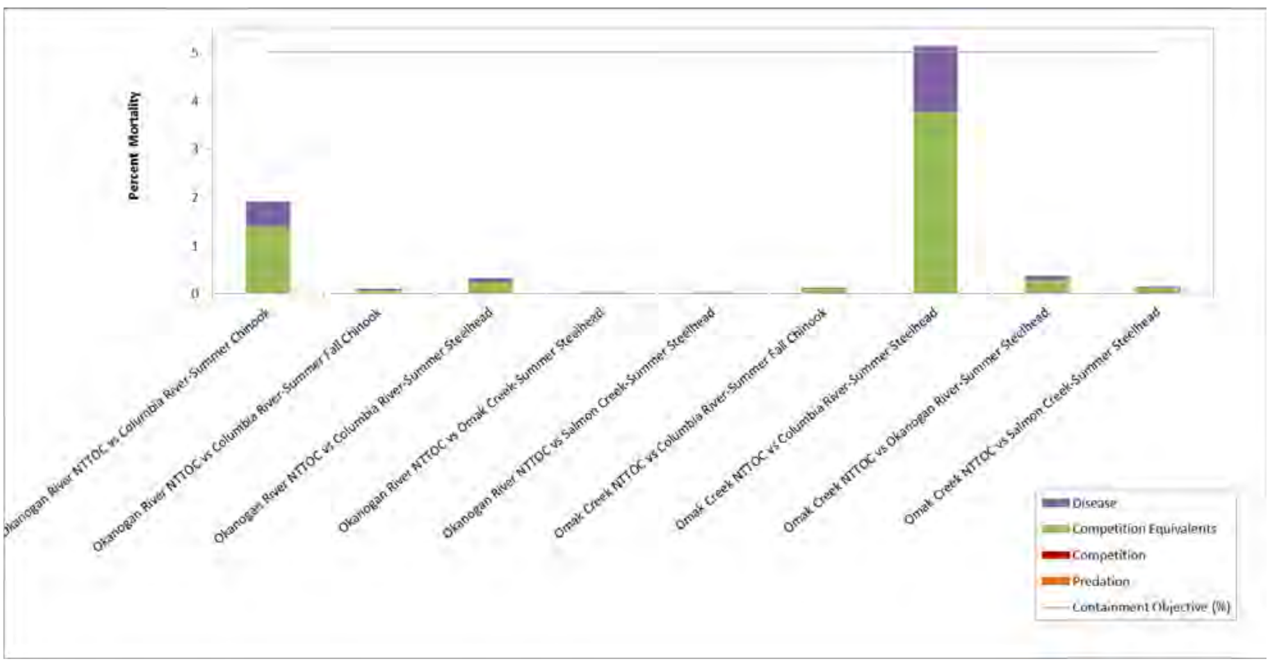


Figure 17. Okanogan Summer Steelhead NTTOC sources of mortality by ecological category

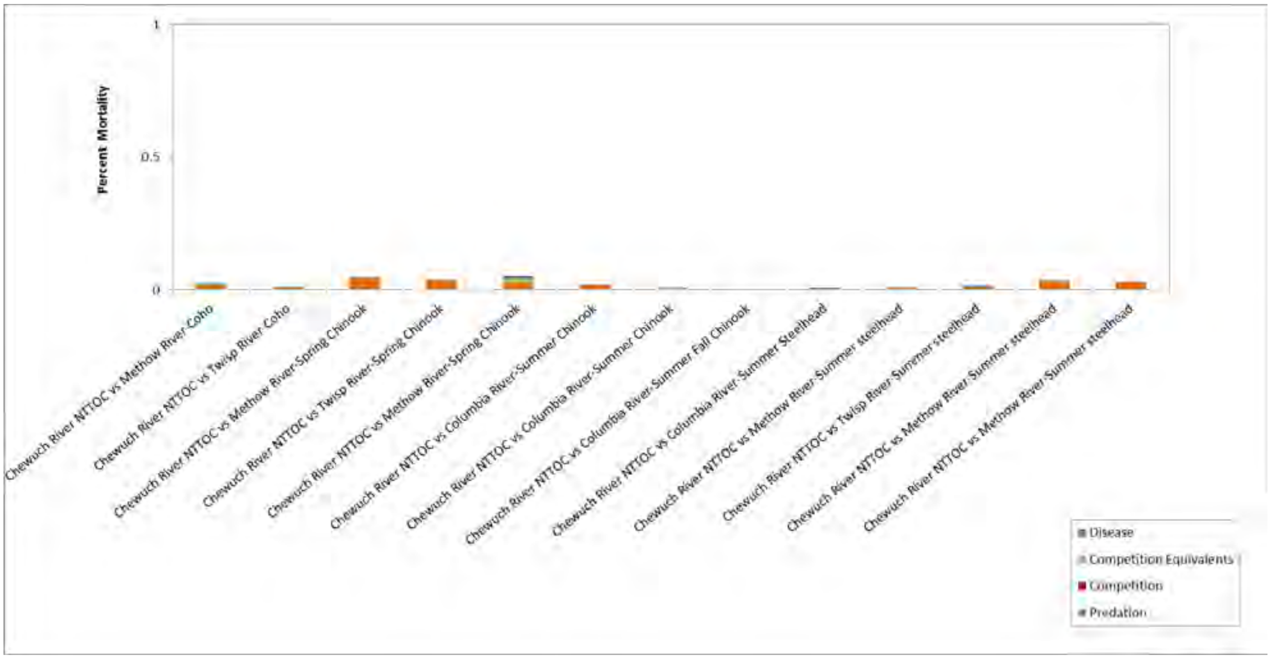


Figure 18. Chewuch River Spring Chinook sources of mortality by ecological category. Note the Percent Mortality axis ranges from 0% to 1% and does not include the 5% containment objective level.

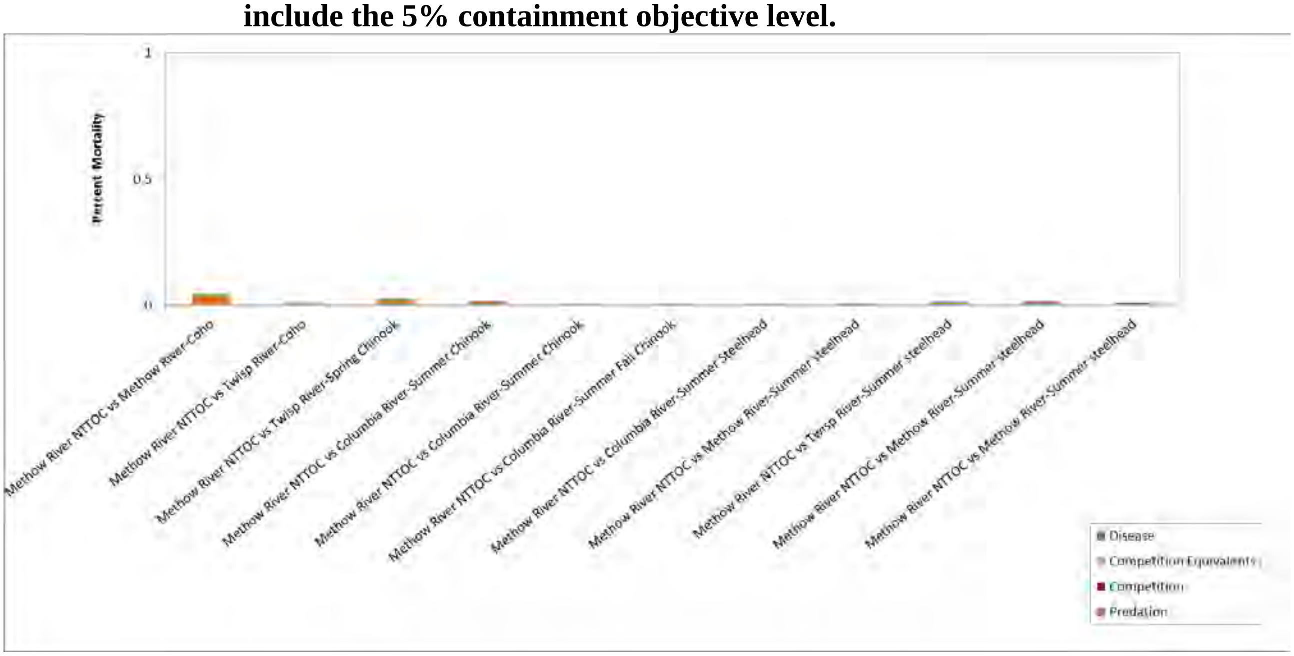


Figure 19. Methow River Spring Chinook sources of mortality by ecological category. Note the Percent Mortality axis ranges from 0% to 1% and does not include the 5% containment objective level.

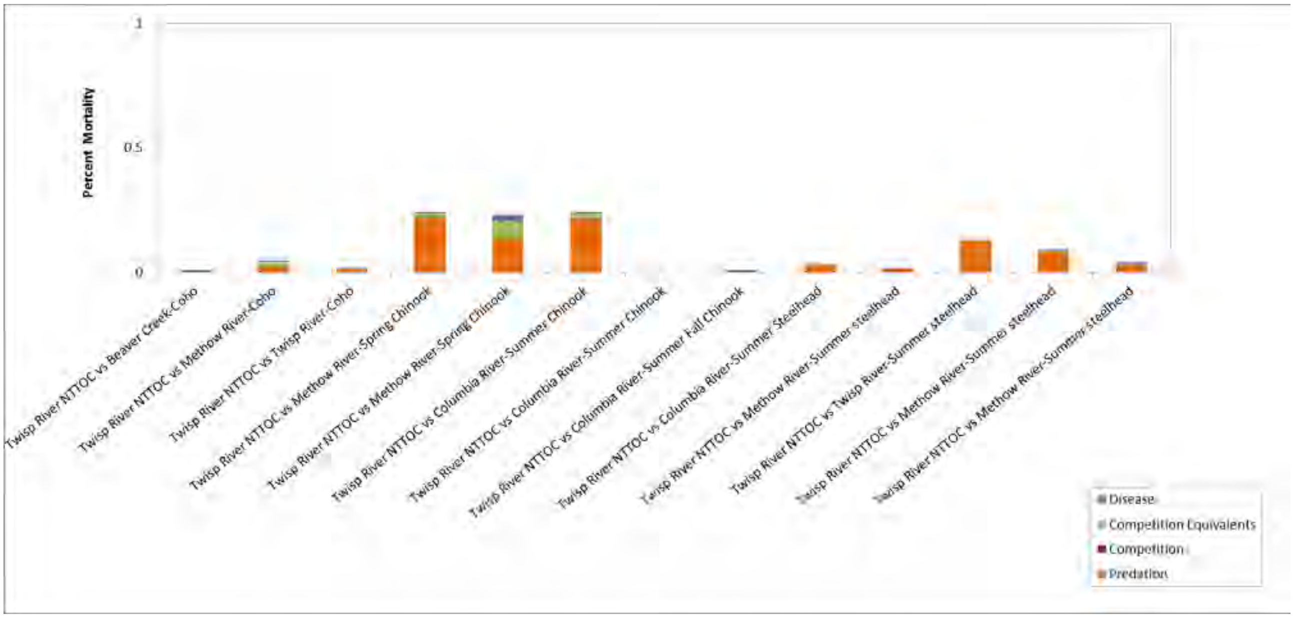


Figure 20. Twisp River Spring Chinook sources of mortality by ecological category. Note the Percent Mortality axis ranges from 0% to 1% and does not include the 5% containment objective level.

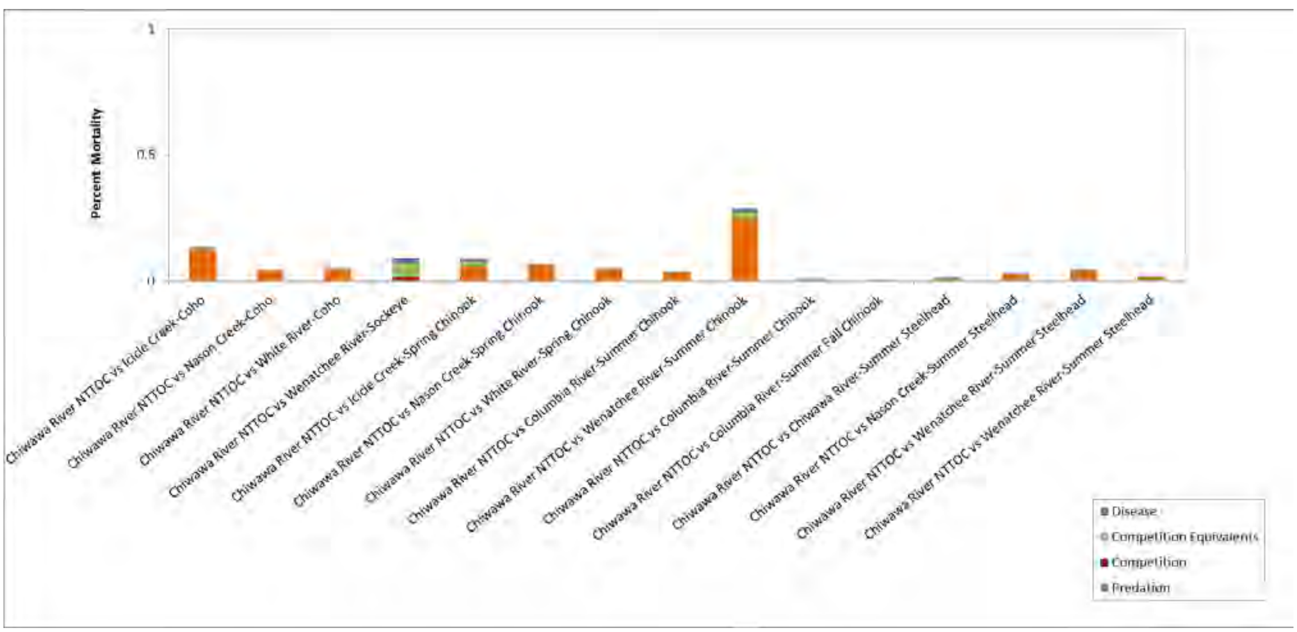


Figure 21. Chiwawa River Spring Chinook sources of mortality by ecological category. Note the Percent Mortality axis ranges from 0% to 1% and does not include the 5% containment objective level.

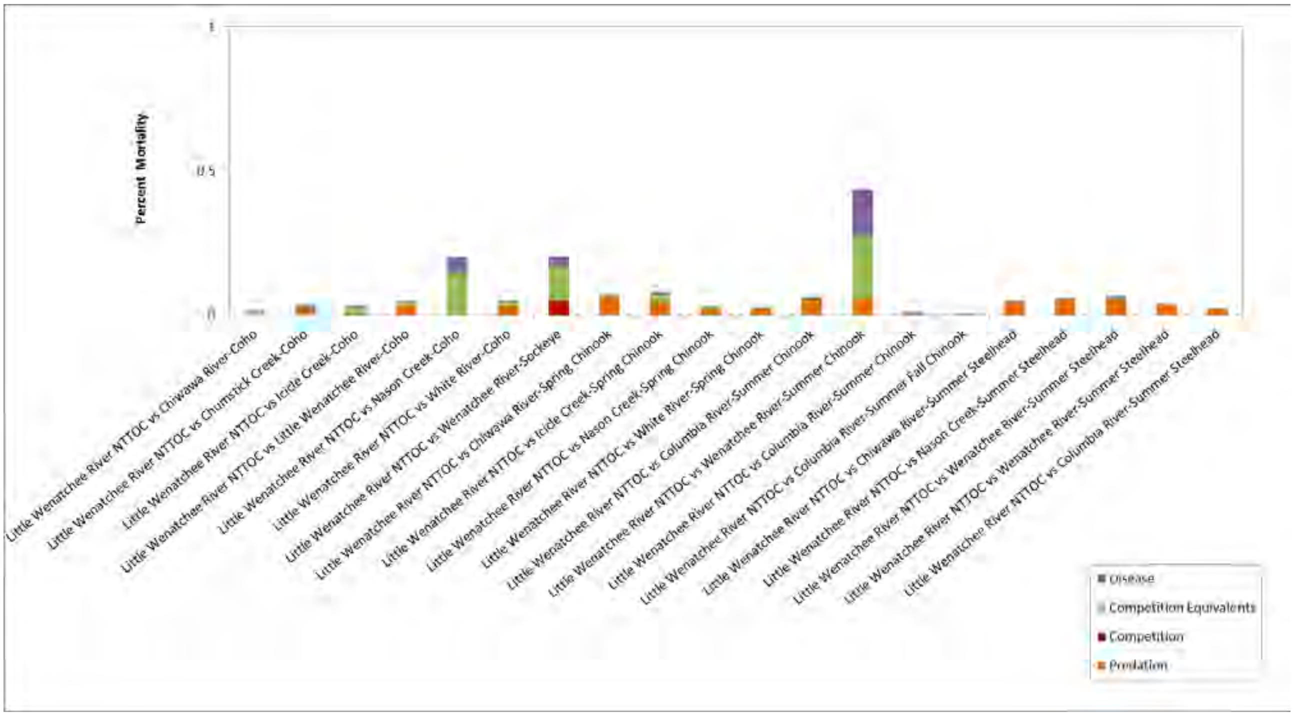


Figure 22. Little Wenatchee River Spring Chinook sources of mortality by ecological category. Note the Percent Mortality axis ranges from 0% to 1% and does not include the 5% containment objective level.

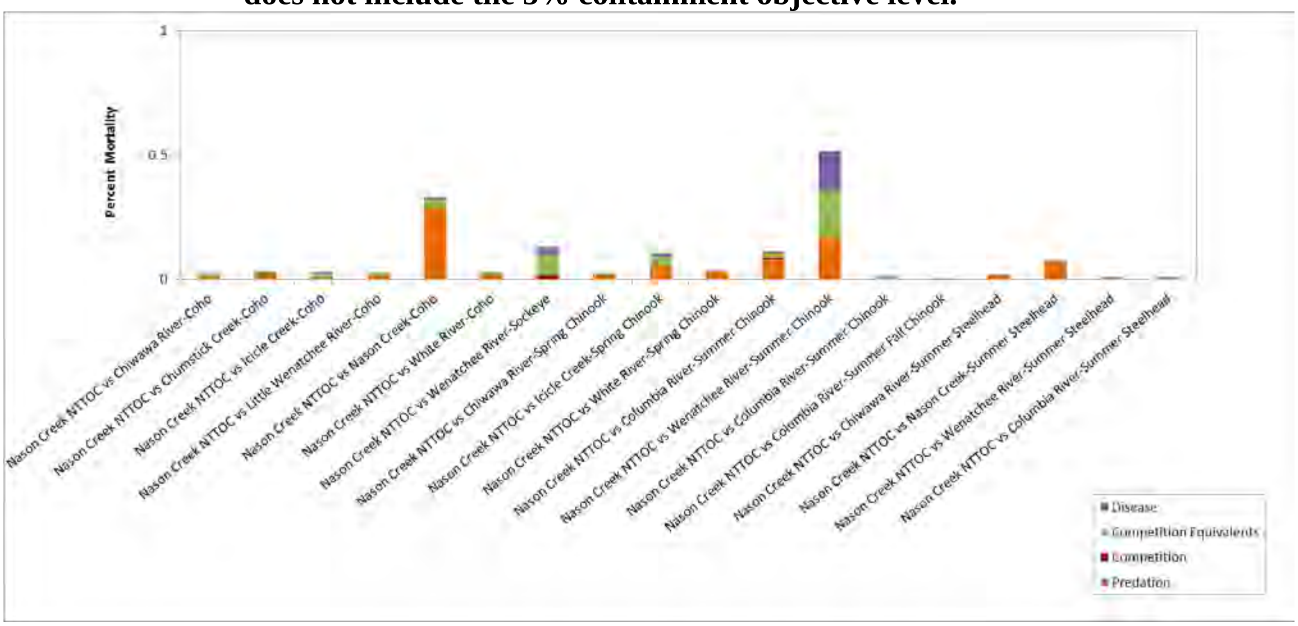


Figure 23. Nason Creek Spring Chinook sources of mortality by ecological category. Note the Percent Mortality axis ranges from 0% to 1% and does not include the 5% containment objective level.

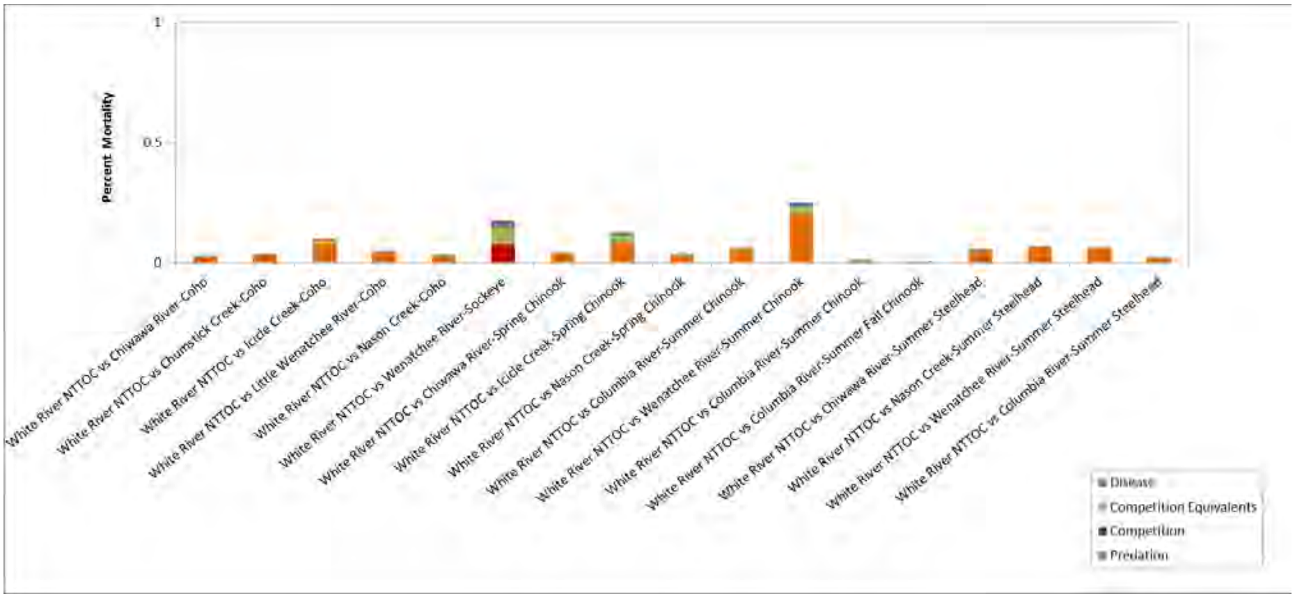


Figure 24. White River Spring Chinook sources of mortality by ecological category. Note the Percent Mortality axis ranges from 0% to 1% and does not include the 5% containment objective level.

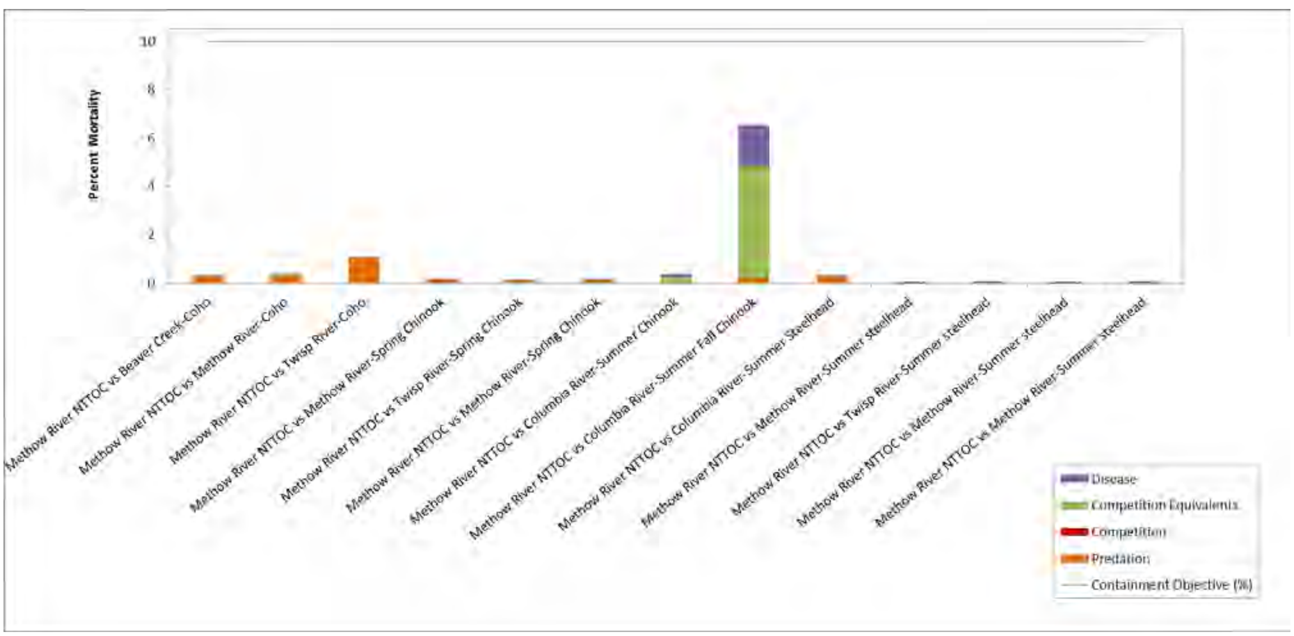


Figure 25. Methow River Summer Chinook sources of mortality by ecological category.

Figure 26. Okanagan River Summer Chinook sources of mortality by ecological category

Figure 27. Wenatchee River Summer Chinook sources of mortality by ecological category

4.6 Cumulative Effects

As NTTOC interact with more hatchery fish through interaction with additional programs (i.e., interaction with increasing numbers of hatchery fish), mortality increases as each additional program is added (Figure 28). With programs that have a small mortality effect, such as the in-basin programs, the NTTOC mortality rate can remain within the containment objective, even when interacting with many hatchery programs.

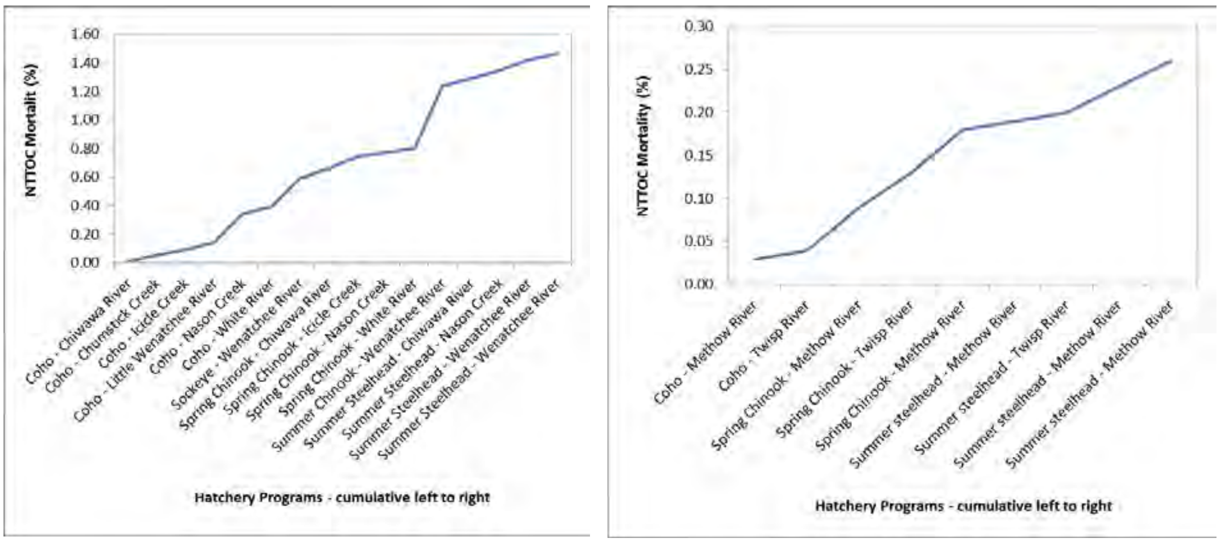


Figure 28. Effect of cumulative interactions with hatchery fish on NTTOC mortality rates for the Chewuch River (left) and the Chiwawa River (right) spring Chinook populations. The x-axis shows cumulative hatchery programs of different species (alphabetical order).

The three summer steelhead NTTOC (Twisp, Omak, Chiwawa) that exceeded containment objectives followed a similar pattern illustrated by the Twisp River steelhead NTTOC (Figure 29) where in-basin cumulative mortality was low, but an interaction in the Columbia River exceeded containment.

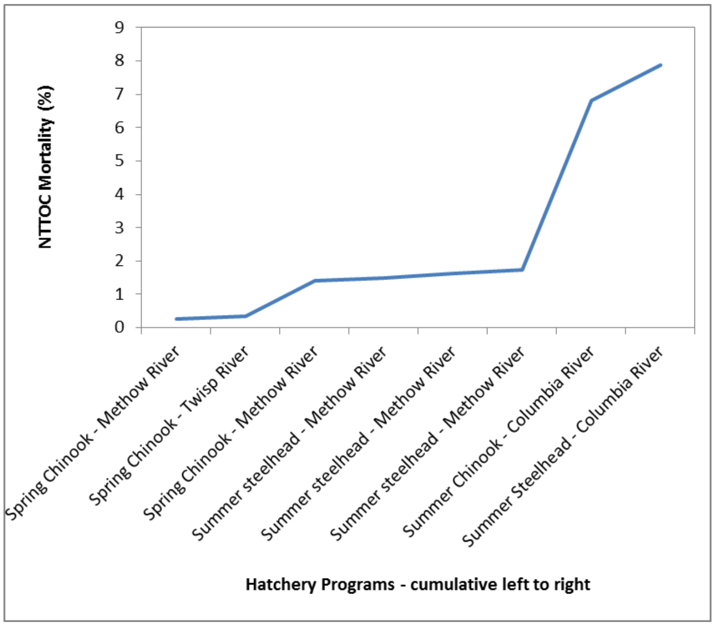


Figure 29. Effect of cumulative interactions with hatchery fish on NTTOC mortality rates for the Twisp summer steelhead population, including in-basin and Columbia River programs. The x-axis shows cumulative hatchery programs of different species (alphabetical order).

4.7 Relationship of Model Input Variables to Mortality

The PCD Risk 1 model uses a complex set of variables to model NTTOC mortality as a result of interactions with hatchery fish. The effect of one variable may depend on other variables. For instance, the ratio of the number of hatchery fish released to the number of NTTOC fish (population estimate of NTTOC) may be a factor that affects the potential for NTTOC mortality. This ratio is not an input variable to PCD Risk 1, but is derived from two input variables. The input variables can interact in complex ways and result in mortality from different sources, such as disease, predation, or competition. Therefore, isolating a single variable that has a substantial effect on mortality by itself is somewhat unlikely. However, some variables may be amenable to modification by managers, such as number of fish released, location of releases (affects distance and time of potential interaction), and size of fish released, whereas other cannot be (easily) changed by managers. Figures 30-32 explore several variables and their relationship to NTTOC mortality. In addition, two derived variables are presented: the mortality rate of NTTOC per stream kilometer of interaction, which corresponds to release location of hatchery fish in relation the NTTOC population, and the ratio of the number of hatchery fish released to the population estimate of the NTTOC. These plots include multiple hatchery species interacting with the NTTOC species across multiple geographic locations. Mortality rate per km is included for informational purposes but is auto-correlated with the NTTOC mortality percentage. The ratio of hatchery fish to NTTOC suggests that this may be a factor that influences NTTOC mortality. Note two outliers in the spring Chinook plot where this relationship is shown.

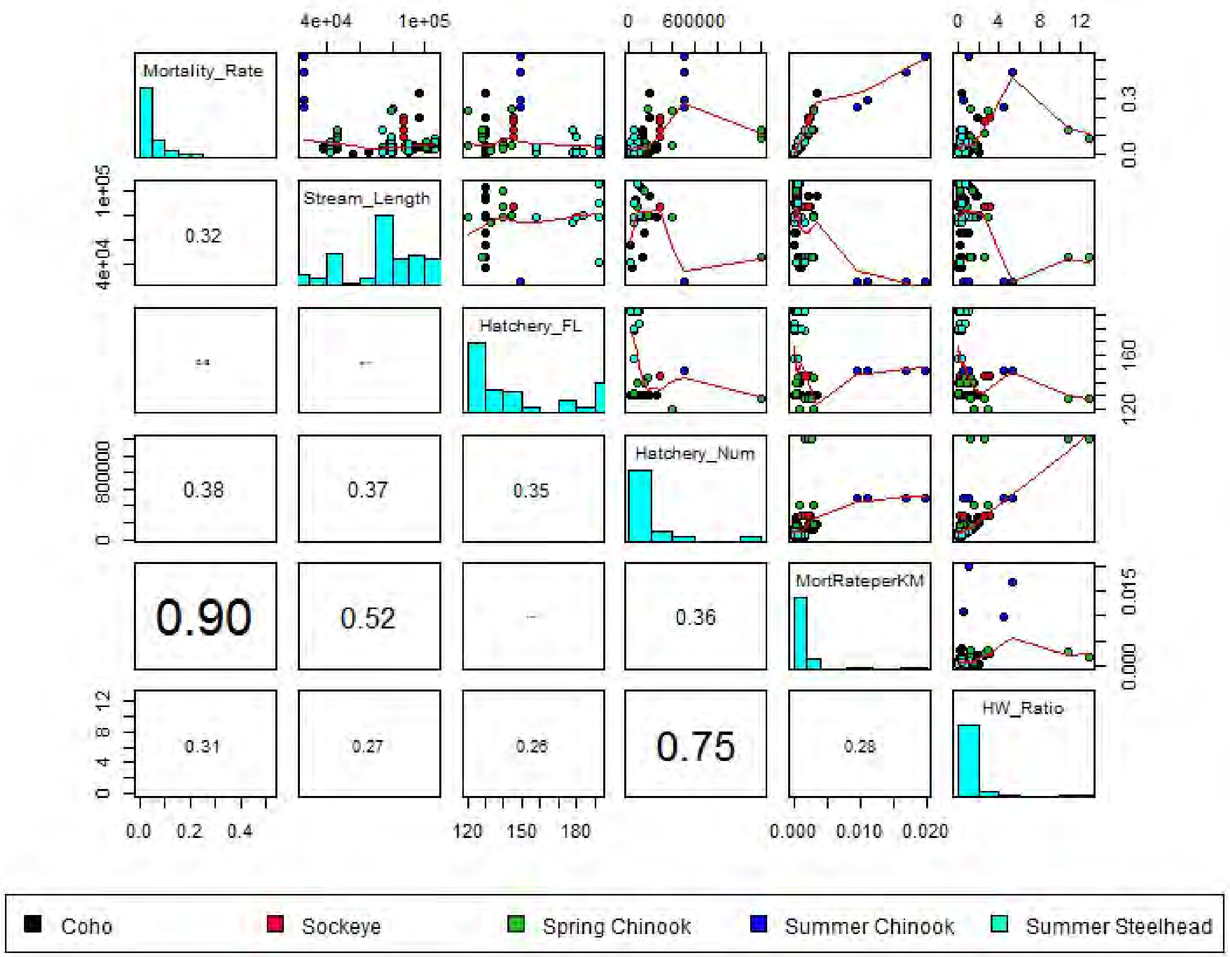


Figure 30. Spring Chinook NTTOC (Wenatchee and Methow) scatter plot matrix of NTTOC mortality percentage (Mortality_Rate, dependnent variable) verses variables that can be manipulated by managers: Release Location (Stream_Length), size of hatchery fish (Hatchery_FL), and number of hatchery fish released (Hatchery_Num). Hatchery program species are color coded (legend). MortRateperKM is the NTTOC mortality percentage (Mortality_Rate) divided by the distance of interaction (Stream_Length) and HW_Ratio is the number of hatchery fish released divided by the NTTOC population estimate. Plots include loess fits, correlation coefficients (font size scaled by correlation), and histograms of the variables.

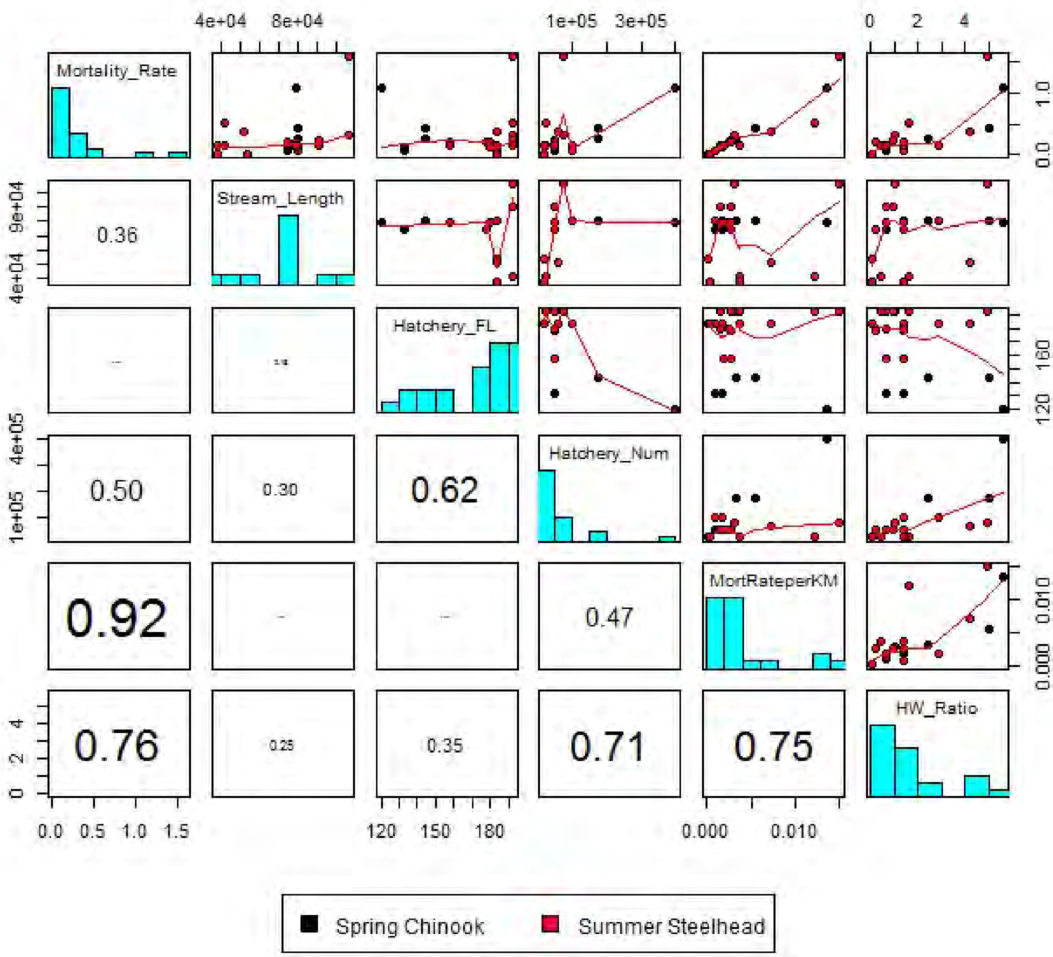


Figure 31. Summer Steelhead NTTOC (Wenatchee, Methow, Okanogan) scatter plot matrix of NTTOC mortality percentage (Mortality_Rate, dependnent variable) verses variables that can be manipulated by managers: Release Location (Stream_Length), size of hatchery fish (Hatchery_FL), and number of hatchery fish released (Hatchery_Num). Hatchery program species are color coded (legend). MortRateperKM is the NTTOC mortality percentage (Mortality_Rate) divided by the distance of interaction (Stream_Length) and HW_Ratio is the number of hatchery fish released divided by the NTTOC population estimate. Plots include loess fits, correlation coefficients (font size scaled by correlation), and histograms of the variables.

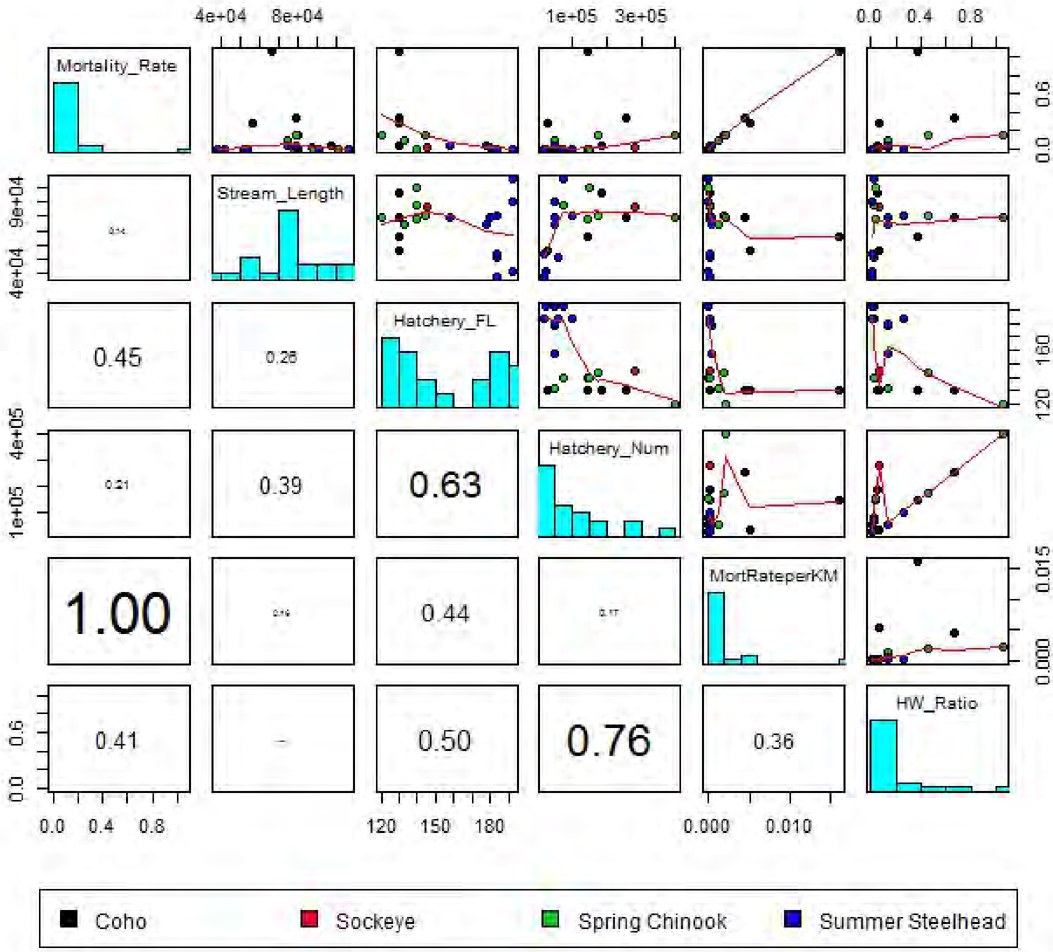


Figure 32. Summer Chinook NTTOC (Wenatchee, Methow, Okanogan) scatter plot matrix of NTTOC mortality percentage (Mortality_Rate, dependnent variable) verses variables that can be manipulated by managers: Release Location (Stream_Length), size of hatchery fish (Hatchery_FL), and number of hatchery fish released (Hatchery_Num). Hatchery program species are color coded (legend). MortRateperKM is the NTTOC mortality percentage (Mortality_Rate) divided by the distance of interaction (Stream_Length) and HW_Ratio is the number of hatchery fish released divided by the NTTOC population estimate. Plots include loess fits, correlation coefficients (font size scaled by correlation), and histograms of the variables.

The ratio of hatchery to NTTOC fish was further explored in Figures 33-36 using quantile regression (Koenker, 2013; R Core Team, 2013). Ordinary least squares regression performs poorly in two of the three data sets, but describes more than half the variance for summer steelhead (Figure 35). However, quantile regression can be used to explore the response of the dependent variable (in this case, NTTOC mortality) to an independent variable when the response to that independent variable is heterogeneous. This may occur because other factors exist that are not included in the analysis, contributing to the observed relationship of the dependent variable to the dependent variable and increasing the variance. In this case, independent variables that managers can adjust are of interest, but these are not solely responsible for the response of the dependent variable. To understand how the independent variable affects the dependent variable when other variables that cannot be "controlled" exist, the response at quantiles other than the central tendency (median or mean) may be useful. Note that the variance is positively correlated with the x-axis in Figures 33-36. Quantiles ranging from 0.05 to 0.95, with the median (0.50 quantile) and ordinary least squares regression are presented on the scatterplots with the hatchery species identified by colored points. The 95% quantiles show the upper threshold of NTTOC mortality percentage where 95% of the time hatchery to NTTOC interactions would be at or below this level. The variance below this line is caused by other variables (unmeasured or not included in the analysis) that limit the mortality percentage. Looking at Figure 21, when the ratio of the number of hatchery fish to the number of NTTOC steelhead is 2, the maximum mortality rate at the 95% quantile likely to be about 0.7%. These quantile plots provide estimates of the maximum mortality likely to be encountered by and NTTOC when interacting with a hatchery program at a given ratio of hatchery to NTTOC fish. Note that all of the mortality response levels at the upper quantiles (e.g., 90 or 95th quantiles) remain well below the containment levels of 5%, suggesting 1) exceeding the containment levels is unlikely, 2) summer Chinook NTTOC may be sensitive to the size of hatchery programs and a hatchery:NTTOC program size ratio greater than 0.4 may result in undesirable levels of summer Chinook mortality, but this analyses was influenced by an extreme data point, and 3) management changes to variables included in this modeling effort with the intent of further reducing risk to NTTOC are likely to result in little gain, with the exception of summer Chinook NTTOC and program size as discussed in #2.

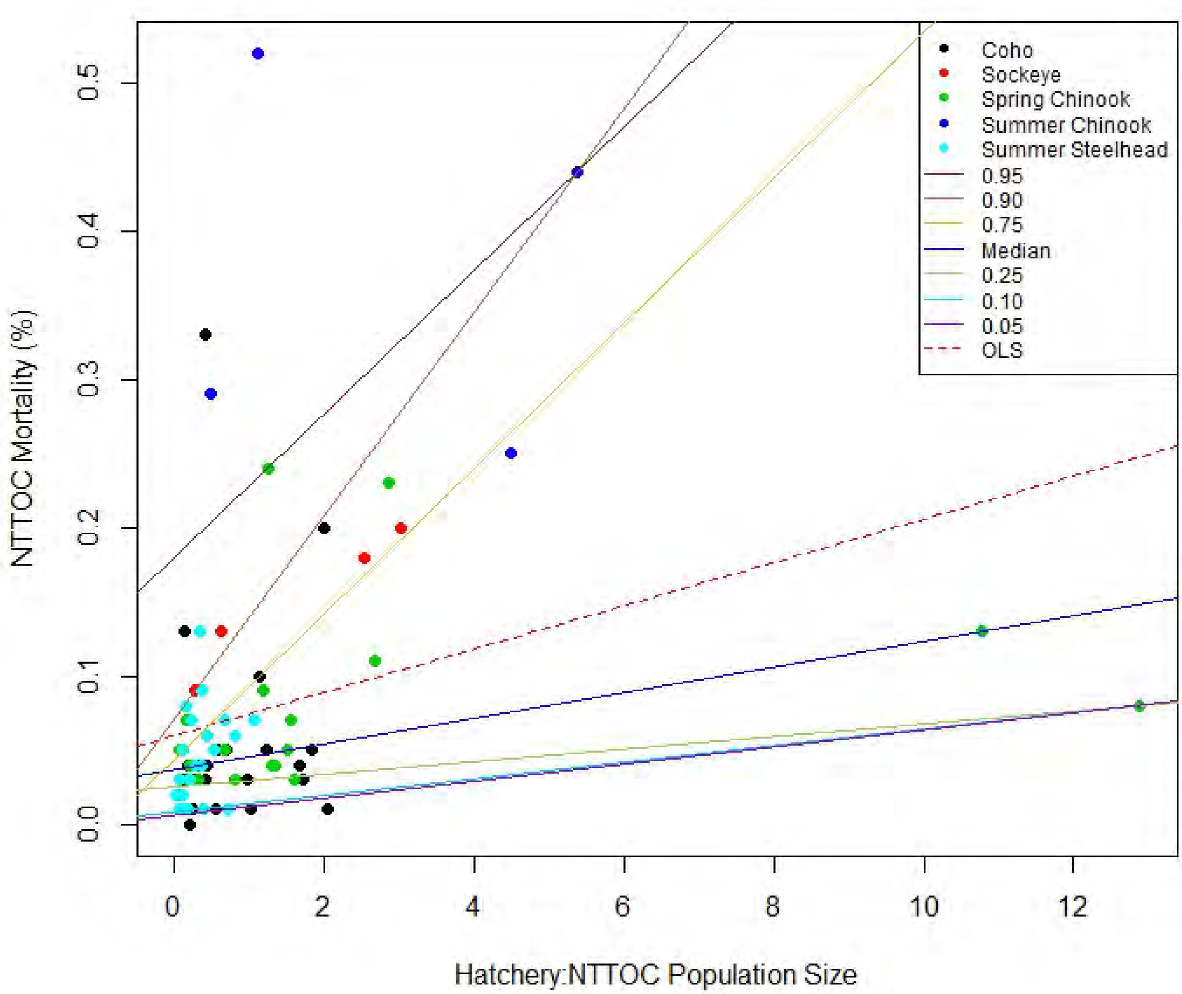


Figure 33. Quantile regression of Wenatchee and Methow spring Chinook NTTOC mortality percentage verses the ratio of the number of hatchery fish released per program to the NTTOC population estimate for all successfully modeled hatchery programs located in the Wenatchee and Methow basins. Quantiles plotted are 0.05, 0.10, 0.25, 0.5 (median), 0.75, 0.90, 0.95. Ordinary least squares (OLS) R^2=0.0953. Hatchery species are indicated in the legend.

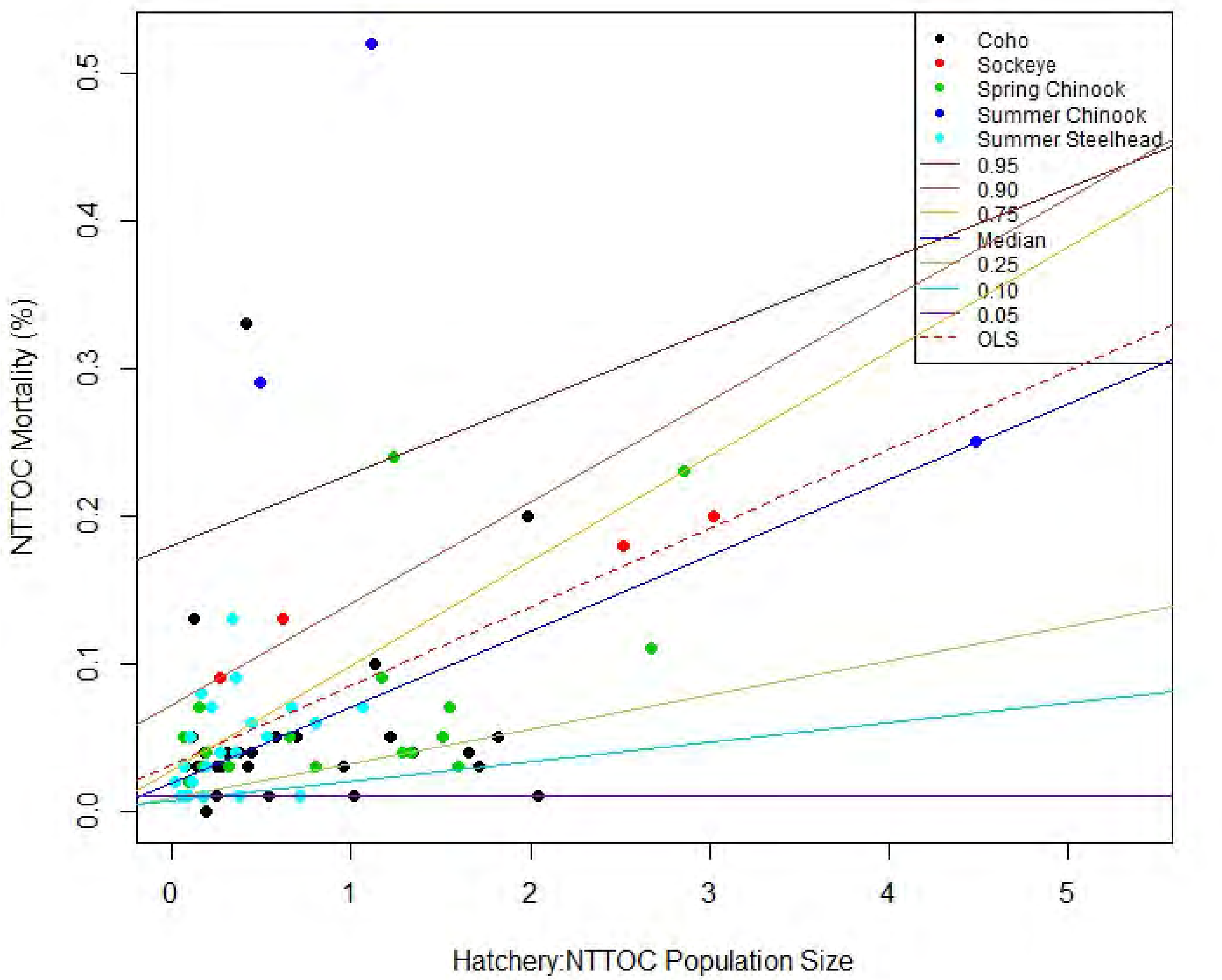


Figure 34. Quantile regression with two outliers removed of Wenatchee and Methow spring Chinook NTTOC mortality percentage verses the ratio of the number of hatchery fish released per program to the NTTOC population estimate for all successfully modeled hatchery programs located in the Wenatchee and Methow basins. Quantiles plotted are 0.05, 0.10, 0.25, 0.5 (median), 0.75, 0.90, 0.95. Ordinary least squares (OLS) R^2=0.3055. Hatchery species are indicated in the legend.

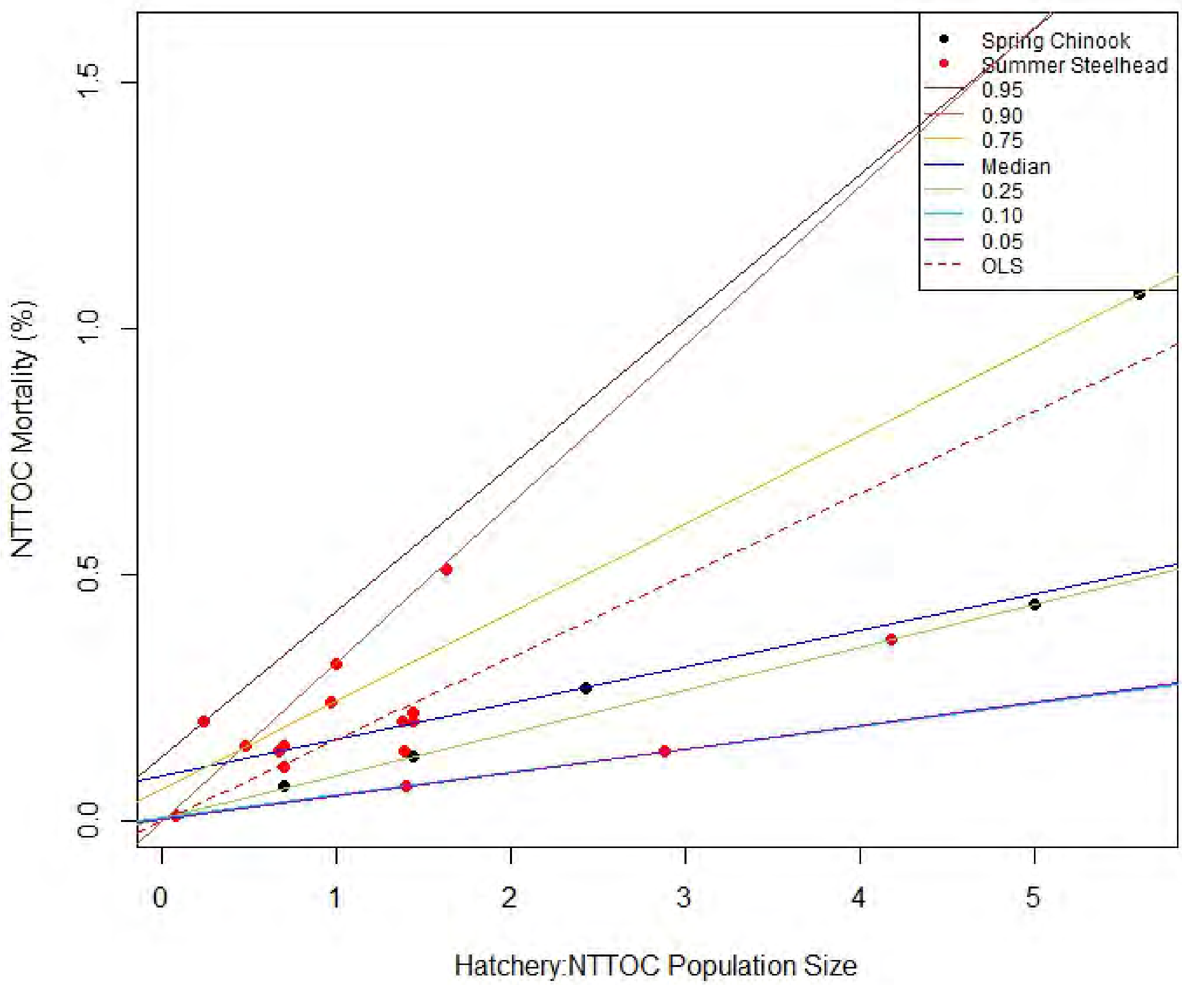


Figure 35. Quantile regression of Wenatchee, Methow, and Okanogan summer steelhead NTTOC mortality percentage verses the ratio of the number of hatchery fish released per program to the NTTOC population estimate for all successfully modeled hatchery programs located in the Wenatchee and Methow basins. Quantiles plotted are 0.05, 0.10, 0.25, 0.5 (median), 0.75, 0.90, 0.95. Ordinary least squares (OLS) R^2=0.5825. Hatchery species are indicated in the legend.

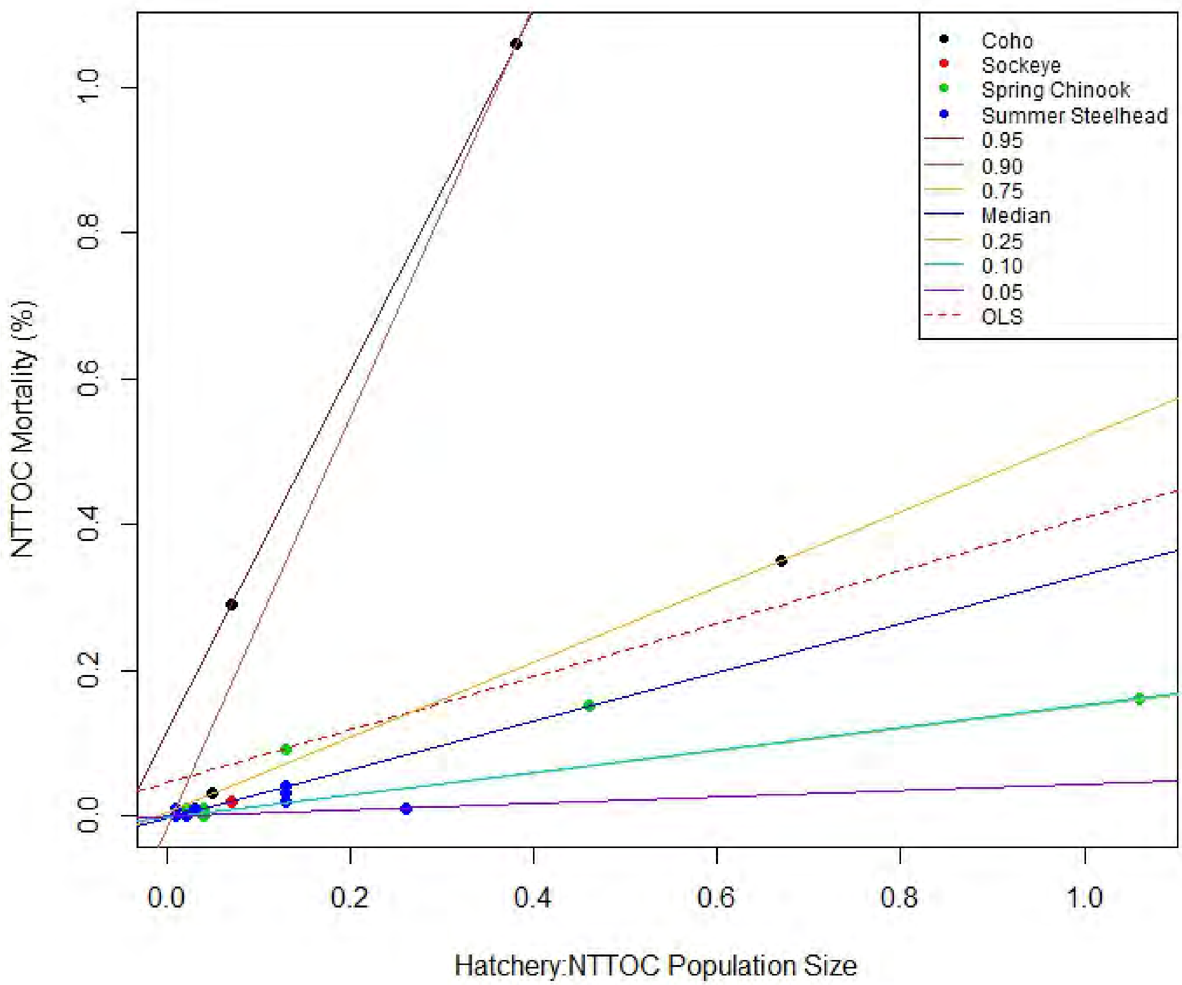


Figure 36. Quantile regression of Wenatchee, Methow, and Okanogan summer Chinook NTTOC mortality percentage verses the ratio of the number of hatchery fish released per program to the NTTOC population estimate for all successfully modeled hatchery programs located in the Wenatchee and Methow basins. Quantiles plotted are 0.05, 0.10, 0.25, 0.5 (median), 0.75, 0.90, 0.95. Ordinary least squares (OLS) R^2=0.1672. Hatchery species are indicated in the legend.

4.8 Westslope Cutthroat Trout and Pacific Lamprey

Two species of NTTOC, westslope cutthroat trout and Pacific lamprey, were not modelled using the PCD Risk 1 model. An alternative risk assessment approach was implemented for cutthroat trout which is described below. Ecological risks for Pacific lamprey in the Upper Columbia Watershed were not assessed because sufficient information about lamprey was not available. Furthermore, we are not aware of others who have estimated ecological risk to lamprey populations associated with releasing fish from hatcheries. Until basic information about lamprey distribution, abundance, and mechanisms of interactions with salmon and steelhead are available, informed risk assessments will not be possible. As such they will not be addressed further in this report.

There was insufficient information to populate data templates for interactions with cutthroat trout because most available data are collected under anadromous salmonid assessment programs that concentrate downstream of the distribution of most cutthroat trout. Therefore we took a different approach to assess risks to this NTTOC. We assumed that if the population overlap between hatchery origin fish and cutthroat trout was lower than the containment objective, then the risk would be acceptable. This is a very conservative assumption because under this approach all fish in the overlap zone would be assumed to be susceptible to death by interactions with hatchery fish. For example, if the overlap is 10% and the containment objective is 40%, then the risk of exceeding the objective would be considered acceptable because all of the NTTOC fish could die in the overlap zone (a very unlikely occurrence) and still be within the acceptable containment objective. Furthermore, this approach was also used in ecological risk assessments in the Yakima Watershed (Pearsons and Temple, 2007; Temple and Pearsons, 2012).

Local experts estimated spatial overlap of cutthroat trout and hatchery origin fish based upon location of hatchery release locations and the estimated distribution of cutthroat trout (Table 25). Overlaps were generated for a representative number of programs (n=45) in the Wenatchee, Methow, and Okanogan watersheds and the Columbia River mainstem. Most cutthroat trout occupied areas above hatchery release locations and also in tributaries that did not include hatchery releases. Overlaps ranged from 0% to 3%. The mean overlap was 0.9% with a standard deviation of 0.9%. Because the maximum overlap with cutthroat trout (3%) was considerably less than the containment objective (<41%), we assess the risk to cutthroat trout as very low.

Table 25. Estimated percentage population overlap for westslope cutthroat NTTOC populations and hatchery programs

NTTOC	Hatchery Program	Percentage Population Overlap
Westslope Cutthroat (Methow)	Beaver Coho	2.00
Westslope Cutthroat (Methow)	Chewuch Coho	3.00
Westslope Cutthroat (Methow)	Chewuch Methow-Composite Spring Chinook (MetComp)	3.00
Westslope Cutthroat (Methow)	Columbia Hatchery Fall Chinook (Priest Rapids)	0.00
Westslope Cutthroat (Methow)	Columbia Spring Chinook (Chief Joe)	0.01
Westslope Cutthroat (Methow)	Columbia Subyearling Summer Chinook (Chief Joe)	0.01
Westslope Cutthroat (Methow)	Columbia Subyearling Summer Chinook (Wells)	0.01
Westslope Cutthroat (Methow)	Columbia Summer Chinook (Turtle Rock)	0.01
Westslope Cutthroat (Methow)	Columbia Summer Steelhead (Wells)	0.01
Westslope Cutthroat (Methow)	Columbia Yearling Summer Chinook (Wells)	0.01
Westslope Cutthroat (Methow)	Columbia Yearling Summer Chinook (Chief Joe)	0.01
Westslope Cutthroat (Methow)	Methow Coho	1.00
Westslope Cutthroat (Methow)	Methow Methow-Composite Spring Chinook (MetComp)	1.00
Westslope Cutthroat (Methow)	Methow Summer Chinook	1.00
Westslope Cutthroat (Methow)	Methow Summer Steelhead (Wells)	1.00
Westslope Cutthroat (Methow)	Twisp Coho	2.00
Westslope Cutthroat (Methow)	Twisp Spring Chinook	2.00
Westslope Cutthroat (Methow)	Twisp Summer Steelhead	2.00
Westslope Cutthroat (Methow)	Winthrop NFH - Methow Summer Steelhead - 2-year rearing program	1.00
Westslope Cutthroat (Methow)	Winthrop NFH - Methow-Composite Spring Chinook (MetComp)	1.00
Westslope Cutthroat (Methow)	Winthrop NFH - Wells Summer Steelhead - 1-year rearing program	1.00
Westslope Cutthroat (Wenatchee)	Chiwawa Coho	1.00
Westslope Cutthroat (Wenatchee)	Chiwawa Spring Chinook	1.00
Westslope Cutthroat (Wenatchee)	Chiwawa Summer Steelhead	1.00
Westslope Cutthroat (Wenatchee)	Chumstick Coho	1.00
Westslope Cutthroat (Wenatchee)	Columbia Hatchery Fall Chinook (Priest Rapids)	0.00
Westslope Cutthroat (Wenatchee)	Columbia Spring Chinook (Chief Joe)	0.01
Westslope Cutthroat (Wenatchee)	Columbia Subyearling Summer Chinook (Chief Joe)	0.01
Westslope Cutthroat (Wenatchee)	Columbia Subyearling Summer Chinook (Wells)	0.01
Westslope Cutthroat (Wenatchee)	Columbia Summer Chinook (Turtle Rock)	0.01
Westslope Cutthroat (Wenatchee)	Columbia Summer Steelhead (Wells)	0.01
Westslope Cutthroat (Wenatchee)	Columbia Yearling Summer Chinook (Wells)	0.01
Westslope Cutthroat (Wenatchee)	Columbia Yearling Summer Chinook (Chief Joe)	0.01
Westslope Cutthroat (Wenatchee)	Icicle Coho Salmon	0.50
Westslope Cutthroat (Wenatchee)	Icicle Spring Chinook	0.50
Westslope Cutthroat (Wenatchee)	Little Wenatchee Coho	1.00
Westslope Cutthroat (Wenatchee)	Nason Coho	2.00
Westslope Cutthroat (Wenatchee)	Nason Spring Chinook	2.00
Westslope Cutthroat (Wenatchee)	Nason Summer Steelhead	2.00
Westslope Cutthroat (Wenatchee)	Wenatchee Sockeye	1.00
Westslope Cutthroat (Wenatchee)	Wenatchee Summer Chinook	0.50
Westslope Cutthroat (Wenatchee)	Wenatchee Summer Steelhead (HxH)	0.50
Westslope Cutthroat (Wenatchee)	Wenatchee Summer Steelhead (WxW)	1.00
Westslope Cutthroat (Wenatchee)	White Coho	2.00
Westslope Cutthroat (Wenatchee)	White Spring Chinook	2.00

5.0 DISCUSSION

The PCD Risk 1 model was used to estimate NTTOC mortality from interactions with hatchery program fish. The program was successfully run for 202 of 336 interactions (an interaction was a hatchery program effect on an NTTOC). Of those interaction modeling runs that were unsuccessful, many of the interactions consisted of hatchery programs releasing fish that were smaller than the NTTOC fish. For example, steelhead NTTOC interacting with summer Chinook hatchery programs tended to crash. In the case of NTTOC fish being larger than hatchery fish, negative interactions such as predation on NTTOC and competition should be minimized. Therefore, such interactions may not pose a high level of risk to the NTTOC. The pattern was not entirely limited to such interactions, however. Although a substantial troubleshooting effort was undertaken, including consultation with the original programmer, review by other computer programmers, and a review of the computer code by biologists, the cause of the problems with the model was not identified. Work continues to remedy this problem outside the scope of this study. For those model runs that were successful, the results appear to be credible and the variability in the results suggests that the model was not generating widely different results for analogous interactions. The number of model runs that were completed provides a very large and diverse set of results that can be applied to the NTTOC and hatchery programs in the Upper Columbia region.

Overall, estimated rates of mortality for NTTOC were extremely small. Variability in the model results also tended to be fairly low, but was higher for the Columbia River programs. Nevertheless, the overall finding of this study is that the hatchery programs appear to be well within the containment objectives for sockeye, spring Chinook, summer Chinook, and summer steelhead. Sources of mortality varied by NTTOC species, with steelhead NTTOC experience a higher incidence of competition and disease-related mortality, while other species tended to experience losses through predation mortality.

Only three steelhead NTTOC (Twisp, Chiwawa, Omak) had interactions that exceeded the containment objective. All three of these occurred with interactions with Columbia River hatchery releases, and all three were only slightly above the containment objective of 5%. These three NTTOC are small populations and may be more susceptible to stochastic effects in the model. Indeed, these three interactions displayed high variability in the model results. Competition equivalents and disease appeared to be the most important sources of mortality for these three interactions. The Columbia River hatchery releases were analyzed separately from hatchery releases that occurred in-basin. There are two important reasons for this: 1) the distance of interaction for in-basin releases was defined as the hatchery release point to the confluence of the tributary with the Columbia River (mean distance is 75 km). The Columbia releases area of interaction was defined as the release point to McNary Dam (mean distance is 380 km). This is on average five times the distance of the in-basin programs and provides more space and time for interactions to occur, and 2) The same input data were used for both in-basin and Columbia releases except for those variables that described physical attributes of the rivers. However, little is known about ecological interactions between hatchery and natural-origin fish in a large river, such as the Columbia, during migration. Using the same input data for interactions that occur in smaller streams, which has been extensively studied, may not be appropriate for a very large river.

Combining hatchery program effects on an NTTOC (roll-up of effects) resulted in increased mortality, but all NTTOC remained below containment objectives under the rollup analyses for in-basin programs, and all, but the three steelhead NTTOC mentioned above, were within the containment objective for the in-basin plus Columbia River programs rollup. This illustrates how low most of the mortality estimates were, even when program effects were combined the NTTOC mortality still remained within acceptable limits. When the NTTOC were analyzed at the higher population level (i.e., at the Wenatchee, Methow, or Okanagan basin population level), none of the populations exceeded containment, even when the NTTOC included a steelhead interaction that had exceeded containment. This is because the net effect on the entire basin-wide population dampened the more acute effect on a smaller unit of the population. Westslope cutthroat trout were found to be well below containment objectives using a spatial overlap approach where hatchery programs and cutthroat populations were estimated to overlap by 3% or less. Even making the unrealistic assumption that 100% mortality of the cutthroat NTTOC would occur in the overlap zone, cutthroat NTTOC would still be far below the 41% containment objective, and even below the more stringent 5% objective applied to listed salmon and steelhead populations. Too little is known about Pacific lamprey population sizes and the ecological interactions between salmon and steelhead hatchery fish and lamprey to attempt a risk assessment at this time.

One approach to assessing risk may be to use quantile regression to identify the level of a factor that may result in unacceptable risk. Quantile regression is well suited for this analysis because it can be used to assess response at the upper quantiles (90 or 95%) of response, providing information that can be used to avoid exceeding risk tolerance levels. In this case, mortality for in-basin interactions was well below the containment objectives set by managers, so quantile regression revealed little risk of the hatchery to NTTOC population ratios analyzed here, with the exception that summer Chinook NTTOC may be sensitive to hatchery:NTTOC program size ratios above 0.4. However, this result was influenced by an extreme data point and a relatively small sample size. The approach may be a useful way to evaluate complex results to inform management decisions.

We conclude that the ecological risks provided by PCD-Risk 1 outputs and overlap (cutthroat trout) are within the NTTOC containment objectives for most NTTOC and are slightly outside of containment objectives for three steelhead NTTOC. Ecological risks could not be assessed for Pacific lamprey because of lack of information. We recognize that our assessment is based upon results of a model that has not been tested and that does not include all mechanisms and locations of interactions that are possible (Pearsons and Busack, 2012). However, the results seem reasonable given the comprehensive scope of the input data to the model, the large number of interactions that were modeled, and the consistently low mortality of NTTOC associated with hatchery releases. In addition, results were consistent for similar programs interacting with similar NTTOC. The assessment of interactions was based on detailed spatial and temporal information that governs the potential for hatchery fish and NTTOC to physically interact. Furthermore, state of the science behavioral ecology concepts were used in the model to assess what is likely to happen when hatchery fish and NTTOC do interact. It is unlikely at this point that a more informed or comprehensive assessment of this topic is possible.

6.0 REFERENCES

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APPENDIX S
EXTENSION OF THE WENATCHEE SPRING CHINOOK RRS STUDY

STATE OF WASHINGTON
DEPARTMENT OF FISH AND WILDLIFE
FISH PROGRAM -SCIENCE DIVISION
HATCHERY/WILD INTERACTIONS UNIT
3515 Chelan Hwy, Wenatchee, WA 98801
Voice (509) 664-3148 FAX (509) 662-6606

February 24, 2014

To: Rock Island HCP Hatchery Committee
Priest Rapids Hatchery Subcommittee

From: Andrew Murdoch, Research Scientist, Science Division, WDFW
Mike Ford, Director, Conservation Biology Division, NW Fisheries Science Center
NOAA Fisheries

Subject: Extension of the Wenatchee spring Chinook RRS Study

Adult management activities at Tumwater Dam are planned to begin in 2014. As a result, the abundance and proportion of hatchery spawners is expected to differ from what has been included in the study thus far (Table 1). For example, the abundance of naturally produced fish has never exceeded that of hatchery fish. In addition, the parental origin of hatchery spawners will also be changing and by 2017 only hatchery fish produced by natural origin parents could be allowed upstream to spawn. Furthermore, the sex and age of hatchery fish allowed to spawn naturally may also differ in the immediate future if jacks and adult male hatchery fish are disproportionately removed at Tumwater Dam. These significant hatchery reform actions are the reasons we (WDFW and NOAA) have proposed extending the duration of study to BPA. These reform actions can be empirically evaluated if additional brood years are included in the study. If approved by BPA, WDFW and NOAA is asking for approval from the Rock Island HCP Hatchery Committee for the change in scope, contingent upon BPAs approval.

Table 1. Summary of the number and percentage of hatchery and naturally produced fish allowed to spawn upstream of Tumwater Dam, 2004 – 2013. Asterisk denotes preliminary numbers that may change after scales are read.

Year	Hatchery		Naturally produced	
	Number	%	Number	%
2004	1,327	0.60	898	0.40
2005	3,217	0.84	594	0.16
2006	1,600	0.74	573	0.26
2007	3,259	0.91	324	0.09
2008	5,338	0.89	631	0.11
2009	4,270	0.85	777	0.15
2010	4,453	0.83	880	0.17
2011	4,792	0.80	1224	0.20
2012	4,010	0.75	1370	0.25
2013*	3,274	0.75	1144	0.25
Mean	3,554	0.79	842	0.21
CV	36	12	39	45

Proposal

Extend the scope of the study to include brood years 2014 through 2018. However, comparisons of relative reproductive success will only be made at the smolt stage through 2020. A comparison of the original proposal and proposed extension is provided in Table 2.

Table 2. A summary of additional impacts directly attributable to the study as a result of the proposal.

Question	Original Project	Proposal
Last brood year in study?	2013	2018
Last year of DNA sampling potential hatchery spawners?[1]	2013	2018
Last year of DNA sampling wild returning adults?[1]	2018	2018
Last year of juvenile DNA sampling?	2015	2020
Last year of intensive spawning ground surveys?	2013	2013

[1] Denotes last year of adult trapping specific to the RRS Study but does change trapping activities that may be associated with adult management, broodstocking, and/or other M&E related activities.

ESA Take and Permitting

Section 10(a)(1)(A) permit #18121 provides the necessary spring Chinook take associated with the proposal. Furthermore, because the removal of excess hatchery fish at Tumwater Dam and the collection of DNA from naturally produced fish (i.e., original RRS study) will also require trapping effort (and scheduling) similar to past years efforts under the RRS, the trapping effort for adult management and DNA collection under the original RRS scope of work will be sufficient to conduct the study. If approved, the change is scope will result in the additional sampling (i.e., biological data, PIT tag, and DNA) of hatchery adults released upstream of Tumwater Dam from 2014 through 2018 and the additional sampling (i.e., DNA) of naturally produced juveniles collected at smolt trap that otherwise would already be sampled and PIT tagged through 2020.

Additionally, specific bull trout coverage for potential take at Tumwater Dam is currently in discussion under the Section 7 consultations with the USFWS for the Wenatchee Basin. Any terms and conditions set forth as result of those consultations will be met.

As with previous years, assessment of/modifications in response to delays resulting from trapping operations, will be consistent with protocols developed and approved by the HCP HC annually.

Other Logistical Considerations

Results of the study thus far have suggested that spawning location accounts for a significant proportion of variation in reproductive success. Because Chelan County PUD has elected to resume conducting spring Chinook spawning ground surveys in the Wenatchee Basin, WDFW will work closely with PUD staff and supply the equipment and supplies necessary to ensure the any additional data critical to the study (i.e., spawning location of all carcasses not just females and DNA from untagged fish) is collected consistent with past protocols.

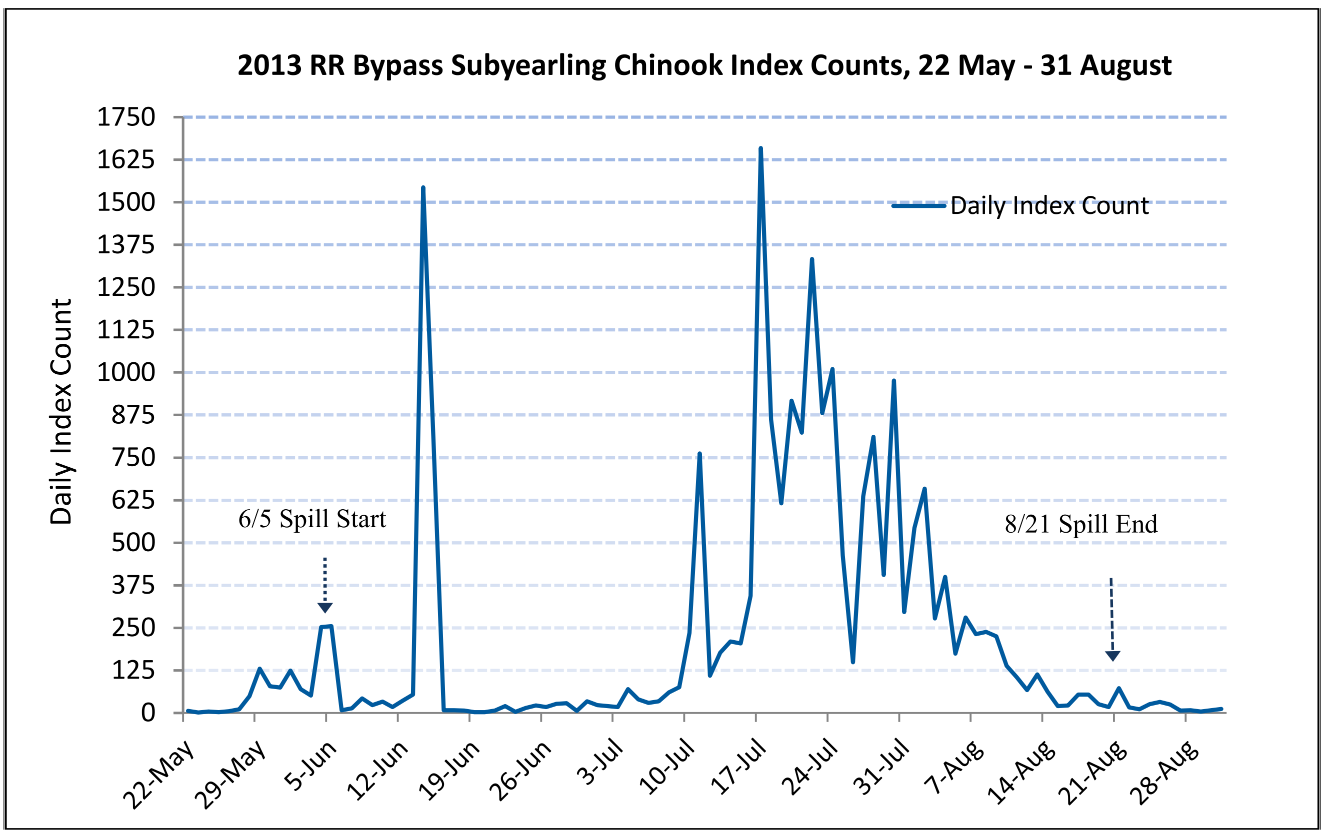
We anticipate approval for the extension of the study from BPA in the next couple months. At this time we are formally seeking approval from the Rock Island HCP Hatchery Committee for the change, conditioned upon BPAs approval. If there are any potential questions or issues with the proposal to extend the study duration please feel free to contact me at your convenience.

APPENDIX T
CHELAN PUD ROCKY REACH AND ROCK ISLAND HCPS – FINAL 2014 FISH SPILL REPORT

Chelan PUD
Rocky Reach and Rock Island HCPs
Final 2014 Fish Spill Report

<u>2014 ROCKY REACH</u>
Summer Spill

Target species:	Subyearling Chinook
Spill target percentage:	9% of day average river flow
Spill start date:	24 May, 0001 hrs
Spill stop date:	24 August, 2400 hrs
95% Est. passage date:	17 August
Percent of run with spill:	98.27% on 24-August (estimated as of 15 September)
Cumulative index count:	22,327 subyearling Chinook (as of 15 September)
Summer spill percentage:	12.72% (9.13%, plus 3.59% forced spill 24 May – 24 August)
Avg river flow at RR:	151,412 cfs (24 May - 24 August)
Avg spill rate at RR:	19,253 cfs (24 May - 24 August)
Total spill days:	93



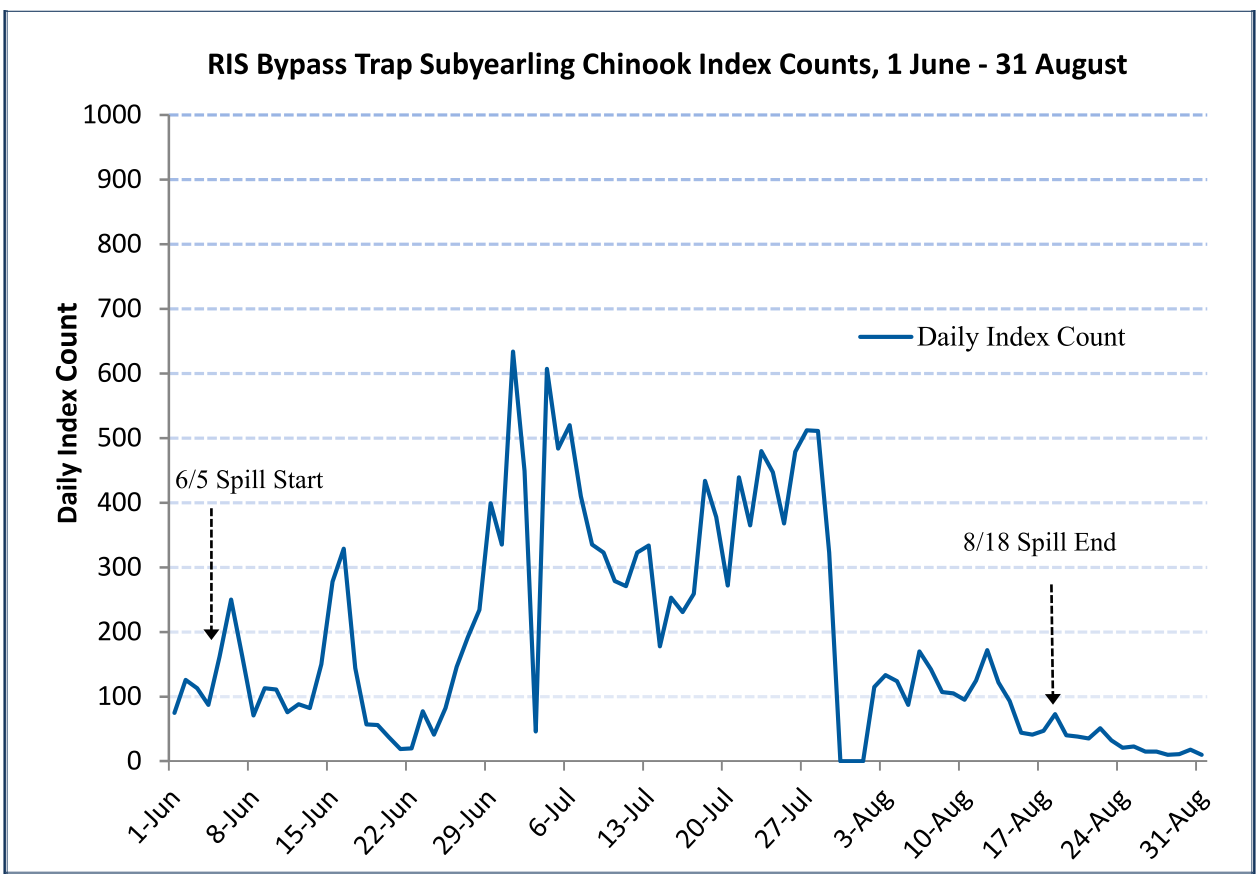
2014 ROCK ISLAND

Spring Spill

Target species:	Yearling Chinook, steelhead, sockeye
Spill target percentage:	10% of day average river flow
Spill start date:	17 April, 0001 hrs
Spill stop date:	23 May, 2400 hrs (immediate increase to 20% summer spill)
Percent of run with spill:	Yearling Chinook 100%; steelhead 99.91%; sockeye 99.94%
Cumulative index count:	26,429 yearling Chinook; 28,299 steelhead; 38,596 sockeye
Spring spill percentage:	18.33% (10.06% plus 8.27% forced spill for 17 April – 23 May)
Avg river flow at RI:	175,295 cfs (17 April – 23 May)
Avg spill flow at RI:	32,126 cfs (17 April – 23 May)
Total spill days:	37

Summer Spill

Target species:	Subyearling Chinook
Spill target percentage:	20% of day average river flow
Spill start date:	24 May, 0001 hrs
Spill stop date:	24 August, 2400 hrs
95% Est. passage date:	19 August
Percent of run with spill:	Subyearling Chinook 97.12% (estimated as of 15 September)
Cumulative index count:	34,527 subyearling Chinook (as of 15 September)
Summer spill percentage:	21.83% (20.05% plus 1.78% forced spill for 24 May – 24 August)
Avg river flow at RI:	157,578 cfs (24 May - 24 August)
Avg spill flow at RI:	34,404 cfs (24 May - 24 August)
Total spill days:	93



Juvenile Index Counts 2004-2014 from the Rocky Reach Juvenile Fish Bypass Sampling Facility and Rock Island Bypass Trap Smolt Monitoring Program (SMP) 1 April – 31 August.

Table 1. Rocky Reach Juvenile Bypass index sample counts, 2004-2014

Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014*
Sockeye	30,935	17,575	239,185	169,937	136,206	40,758	724,394	67,879	384,224	199,497	**553,645**
Steelhead	6,433	5,821	4,329	4,532	8,721	6,309	4,931	5,683	4,902	2,528	**5,270**
Yearling Chinook	53,946	27,611	23,461	18,080	38,394	18,946	33,840	24,400	95,207	29,018	**15,871**
Subyearling Chinook	20,062	10,978	19,996	13,496	11,820	11,944	59,751	17,246	5,774	22,073	**22,327**

Table 2. Rock Island Smolt Monitoring Program index sample counts, 2004-2014

Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014*
Sockeye	7,114	1,991	34,604	16,410	38,965	4,926	37,404	18,697	46,788	25,111	**38,596**
Steelhead	10,735	15,974	26,930	18,482	22,780	17,636	17,194	28,408	16,957	15,099	**28,299**
Yearling Chinook	12,574	14,797	37,267	23,714	22,562	9,225	11,802	26,407	25,759	28,324	**26,429**
Subyearling Chinook	23,563	18,710	27,106	15,686	15,940	8,189	23,205	27,397	27,298	17,170	**34,527**

* In 2014, as directed by the HCP, Chelan PUD conducted bypass operations outside of the normal operating period of 1 April to 31 August to assess achievement of bypass operations for 95% of the subyearling Chinook outmigration. The Rocky Reach juvenile fish bypass operated from 1 April through 15 September, and the Rock Island bypass facility at powerhouse 2 operated from 1 April through ? September.