Rocky Reach Fish Forum
Wednesday, 7 March 2018
1:00 – 4:00 p.m.
Chelan PUD Second Floor Conference Room
Wenatchee, WA

Meeting called by Steve Hemstrom — Chairperson, Tracy Hillman
Notes taken by Dee Swank

Attending Representatives:

Hemstrom, Steve	Chelan PUD	(509) 661-4281	steven.hemstrom@chelanpud.org
Lewis, Steve	USFWS	(509) 665-3508 x14	stephen_lewis@fws.gov
Truscott, Kirk	CCT	(509) 978-8031	Kirk.truscott@colvilletribes.com
Zimmerman, Breean*	ECY	(509) 575-2808	breean.zimmerman@ecy.wa.gov

Attending Participants:

Clement, Marcie*	Chelan PUD	(509) 661-4186	marcie.clement@chelanpud.org
Hillman, Tracy	BioAnalysts	(208) 321-0363	tracy.hillman@bioanalysts.net
Keller, Lance	Chelan PUD	(509) 661-4299	lance.keller@chelanpud.org
Kunz, Heidi	Chelan PUD	(50) 661- 4785	Heidi.kunz@chelanpud.org
Lampman, Ralph*	YN	(509) 388-3871	lamr@yakamafish-nsn.gov
Nelle, RD	USFWS	(509) 548-7573	RD_Nelle@fws.gov
Rose, Bob*	YN	(509) 865-5121	rosb@yakamafish-nsn.gov
Swank, Dee	Chelan PUD	(509) 661-4601	delores.swank@chelanpud.org

* Joined via phone.

Meeting Minutes

I. Welcome and Introductions

Tracy Hillman welcomed everyone to the Rocky Reach Fish Forum (RRFF or Forum) meeting. Participants introduced themselves.

II. Agenda Review

The meeting agenda was reviewed and approved with no additions.

III. Approval of February Meeting Minutes

The February RRFF meeting minutes were reviewed and approved with an edit.

IV. Review Action Items

- Steve Hemstrom will talk to Ralph Lampman about his comments on the 2016 Final Passage and Escapement Report. **Complete**
- USGS will send a short paper to the RRFF providing guidance on studying the effects of Triclopyr TEA on Pacific lamprey. **Ongoing**
- Ralph Lampman will suggest studies on the effects of Triclopyr TEA on Pacific lamprey ammocoetes. **Ongoing**
- Lance Keller will ask Corey Morrison for information about the next culling event for white sturgeon at Chelan Hatchery. **Complete**
- Marcie Clement will send Breean Zimmerman information regarding the Flowering Rush Summit in Spokane, WA, on 27-28 February. **Complete**
- Bob Rose will contact Lisa DeBruyckere to see if she can provide more information on the Action Plan to the RRFF. **Complete. Lisa will call into the April meeting.**
- Tracy Hillman will forward the Statement of Work from Ann Gannam (USFWS) to the RRFF for review during the March meeting. **Complete**
- Tracy Hillman will send the GeoEngineers et al. (2011) report to the RRFF for discussion during the March meeting. **Complete**

V. Aquatic Invasive Species

ESA Compliance for Invasive Species Response

Marcie Clement reported on the Draft 2017 Aquatic Invasive Species Monitoring and Control Report, which was sent to the RRFF for review and comments. Marcie has not yet received any comments. She said that while performing the boat launch surveys, Chelan PUD did not find any Zebra or Quagga mussels, or any new invasive plants. Last year, WDFW requested a more thorough boat launch and shoreline survey to locate anything out of the ordinary. Kirk Truscott asked if they have detected the presence of northern pike. Lance Keller said no, they have not observed any pike in their bypass systems or in their Pikeminnow Program. The Pikeminnow Program incorporates five fishermen at the dams and four boats with three anglers in each boat moving throughout the reservoirs. Kirk asked if there would be a fish assemblage survey conducted in the reservoir. Lance responded that resident fish surveys are conducted as part of the Rocky Reach License. He added that for the next survey (in 2023), they will choose sampling sites where they are likely to detect northern pike if they are present. Lance said they may add an eDNA component to the resident fish survey in 2023.

Action Item:

- **RRFF will review the Aquatic Invasive Species Monitoring Report and provide comments to Marcie Clement by 16 March 2018.**

VI. White Sturgeon

Juvenile Rearing Update

Lance Keller reported that as of the end of February, there were 2,479 juvenile white sturgeon at Chelan Hatchery. Fish are distributed among six tanks and range from 6.8 to 36 fish per pound. In January, the weight range was 7 to 48 fish per pound, indicating that the smaller fish have grown. Tagging will be conducted in late March or early April. Before release, Chelan PUD will conduct a QA/QC scan to determine tag retention and will measure fish for weight and length. A total of 2,250 juvenile sturgeon will be released this spring with a target release weight of 2.2 fish per pound. Lance noted that variability in size is due to culture, water temperatures, and getting fish on feed.

2017 Annual M&E Report

Lance Keller reported that LGL and Corey Wright from Blue Leaf are working on completing the 2017 Annual M&E report; however, an additional month is needed to complete the draft. The Forum approved an additional month for completing the report.

Lance and Corey conducted the winter sturgeon diet survey on 21-23 January. They sampled one day in each of the three sections of the reservoir (upper, middle, and lower sections). Survey locations within each section of the reservoir were selected based on M&E data. Over the three-day period, only one

sturgeon and three pikeminnow were caught. The sturgeon had an empty stomach. Because of poor sturgeon captures during winter, Lance will recommend during the April meeting that winter diet surveys be discontinued, and the effort spent sampling in winter be transferred to the other three sampling periods.

VII. Pacific Lamprey

USFWS Artificial Propagation SOW and Budget

Tracy Hillman provided the RRFF with the Statement of Work and Budget from the USFWS requesting $41,700.70 for continued development of artificial propagation methods (see Attachment 1). The period for the continued work is 1 May 2018 to 30 April 2019. Steve Hemstrom stated the proposed work will help advance artificial propagation methods and give the USFWS a third year to complete their work. He added that the funding would come from the Rocky Reach License budget, which is set aside for juvenile survival study work. Kirk Truscott asked what happens to the artificially propagated lamprey after the study is complete. Ralph Lampman said the larger lamprey would be reared to transformation. After discussion, Tracy asked members present if they approve the USFWS statement of work and budget for the performance period 1 May 2018 to 30 April 2019. The RRFF approved the SOW and budget as follows: Yakama Nation, Colville Tribes, Chelan PUD, USFWS, and WDOE approved the SOW and budget on 7 March 2018; WDFW approved the SOW and budget on 19 March 2018. Alcoa abstained. Given approval of the SOW and budget, the RRFF requested that Chelan PUD fund the work for the period 1 May 2018 to 30 April 2019.

VIII. 2017 Rocky Reach Lamprey Passage Update

Steve Hemstrom will ask Blue Leaf to perform another PIT-tag query in late March or early April to document early detections of adult lamprey movement within the mainstem Columbia River and tributaries. Steve said of the 300 fish released in August 2017, 274 (91.3%) have been detected. He hopes to detect the remainder this spring. He said passage success at Rocky Reach Dam has not changed for the 2017 study (remains at 98%; 253 of 259 passed). The next queries will focus on detections at Rocky Reach Dam and in the Wenatchee River. Steve Hemstrom added that he does not expect drastic changes in passage success at Rocky Reach Dam, and he hopes to prepare an adult passage SOA for RRFF review soon. He said the Forum will need to review the SOA based on two objectives identified in the Pacific Lamprey Management Plan: (1) determine that improvements have been made in lamprey passage based on modifications in the dam's fishway for lamprey passage, and (2) achieve passage that is similar to or better than those measured at other projects on the Columbia River.

Steve Lewis asked for clarification on the intent of the adult lamprey SOA in terms of what Chelan PUD will provide on passage efficiency after the SOA is approved and what the PUD's role will be for the remainder of the license regarding check-ins. Steve Hemstrom indicated that the intent of the SOA will

be to demonstrate Chelan PUD's successful completion of Objectives 1 and 2 for adult lamprey passage and once the SOA is approved, then establish direction for the lamprey plan/license to include study check-ins that are appropriate.

RD Nelle asked Steve Hemstrom if there was an update on the Tumwater Dam feasibility assessment. Steve Hemstrom believes comments from Chelan PUD engineers will come soon. He added that next steps are still pending.

Tracy Hillman reminded the RRFF that the Warm Springs Tribe will be conducting an adult lamprey PIT-tag study in the lower Columbia River with the goal of evaluating adult lamprey passage at Bonneville, The Dalles, and McNary dams. A total of 600 adult lamprey will be tagged with radio tags and HDX PIT tags (released downstream from Bonneville Dam); 500 adult lamprey will receive HDX PIT tags and 100 will receive HDX and FDX PIT tags (released downstream from Bonneville Dam); 300 will be tagged with HDX PIT tags for an AFF flume test (released at Stevenson); and 30 adult lamprey will be tagged with accelerometer radio tags and HDX PIT tags (released at Bonneville AFF). PIT-tag interrogation systems at Priest Rapids, Wanapum, Rocky Reach, and Wells dams will detect adult lamprey that move upstream. Ralph Lampman stated that the Warm Springs are also looking at turning on the dual mode to scan for full- and half-duplex PIT tags at McNary and The Dalles dams for the migration season.

Action Item:

- **Steve Hemstrom will check on the timeframe for comments/responses on the Tumwater Dam Feasibility Assessment.**

IX. Bull Trout

2018 Bull Trout Passage Monitoring Study

Steve Hemstrom provided a draft study plan outline for the 2018 Bull Trout Interactions and Genetics Analysis Study Plan and License Management Plan's Year 10 Monitoring Study (see Attachment 2). The purpose of the draft plan is to analyze bull trout interactions with Rocky Reach and Rock Island dams including upstream and downstream passage of bull trout. Chelan PUD began studying bull trout passage at the Rocky Reach and Rock Island Projects in 2001. The PUD conducted multiple-year radio telemetry studies (2001-2003 and 2005-2007). Many bull trout were tagged (N = 165) and extensive passage data were compiled for the projects. The Bull Trout Management Plan indicates that the RRFF needs to review and approve the bull trout passage monitoring plan and taking of additional genetic samples from any tagged fish. Part of the proposed draft plan includes PIT tagging a target number of bull trout at Dryden and Tumwater dams in 2018. The plan provides for the collection of bull trout tissue samples for genetic analyses and analysis of tissue samples from previous studies. For the check-in study, Chelan PUD would prepare and provide a draft report of initial PIT-tag data findings to the USFWS and RRFF by July 2019, and a final report by July 2021.

Steve Hemstrom asked for feedback regarding taking additional genetic samples from only Wenatchee River bull trout. He added that the USFWS has completed a genetic profile baseline for the Entiat, Wenatchee, Methow, and Yakima rivers. Steve Lewis said he likes the study plan framework and would like to see more effort analyzing bull trout delays within fishways. In addition, he would like more route specific (qualitative) data, which could lead to identification of data gaps for juvenile sub-adults. The USFWS performed their own PIT-tag queries and found that a combined 1,413 bull trout have been PIT-tagged in mid-Columbia tributaries and at Tumwater, Dryden, and Rocky Reach dams over time. It is his understanding that interactions of these fish with dams might need some reconciliation to fill in data gaps or strengthen the scope, and to examine the resiliency of these other local populations to potential project effects.

Steve Hemstrom would like recommendations from the RRFF on continuing genetic sampling within the next month. Rocky Reach is operating off the 2008 Biological Opinion for the new license. Many of the terms and conditions of the HCP Biological Opinion for Rocky Reach were moved into the new license for Rocky Reach as well as the Rocky Reach Bull Trout Management Plan for the Rocky Reach license. Rock Island is still operating under the USFWS 2004 Biological Opinion and Chelan PUD's 2005 Bull Trout Management Plan, created under the last federal action to add the Rock Island HCP into the FERC license. The Rock Island Bull Trout Management Plan was written, and those terms/conditions are implemented today. Each Bull Trout Plan follows the Project for which it was written. The 2005-2007 bull trout radio-telemetry study was designed to include both projects. That resulted in the two projects (Rocky Reach and Rock Island) having the same 10-year check-in study timeline. The 2018 PIT-tag studies will be for Rock Island and Rocky Reach.

Tracy Hillman noted that moving from radio-telemetry studies to PIT-tag studies represents a significant departure in methodology and asked the Forum if they agree with the proposed change in methodology. Steve Lewis said it is an appropriate change given the effects of radio tags on bull trout survival and behavior. Kirk Truscott offered some concerns with changing from radio tags to PIT tags and said he will discuss this with Jason McLellan (CCT) before making a decision. Other members present agreed with the change in methodology.

Steve Lewis said there are obligations and different types of crosswalks between the 2008 BiOp, 2004 BiOp, and the Bull Trout Management Plan that need additional review. The 2004 BiOp is 93% complete; however, there is still 7% that is not complete (processing 79 fish). Steve Lewis would like to focus on completing previous genetics work tasks rather than looking at the larger samples from PIT-tag or genetic sampling under the 2008 BiOp. Steve Hemstrom re-capped the 2008 Rocky Reach BiOp and the 2004 Rock Island BiOp and the cost share with the USFWS for samples collected in 2001-2002. Steve Lewis would like to have further discussion on wrapping up the 2004 and 2008 genetic obligations. Steve Lewis is preparing a list of remaining obligations and hopes to have it finished in a couple of days. Steve Hemstrom noted during the 2005-2007 radio telemetry studies, Chelan PUD documented dozens of upstream, downstream, and passage events of bull trout and observed no mortality during passage through the fishways, turbines, spillways, or bypass systems at Rocky Reach Dam or Rock Island Dam.

Kirk noted there have been some necessary operational repairs to both Rocky Reach and Rock Island dams, which changed spillways and generation during the juvenile migration. Lance Keller said over the 10-year timeframe, those altered operations have been brief, and the planned Project operations for spill and turbines following completion of this work will not change.

Kirk asked what information will radio tags provide that PIT-tags will not. Steve Lewis replied that you get more specific route information with radio tags. He added that the Wells study documented odd mortalities in bull trout tagged with radio tags but not with PIT tags. Steve Lewis noted that PIT tags provide more qualitative information for longer periods of time, while radio tags provide more quantitative information. Kirk mentioned that telemetry studies occurred previously and there have been operation changes since then that may affect project-level mortality. Will PIT tags allow more definitive estimates of mortality than radio tags? Steve Hemstrom responded there have been PIT-tag analyses completed that allow determination of survival and passage routes if Project operations are also reviewed in conjunction with timeframes of passage detections. He added that PIT-tags are much smaller, longer lasting, safe for fish (less invasive than radio tags), and allow determination of project interactions, rates, frequency, and fish survival.

Action items:

- **Kirk Truscott will ask Jason McLellan (CCT) for feedback on the use of PIT-tags to document bull trout interactions with hydroelectric projects.**
- **RRFF will review the draft bull trout study plan outline and provide comments to Steve Hemstrom by 28 March 2018.**

X. Public Comments

None.

XI. Next Meeting

The next meeting of the RRFF is scheduled for Wednesday, 4 April 2018 from 1:00 to 4:00 p.m. and will be held at the Chelan PUD office in Wenatchee at 327 N. Wenatchee Avenue (2nd Floor Conference Room).

Attachment 1

Statement of Work and Budget from the USFWS

Development of artificial propagation methods for production of juvenile Pacific lamprey (*Entosphenus tridentatus*) for use in research associated with Section 4.2.3 of the Rocky Reach Pacific Lamprey Management Plan

Statement of Work and Budget for

Performance Period May 1, 2018– April 30, 2019

Funds requested:

$ 41,700.70

U.S. Fish and Wildlife Service
Abernathy Fish Technology Center
Nutrition/Physiology Program
1440 Abernathy Creek Road
Longview, WA 98632
(360) 425-6072x339
ann_gannam@fws.gov

In cooperation with
Rocky Reach Fish Forum, via
Public Utility District No. 1 of Chelan County
327 North Wenatchee Avenue, PO Box 1231, Wenatchee, WA 98807-1231

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Scope of Work: The US Fish and Wildlife Service (USFWS) Abernathy Fish Technology Center (AFTC) will provide to the Public Utility District No. 1 of Chelan County (Chelan PUD) data concerning husbandry and rearing requirements, and rearing success of Pacific lamprey ammocoetes (*Entosphenus tridentatus*) by investigating rearing conditions and methodology including water temperature, photoperiod and diet. In this process the USFWS will develop specific rearing techniques (from spawning to juvenile rearing) to produce a sufficient number of migration-ready juvenile Pacific lamprey large enough to be used in future evaluations supporting the Rocky Reach Pacific lamprey Management Plan.

Background: Pacific lamprey possess a highly complex life cycle, spending 2-7 years in a filter feeding larval stage (ammocoete) in freshwater, a few months as an out-migrating juvenile (macropthalmia), 1-3 years as a parasitic adult at sea, and returning to freshwater for approximately 1 year before spawning. Pacific lamprey populations have greatly declined from historical levels within the Columbia River Basin (Close et al. 2002; Moser & Close 2003; Moyle et al. 2009). The number of adult lamprey counted by the Fish Passage Center (FPC) passing Bonneville Dam has declined from 379,509 in 1969 to 38,716 in 2015 (FPC 2015). The decline in population size is attributed to various factors including delay, entrainment, and mortality during passage at hydropower facilities, rearing and spawning habitat loss, increased predation (Beamish 1980; Beamish & Northcote 1989; Matter et al. 2000; Close et al. 2002), and abundance of host species in ocean environments (Murauskas et al. 2013). Lamprey declines have raised concerns among tribal, state and federal management agencies throughout the Columbia River Basin (Close et al. 2002) and have led to recent calls for development of lamprey culture to supplement declining populations (CRITFC 2011). Although the conservation of Pacific lamprey is increasingly important given the ecological and cultural importance of the species, insufficient information is available about many basic life history characteristics thereby hampering efforts to make informed management decisions. In particular, there are many knowledge gaps in the methods for culturing Pacific lamprey for conservation and experimental studies purposes. Refined culture methods for this species are needed to create the capability to produce fish to use for mitigation, research, and translocation efforts, or to establish and maintain populations in refugia.

There are many differences between lamprey and most commonly cultured fin fish that make lamprey culture unique and challenging. The primary differences are the requirement for sediment in the culture tanks which larval lamprey burrow into, and their filter feeding behavior which requires unconventional diets and feeding methods. Culture is further complicated because the Pacific lamprey begins life as a larval fish measuring less than 1 cm in length. To date, our experiences with lamprey culture efforts at AFTC have been effective, but at times survival is poor. In the first year of work under this contract we examined the possible cause for a bottleneck in survival in first feeding prolarvae/larvae and we characterized the temporal pattern of mortality during the bottleneck period. In the second year we investigated the effects of substrate, tank water exchange and cleaning frequency on growth and survival of ammocoetes. The third year focused on rearing methods for ammocoetes ranging from 3

months to 2 years old. The research investigated the effects of water temperature, photoperiod and diet. These factors influenced growth and survival of the ammocoetes. The fourth year's studies will include the effects of feeding frequency on ammocoete growth and survival. Currently feeding twice a week is the protocol. In this feeding trial the current protocol will be compared to feeding the fish five times a week. Young of the year (YOY) and one year old fish will be used. Additionally, we will use a factorial design to test sediment depth and ammocoete density and their effects on fish growth and survival. In conjunction with this study we will run a straight density trial using the standard sediment depth. These two studies will help define the rearing parameters that allow lamprey to have optimum growth. We will also test the addition lipid to the diet to enhance the lipid portion of the ammocoetes' body composition. Some aspects of the studies proposed here were developed with our partners, NOAA Fisheries and the Yakama Nation, and we are continuing our collaborative work with them. Results from the studies proposed here will be shared with our partners.

Ultimately, the lamprey rearing research will include refining captive culture to be able to grow lamprey to size for tagging with acoustic transmitters commonly used in wild fish movement studies. Once the techniques are developed to grow lamprey to 50-150 mm, there will be a ready source of fish available for tagging and instream studies without having to mine wild populations.

The following tasks will be performed by the USFWS:

Task 1.

- Determine the optimum feeding frequency for the lamprey to achieve the best growth
    - Compare the current twice a week feeding to feeding the fish five times a week. Use YOY and one year old fish

- Determine the effects of density X sediment depth on growth and survival of BY15 ammocoetes
    - Use low, medium and high sediment depths
    - Use a low and a high stocking density

- Conduct a trial to run concurrently with the density X sediment depth using just density as a density refinement study
    - Use several levels of fish density that fall on either side of the current standard density
    - Use the same medium level of substrate used in the density X sediment depth study

- Conduct a feeding trial to assess the effects of increased levels of lipid in the diet on fish

growth and body composition

- Use the 1) standard diet of 80% yeast/20% Otohime, 2) standard diet plus 20% fish oil emulsion, 3) standard diet plus 40% fish oil emulsion

- Continue to rear ammocoetes for long term objective of metamorphosed juvenile production

Task 2. Reporting

A final report will be disseminated to the Chelan PUD by 04/30/2019. A manuscript will also be submitted to a peer-reviewed scientific journal. Final reports will be supplied to the public upon request.

Expected Products:

- Deliverables:
  - Status summary of Year 4 lamprey culture operations that will include the following:
    - Results from the feeding frequency trial, YOY and one year olds
    - Results from the sediment/density experiment
    - Results from an experiment investigating density alone
    - Results from the diet/lipid study
    - Detailed information on the progress of the 2015, 2016 and 2017 brood year lamprey that are being reared for long term grow-out to macropthalmia

Timeline

- Obtain prolarvae lamprey from Prosser Hatchery end of June
- Test the effects of feeding frequency on YOY and one year old fish. Conduct each feeding trial for two months. Run concurrently.
- Test the effects of density X sediment depth using BY15 ammocoetes. Conduct trial for three months.
- Test the effects of density using a standard sediment depth using BY15 fish. Conduct trial for three months, run concurrently with the density X sediment depth trial.
- Run feeding trial testing the effects of increased lipid in the diet on growth and body composition. Conduct the trial for two months.
- Maintain ammocoetes for grow out to macropthalmia until the fish reach metamorphosis.

Data Management Plan

All finalized data will be stored in the Nutrition Projects database on the AFTC's network drive. The final report/publication will be stored in an Endnote database on the AFTC's network drive.

Literature Cited

Beamish, R. J. 1980. Adult biology of the river lamprey (*Lampetra ayresi*) and the Pacific lamprey (*Lampetra tridentata*) from the Pacific coast of Canada. Canadian Journal of Fisheries and Aquatic Sciences 37:1906-1923.

Beamish, R. J., and T. G. Northcote. 1989. Extinction of a population of anadromous parasitic lamprey *Lampetra tridentata* upstream of an impassable dam. Canadian Journal of Fisheries and Aquatic Sciences 46:420-425.

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CRITFC (Columbia River Inter-Tribal Fish Commission). 2011. Tribal Pacific Lamprey Restoration Plan for the Columbia River Basin. CRITFC, Portland, OR. Pp 183.

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Moser, M., and D. Close. 2003. Assessing Pacific lamprey status in the Columbia River Basin, Project No. 1994-02600, 10 electronic pages, (BPA Report DOE/BP-00005455-5).

Moyle, P. B., L. B. Brown, S. D. Chase, and R. M. Quinones. 2009. Status and conservation of lampreys in California. In *Biology, management, and conservation of lampreys in North America* (ed. by L. R. Brown, S. D. Chase, M. G. Mesa, R. J. Beamish and P. B. Moyle), pp. 279-293. American Fisheries Society, Symposium 72, Bethesda, Maryland.

Murauskas, J.G., A.M. Orlov, and K.A. Siwicke. 2013. Relationships between the Abundance of Pacific Lamprey in the Columbia River and Their Common Hosts in the Marine Environment. *Transactions of the American Fisheries Society*. 142:143-155.

FPC (Fish Passage Center). 2015. http://www.fpc.org/lamprey Fish Passage Center 847 NE 19th Ave., Suite 250, Portland, OR.

Chelan PUD lamprey Trials 2018-2019					
Direct Costs:		*Salaries:*			
		Staff	Hours		
		GS-13/9	*80*	*$56.25*	*$ 4,500.00*
		GS-11/9	*20*	*$39.47*	*$ 789.20*
		GS-11/2	*100*	*$31.16*	*$ 3,116.00*
		GS-9/5	*300*	*$29.18*	*$ 8,754.00*
		GS-5/2	*200*	*$17.56*	*$ 3,512.00*
			Benefits (35%)		$ 7,234.92
		Salaries and Benefits Total:			***$ 27,906.12***
		Supplies:			
		Supplies (feeds, consumables for analyses)			$ 1,000.00
		Replacement tanks, sand, screening material, airstones			$ 2,000.00
		Supplies Subtotal:			***$ 3,000.00***
		Direct Costs Total:			***$ 30,906.12***
		Nutrition O&M (7%)			$ 2,163.43
		Indirect cost (26.1%)			$ 8,631.15
		Total indirect cost			***$ 10,794.58***
Total Funds for Project					**$ 41,700.70**

Attachment 2

Draft Bull Trout Study Plan Outline

Rocky Reach and Rock Island Hydroelectric Projects
DRAFT STUDY PLAN OUTLINE
2018 Bull Trout Project Interactions and Genetics Analysis Study Plan
License Management Plans Year 10 Monitoring Study

Steve Hemstrom and Scott Hopkins
Chelan PUD
March 7, 2018

1.0 INTRODUCTION AND REGULATORY CONTEXT

In 2018, Chelan PUD (District) will conduct a PIT-tag monitoring study for bull trout to analyze interactions with Rocky Reach and Rock Island Dams including upstream and downstream passage. The District's Rocky Reach FERC License Bull Trout Management Plan (2009) and Rock Island Project's Bull Trout Management Plan (2005) require the District to implement Terms and Conditions of U.S. Fish and Wildlife Service (Service) Biological Opinions (Service 2004, 2008) and conduct a monitoring study every 10 years using methods chosen by the District and Rocky Reach Fish Forum (RRFF).

2.0 BACKGROUND

The District began studying bull trout passage at the Rocky Reach and Rock Island Projects in 2001. Multiple-year radio telemetry studies were conducted by the District from 2001 to 2003 and 2005 to 2007. Significant numbers of fish (165) were tagged and extensive passage data were compiled for the Projects. During these studies, hundreds of upstream and downstream passage interactions occurred, but no fish injury of any kind was observed or verified during passage through the fishways, turbines, spillways, or bypass system at Rocky Reach or Rock Island.

However, some negative trapping and tagging-related effects on bull trout were observed. A numbers of fish died unexpectedly within tributaries within one year of tagging, and a number of fish appeared to have lost their tags in tributaries shortly after tagging. Tags were recovered in log jams. Douglas PUD (2017) observed similar results during its recent radio-tag study on bull trout in 2016 (Andrew Gingrich, Douglas PUD, Personal Communication). Effects on otherwise perfectly healthy bull trout from trapping and handling in the Rocky Reach fishway and marking them with large tags (having long external antennas) may affect fish behavior and survival during studies. Spawning success and survival of radio-tagged fish during tributary residence may also have been affected.

Radio tags for larger fish provide between 12 to 18 months of information before battery function in the tag ceases; at this point the large tag and external antenna remain in the fish un-operational with continued health effects, but provide no information. PIT tags however, are completely internal and remain operational in the fish during its entire life span. Because trapping and tagging effects are highly undesirable for a listed species, Chelan PUD and the Service have agreed to utilize full-duplex PIT tags and existing tag data for this study to monitor bull trout passage, migration, and interaction rates with Project facilities for the 2018 study.

3.0 STUDY AREA

The geographic scope for this bull trout study will include Rock Island Dam and reservoir, Rocky Reach Dam and reservoir, and all mid-Columbia dams and tributaries inclusive of the Yakama River upstream to the Okanogan River.

4.0 STUDY OBJECTIVES

The objectives of this study are to: **1)** Comply with the Bull Trout Management Plans contained in the Rocky Reach and Rock Island FERC Licenses and the Terms and Conditions in the Service's Biological Opinions; **2)** develop a database of bull trout movements and interactions with Project facilities over a long time duration exceeding that available with radio-tags; **3)** determine and describe the interaction types, frequency, and locations of bull trout passage interactions with the District's Projects to the extent possible; **4)** PIT tag a target number of bull trout at Dryden and Tumwater dams in 2018 and collect tissue samples for genetic analyses; ensure any remaining tissue samples from previous studies are analyzed, and reports are prepared by the analyzing agency; **5)** ensure funding is provided by the District for costs associated with previous genetic sample analysis and study reports; **6)** prepare and provide a draft report of initial PIT-tag data findings to the Service and RRFF by July of 2019, and a final report of results by July of 2021.

5.0 METHODS

In 2018, the District will use full-duplex (FDX) PIT tags and existing PIT data from previously tagged fish to monitor and analyze success rates of upstream and downstream dam passage events for fluvial and adfluvial bull trout. New and existing PIT tag data will be used to estimate fishway passage success and passage times, downstream passage rates and timing, tributary choice and residency times, migration extent and geographic range of bull trout within the mid-Columbia River. More than 1,000 individual PIT detection records are available from Mid-Columbia dams and tributaries for bull that have interacted (passage) specifically with Rocky Reach and/or Rock Island since 2008 (more than 100 individual fish).

Bull trout will not be trapped or tagged at Rocky Reach or Rock Island dams in 2018. The District will utilize the existing PIT-tag data available for fish tagged from 2008 to 2017, and new any PIT tag detections from 2018 fish tagged at Tumwater and Dryden dams. Detection data will be used to establish passage and interaction histories for each bull trout that made contact with Rocky Reach or Rock Island from 2008 to 2020. The PITAGIS database will be queried for tagged fish that have been detected moving upstream or downstream of Rocky Reach and Rock Island in this 13-year period.

For one year (2018) at Tumwater and Dryden dams, up to 30 adult bull trout and 40 subadult bull trout will be PIT-tagged (12 mm Biomark PIT tags) if incidentally captured by Washington Department of Fish and Wildlife (WDFW) during salmon and steelhead trapping. This will provide an additional source of tagged fish to track for a period of three years, 2018-2020. The District, through WDFW's fishway trap

operation, will collect a new tissue sample from each bull trout that is tagged in 2018 at Dryden in 2018, if desired by the Service and RRFF. The District will submit the samples and fund genetic analyses and report preparation for these samples.

Complete tag and interaction histories for each bull trout that interacts with Rocky Reach or Rock Island will be created to determine the number and timing of upstream and downstream passage events at both Projects, and the route of passage (i.e. spill, turbine, bypass) when possible. Tributary entrance and detection histories will also be provided for these fish in all tributaries, at other Mid-Columbia River dams, and any other location they may be detected.

The District will estimate the type and number project interactions made by PIT tagged fish over multiple years, 2008-2020. Project operations (turbines, spill, bypass operations and time periods) will be analyzed to determine downstream passage routes based on timing of PIT detection upstream or downstream. Successful upstream and downstream dam passage events will be determined by the number of events and later detections upstream or downstream after each individual passage event. Complete tag histories will be compiled using initial mark and release location, and time, and all subsequent detections in time and place after detection at Rocky Reach and Rock Island facilities.

Definition of Passage Success and In-Progress Detection History

1) "Upstream Project passage" (fishway) is defined and confirmed by a PIT detection in the Project's fishway, then by a subsequent detection anywhere upstream of that fishway (in a tributary or next dam).

2) "Downstream Project passage" (turbine, spill, or bypass if operating) is defined and confirmed by a release event or PIT detection upstream of the Project (in a tributary or dam upstream), then subsequently anywhere downstream of the Project, or again later in the Project's *upstream adult fishway*.

3) "In-Progress PIT Detection History" is the PIT detection timeline for any tagged bull trout that may still be alive and at large; so its tag history is still "in-progress". For the study, we believe a three-year tracking period is necessary to account for at-large, alternate-year spawning bull trout (large fluvial or adfluvial fish) that may not interact with any fishways on the Columbia River or access any tributary to spawn annually, and hence may not be detected by any PIT antenna system for long periods. Bull trout with alternate year spawning are common in the Mid-Columbia. At study completion, the number of fish with in-progress timelines will be reported as in-progress or unknown.

Photo Identification of Tagged Bull Trout in Fishways

The District has recorded and cataloged photographs of all bull trout passing through fishways at Rocky Reach and Rock Island Dams since 2003. Still photographs are taken as the fish pass by the count window at each fishway. Photograph date, time, and specific fishway (Rock Island has three separate fishways) are recorded for each fish.

PIT detection times from PITAGIS are recorded by the uppermost set of fishway PIT antennas, located immediately downstream of count windows. Detection times will be used to identify and match passage photographs of each individual PIT tagged bull trout. We will attempt to estimate total length of each

tagged fish to within in 25 to 50 mm. Photo data will also be used to visually assess the physical condition of bull trout after they have traversed the fishway and are about to exist upstream.

5.0 RESULTS

Study results will be provided in report form, using text, tables and figures to summarize data for each individual fish having a Project interaction. Data will include tag code, first release (mark) and tag detection history at all antenna system locations, Project interaction frequency, interaction type, and success (upstream or downstream), tributary entry and residence, and any other detections outside of the study area.

6.0 Discussion

This section will summarize the overall number of successful interactions at each location (Project and passage route) over the period of detections for each fish that interact with Rocky Reach or Rock Island, and when possible, fates of each fish during the study period.