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In Reply Refer To:
CWFO

P-943-083
P-2145-057
P-2149-106

May 12, 2004

Magalie A. Salas
Secretary
Federal Energy Regulatory Commission
Washington, D.C. 20426

RE: License Amendments to incorporate the Rocky Reach, Rock Island, and Wells Anadromous Fish Agreements and Habitat Conservation Plans
FWS Reference: 04-W0203
Hydrologic Unit Code: 1720010

Dear Ms. Salas:

This correspondence transmits the U.S. Fish and Wildlife Service's (Service) biological and conference opinions based on our review of the proposed license amendments to incorporate the Rocky Reach, Rock Island, and Wells Anadromous Fish Agreements and Habitat Conservation Plans. In response to your request for formal consultation and conference, received on December 10, 2003, the Service provides the attached Biological/Conference Opinion (BO/CO) which addresses the effects of the proposed license amendments on bull trout (*Salvelinus confluentus*) and proposed critical habitat for bull trout in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

The Service concludes in the attached BO/CO that the implementation of the proposed action is not likely to jeopardize the continued existence of the Columbia River distinct population segment of bull trout, and is not likely to destroy or adversely modify proposed critical habitat for bull trout.

The Service also concurs with the FERC determination that the proposed action, which does not include future projects under the Hatchery Compensation and Tributary Conservation Plans, may affect but is not likely to adversely affect bald eagle (*Haliaeetus leueocephalus*), grizzly bear (*Ursus horribilis*), and Ute ladies'-tresses (*Spiranthe diluvialis*) and will have no effect on pygmy rabbit (*brachylagus idahoensis*), Canada lynx (*Lynx Canadensis*), gray wolf (*Canis*

lupus), marbled murrelet (*Brachyramphus marmoratus*), northern spotted owl (*Strix occidentalis*) or critical habitat for the northern spotted owl, showy stickseed (*Hakelia venusta*), and Wenatchee mountains checkermallow (*Sidalcea oregano*).

Please note that the accompanying incidental take statement includes reasonable and prudent measures and terms and conditions that are designed to minimize incidental take. If you have further questions about this document or your responsibilities under the Act, please contact Gregg Kurz of the Central Washington Fish and Wildlife Office in Wenatchee at 509-665-3508 extension 22.

Sincerely,

Jessica L. Gonzales for Mark Miller

Supervisor

Biological Opinion and Conference Opinion
for the

License Amendments to incorporate the Rocky Reach, Rock Island, and Wells Anadromous Fish Agreements and Habitat Conservation Plans

Federal Energy Regulatory Commission (FERC)

FWS Reference Number: 04-W0203
HUC: 17020010

Consultation by: U.S. Fish and Wildlife Service
Central Washington Field Office, Wenatchee

Issued by: Mark D. Miller Date 5-11-04

Supervisor

Introduction

The objective of this Biological Opinion (BO) and Conference Opinion (CO) is to determine whether the proposed incorporation of the Rocky Reach, Rock Island, and Wells Anadromous Fish Agreements and Habitat Conservation Plans (HCP) into the Federal Energy Regulatory Commission (FERC) licenses for operation of these hydroelectric facilities is likely to jeopardize the continued existence of the Columbia River distinct population segment (DPS) of bull trout, or destroy or adversely modify proposed bull trout critical habitat. All three of the proposed license amendments are considered in this document due to their similarities in (1) geographic location (2) timing (3) the nature of the proposed actions and (4) their effects. The standards for determining jeopardy are described in section 7(a)(2) of the ESA and further defined in 50 C.F.R. 402.14. A complete administrative record of this consultation is on file in the Central Washington Field Office in Wenatchee.

Consultation History

As part of the HCP development process, NOAA Fisheries conducted an analysis of issues in connection with the issuance of separate incidental take permits for the operation of three hydroelectric projects pursuant to the HCPs. In performing this analysis NOAA Fisheries issued an Environmental Impact Statement, three separate Biological Opinions, and a Record of Decision. The Biological Opinions addressed the effects of the HCP actions to currently ESA listed Upper Columbia River (UCR) steelhead (*Oncorhynchus mykiss*) and UCR spring-run chinook salmon (*O. tshawytscha*) and presently unlisted UCR summer/fall-run chinook salmon (*O. tshawytscha*) and sockeye salmon (*O. Nerka*). In addition, NOAA Fisheries prepared Environmental Assessments/Finding of No Significant Impacts, and Biological Opinions for each of the separate incidental take permits for the operation of hatcheries pursuant to the HCPs. To expedite the ability of FERC to complete formal consultation, biological evaluations of the effects of implementing the HCPs on listed species under the jurisdiction of the Service were prepared by the Public Utility District No. 1 of Chelan County (Chelan PUD) and Public Utility District No. 1 of Douglas County (Douglas PUD).

This BO/CO is based upon the information presented in the incidental take permits, National Environmental Policy Act documents, biological opinions, records of decisions, and the biological evaluations on Service listed species submitted with the license amendment proposals. As a package, these documents comprise a sufficient biological assessment related to the effects of the proposed action on listed species.

- *May- November 2003*: The Service provided technical assistance to Chelan and Douglas PUD's for development of biological evaluations of the effects of HCP implementation on listed species and proposed bull trout critical habitat.

- *December 10, 2003*: Service received the request from FERC for formal consultation regarding license amendment applications for the Rocky Reach, Rock Island, and Wells hydroelectric projects.

- *January 20, 2004*: Service received an amended request from FERC to include formal conference on the effects of their actions to proposed bull trout critical habitat.

Biological and Conference Opinion

1. Description of the Proposed Action

The proposed action is:

1. The FERC issuance of a license amendment to incorporate the terms of NOAA Fisheries' Rocky Reach Anadromous Fish Agreement and Habitat Conservation Plan for Chelan PUD operation of the Rocky Reach hydroelectric project (FERC #2145), tributary enhancement, and hatchery compensation projects in accordance with the HCP.
2. The FERC issuance of a license amendment to incorporate the terms of NOAA Fisheries' Rock Island Anadromous Fish Agreement and Habitat Conservation Plan for Chelan PUD operation of the Rock Island hydroelectric project (FERC #943), tributary enhancement, and hatchery compensation projects in accordance with the HCP.
3. The FERC issuance of a license amendment to incorporate the terms of NOAA Fisheries' Wells Anadromous Fish Agreement and Habitat Conservation Plan for Douglas PUD operation of the Wells hydroelectric project (FERC #2149), tributary enhancement, and hatchery compensation projects in accordance with the HCP.

The documents that comprise the BA for the proposed actions outline an adaptive management framework for operation of the projects through development and implementation of performance measures. The actions outlined in the BA represent current operations for the projects and it is intended that these operations provide a base for future operations that are subject to adjustment over time. Additional actions may be developed through consultation and implementation of recovery plans for listed aquatic species.

Rather than propose specific actions at this time, the action agency has proposed a plan that establishes measurable performance/survival standards for the projects. This approach provides a methodology for defining desired levels of improvement in various activities that affect listed aquatic species and measures to determine how those standards are being met. However, the biological information available for bull trout is not adequate to allow development of performance/survival standards at this time.

1.1. Description of the Action Area

The action area includes all areas affected directly or indirectly by the Federal action and not merely the immediate area involved in the action [50 CFR section 402.02]. Direct effects of the Project are confined to the reservoirs, forebays, dams and tailraces of each facility (approximately 1,000 feet downstream of the dam to 1,000 feet downstream of the next dam upstream). However, water quality impacts (in this case, elevated levels of total dissolved gas resulting from either voluntary or involuntary spill at the Projects) are expected to extend as far downstream as the confluence of the Yakima River. In addition, habitat protection and enhancement projects resulting from implementation of the HCP's Tributary Enhancement Plan would affect bull trout in tributary river systems of the Columbia River. Based on these considerations, the Service defines the action area as the mainstem Columbia River between River Mile 544.9 (approximately 1,000 feet downstream of Chief Joseph Dam) and River Mile 356.0, a distance of nearly 190 miles, as well as the Okanogan, Methow, Entiat, and Wenatchee River systems.

1.2. Project Descriptions

Rocky Reach Project

The Rocky Reach Hydroelectric Project (FERC Project No. 2145) includes the reservoir, forebay, dam, and tailrace. As defined, the project boundary is approximately 1,000 feet downstream of the Rocky Reach dam (tailrace) to 1,000 feet downstream of the next dam upstream (reservoir), a distance of approximately 42 miles. The 130 foot high concrete gravity dam was completed in 1961 and is located approximately 4 miles north of Wenatchee, Washington on the mainstem Columbia River at river mile 474.5 (Figure 1). The reservoir formed by the Project extends past Chelan Falls to Douglas PUD's Wells Dam, contains 387,500 acre-feet of water, and has a surface area of 8,235 acres at the normal pool elevation of 707 feet above mean sea level (msl). Based on a draft limit of four feet, usable storage is 36,400 acre-feet. The annual median flow is 110.5 thousand cubic feet per second (kcfs).

The project includes a spillway, a powerhouse, an earthen embankment section, a newly constructed juvenile bypass system (JBS), and an adult fishway. The spillway consists of 12 spillway gates with a combined capacity of 1,200 kcfs. The powerhouse has 11 Kaplan turbine units (units 8-11 being of larger size) with a combined hydraulic capacity of 217.5 kcfs, producing about 1,280 megawatts (MW) of electricity. The adult fishway consists of three separate entrances in the tailrace, collection channels, a fish ladder, and a single exit in the forebay adjacent to the west bank of the river near the earthen embankment section of the Project. The juvenile bypass system consists of a single entrance surface collection system in the cul-de-sac area of the forebay, intake screens in generating units 1 and 2, bypass channel, juvenile sampling facility, and outfall in the tailrace.

Rock Island Project

The Rock Island Hydroelectric Project (FERC Project No. 943) includes the reservoir, forebay, dam, and tailrace. As defined, the project boundary is approximately 1,000 feet downstream of the Rock Island Dam (tailrace) to 1,000 feet downstream of the next dam upstream (reservoir), a distance of approximately 21.1 miles. The 42-foot-high concrete gravity dam is located approximately 12 miles south of Wenatchee, Washington, on the mainstem Columbia River at RM 453.5 (Figure 1). The reservoir formed by the Project extends to the tailrace of Rocky Reach Dam, contains 126,000 acre feet of water, and has a surface area of 3,470 acres at the normal pool elevation of 613 feet above mean sea level (msl). Based on a draft limit of 4 feet, usable storage is less than 12,500 acre-feet. The annual median flow is 115 kcfs.

The Rock Island Project includes a spillway, two powerhouses, a passive juvenile bypass system (JBS), and three adult fishways. The spillway consists of 31 spillway gates with a combined capacity of 943 kcfs. Powerhouse 1 consists of 4 Nagler turbines (units 1-4) and 7 Kaplan turbines (units 5-10), and Powerhouse 2 consists of 8 bulb turbines, with a combined hydraulic capacity of 205 kcfs, producing about 624 MW of electricity. Rock Island Dam has three adult fishways: a right bank fishway, a left bank fishway, and a middle fishway. Each fishway consists of an entrance, a collection channel, a fish ladder, and an exit in the forebay.

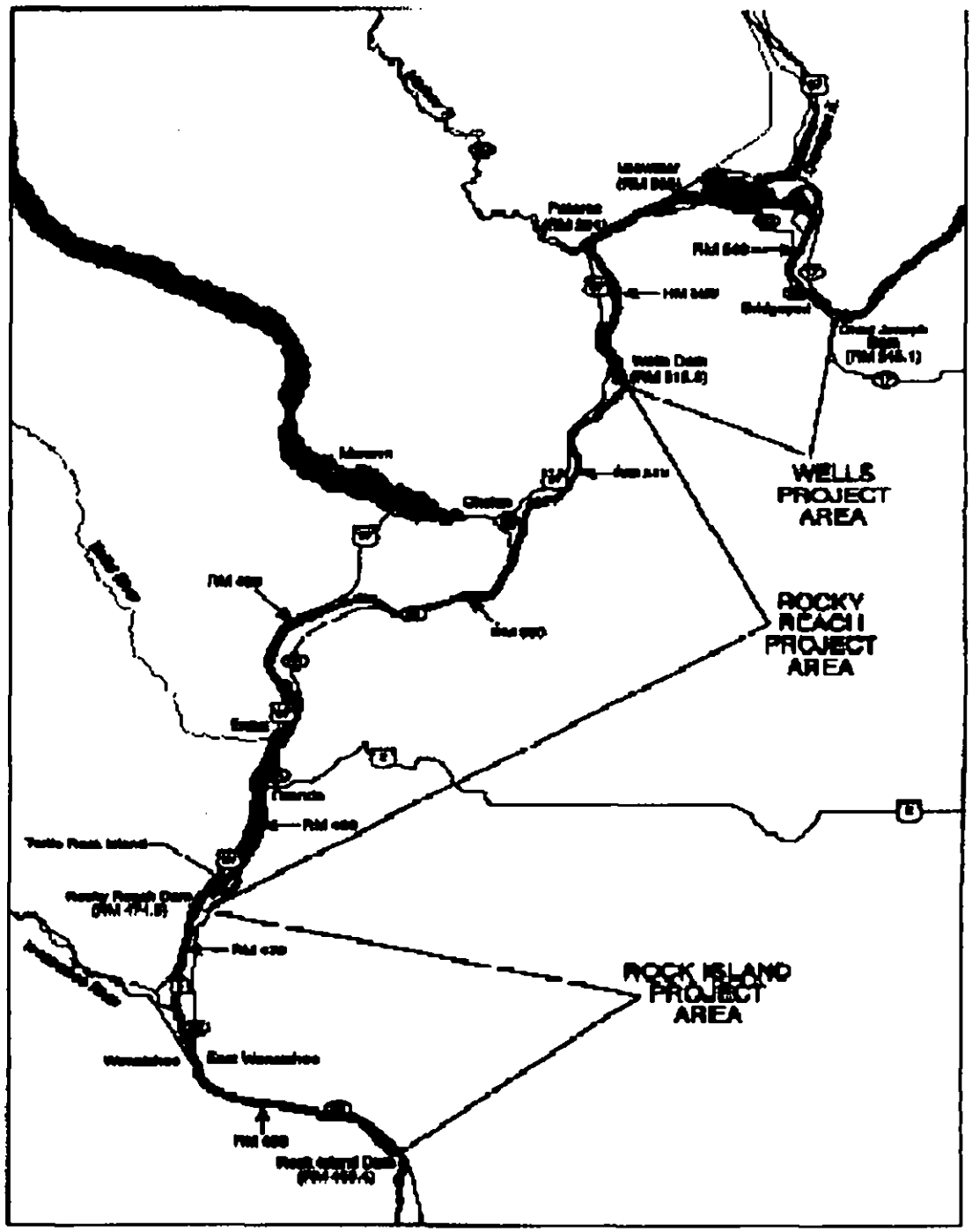
Wells Project

The Wells Hydroelectric Project is located on the mainstem Columbia River at RM 515.8 and is approximately 12 miles north of the city of Chelan, Washington (Figure 1). The dam spans 4,460 feet, with the hydrocombine structure (spillway, turbine and fishways combined into one structure) comprising 1,130 feet. Wells Dam is a 185 foot high concrete gravity dam completed in 1967. The reservoir formed by the project extends upstream 29.5 miles, past the cities of Pateros, Brewster and Bridgeport and up to the Army Corps of Engineer's Chief Joseph Dam, totaling 331,200 acre feet of water, and having a surface area of 9,740 acres at the normal pool elevation of 781 feet above msl. Based on a draft limit of ten feet, usable storage is 98,000 acre-feet. The annual median flow is 109 kcfs.

The project includes a spillway, powerhouse, an earthen embankment section, a juvenile bypass system and two adult fishways. The spillway consists of 11 spillway gates with a combined capacity of 1,180 kcfs. The powerhouse has 10 Kaplan turbine units, equipped with minimum gap turbine runners to increase protection for juvenile salmonids during turbine passage, with a combined hydraulic capacity of 205 kcfs with a peak generating capacity of 840 MW of electricity. Douglas PUD operates the turbines at Wells Dam at the highest power efficiency possible for a given flow to maximize power generation and revenue for the facility. Operating the units at or near the peak efficiency reduces the turbulence and cavitation of water passing through the unit, resulting in more efficient generation conditions. Reduced turbulence and cavitation also improves the flow conditions for fish passing through the turbines, and is expected to result in reduced injury and mortality rates. The two adult fishways are mirror image left and right bank fishway facilities. Each of the two fishways contains a single main entrance, a collection

gallery, a fish ladder, adult count station, trapping facilities and an exit in the forebay adjacent to the earthen embankment section of the project. The juvenile bypass system consists of five evenly spaced surface collector entrances that guide fish into and through the juvenile bypass system and into the tailrace of the dam.

Figure 1. Project Location Map



1.3. Summary of HCP Actions

The objective of the HCP's is to achieve and maintain a "No Net Impact" (NNI) standard for each Plan species (steelhead, spring and summer/fall run chinook, sockeye and coho) at the projects by March 1, 2013. NNI consists of two components: (1) 91% Combined Adult and Juvenile Project Survival achieved by project improvement measures that are implemented within the geographic area of the Project, and (2) 9% compensation for unavoidable project mortality provided in the form of hatchery and tributary programs, with 7% compensation provided through hatchery programs and 2% compensation provided through implementing the Tributary Conservation Plan.

1.3.1. HCP Survival Standards

The HCP's have specific performance standards relating to the survival of juvenile and adult anadromous fish migrating through the projects. The primary survival standard of the HCP is to achieve and maintain the 91% Combined Adult and Juvenile Project Survival standard.

Until technology is available to differentiate Project-related mortality from natural adult losses, Chelan and Douglas PUD will implement the adult passage plans and initiate studies, at the direction of the Coordinating Committees (see section 1.3.3) to assess juvenile fish survival at the Project. In order of preference the survival standards are (1) measured Juvenile Project Survival - 93 percent, (2) measured Juvenile Dam Passage Survival - 95 percent, and (3) calculated Juvenile Dam Passage Survival (JDPS) - 95 percent. The most appropriate standard for each species shall be determined by the Coordinating Committees, per guidelines established in each HCP. In the event that the Coordinating Committees determine that no current methodology is available for measuring a juvenile survival standard, the Coordinating Committees will use the best available information to calculate an estimate of Juvenile Dam Passage Survival.

1.3.2. HCP Phase Implementation

Phase I studies, to be overseen by the Coordinating Committee to assess whether or not the most appropriate survival standard is being achieved for each Plan Species, will begin in 2004 through 2006. Point estimates of survival measurements from three years of valid studies (meeting critical criteria identified in the HCP) for each species will be the averaged arithmetic mean. The point estimate of the average will be used to compare against the pertinent survival standard. If the averaged point estimate equals or exceeds the survival standard, then the standard has been achieved. If the average is no more than 0.5 percent below the survival standard, the Coordinating Committee may decide whether an additional year of study is appropriate. If an additional year of study is undertaken, the study result (if valid) will be included in the calculation of the arithmetic mean.

Phase II will apply in the event that averaged point estimates from Phase I testing studies indicate that the survival standard being evaluated is not being met for a Plan species; the Coordinating Committee shall decide on additional tools (actions, structures, facilities, or

programs in addition to those initially proposed) for Chelan PUD to implement in order to achieve the survival standard. Until the survival standard being evaluated is achieved, the Coordinating Committee shall continue to implement additional tools for the standard and for each Plan species that is not meeting the pertinent survival standard, except as set forth in the HCP section 2.4 "Impossibility." The Coordinating Committee will determine the number of valid studies (not to exceed three years) necessary to make a phase determination following the implementation of additional tools.

Phase III will apply in the event that the averaged point estimates from Phase I testing studies (or studies implemented following Phase II) indicate that the survival standard being evaluated has either been achieved or is likely to have been achieved. This provides additional or periodic monitoring to ensure that survival of the Plan species remains in compliance with the survival standards for the term of the HCP.

1.3.3. HCP Committees

To accomplish these objectives, the HCP's propose to utilize three committees associated with each project (9 total) to adaptively manage the major components, and one committee associated with each project (3 total) to provide policy oversight in the event of disputes amongst the Parties. Each committee acts upon the unanimous vote of those members present.

The Coordinating Committees would be composed of one voting representative of each Party, in addition to a non-voting observer representing Chelan or Douglas PUD's power purchasers. The Coordinating Committee serves as the primary means of consultation and coordination between Chelan and Douglas PUDs and the other Signatory Parties, in connection with the conduct of studies and implementation of the measures set forth in each HCP and for dispute resolution.

The Tributary Committees would be composed of one voting representative of each Party choosing to appoint a representative to the committee. In addition to non-voting representatives of the Service and a single non-voting observer representing Chelan or Douglas PUD's power purchasers, the Tributary Committees may select other expert entities, such as land and water trusts/conservancy groups, to serve as non-voting members of the committees. The Tributary Committee is charged with the task of selecting projects and approving project budgets from the Plan Species Accounts for the purposes of implementing the Tributary Plans.

The Hatchery Committees would be composed of one voting representative of each Party choosing to appoint a representative to the committee and a single non-voting observer representing Chelan or Douglas PUDs power purchasers. The Hatchery Committees are responsible for developing recommendations and implementing the hatchery elements of the HCP that each PUD is responsible for funding. This includes overseeing the implementation of improvements, as well as monitoring and evaluation relevant to Chelan and Douglas PUD's hatchery programs.

The Policy Committees would also be comprised of one designated representative of each Party. The primary function of the Policy Committees would be to resolve disputes amongst the Parties.

The Parties will choose, and Chelan or Douglas PUD will fund, a neutral third party to act as the chair of each committee, excepting that the chair of the Coordinating Committee shall also serve as the chair of the Policy Committee. The committee chairs would prepare annual lists of understandings based on the results of studies, progress reports, and meeting minutes; facilitate and mediate the meetings; and assist the members of the respective committees in making decisions.

1.3.4. HCP Dispute Resolution

The HCP provides a non-binding dispute resolution process. Disputes which cannot be unanimously resolved within 20 days by the Tributary or Hatchery Committees may be raised with the Coordinating Committees. If, at the end of 20 days, the Coordinating Committee is unable to reach unanimous agreement on the dispute, then the chair of the Coordinating Committee or any Party may request that the Policy Committee convene to resolve the dispute. Upon referral, the Policy Committee would have 30 days to convene and consider the dispute.

If the Policy Committee successfully resolves the dispute, then the Parties will implement all aspects of the settlement that can lawfully be implemented without FERC approval, or the approval of another federal agency. If FERC or other federal agency approval is needed, all settling Parties will jointly present the resolution of the dispute to FERC or the appropriate federal agency for approval. If the Policy Committee is unable to unanimously resolve the dispute, then any Party may pursue any other right they might otherwise have.

1.3.5. HCP Project Operations and Measures

Rocky Reach Project

To achieve the applicable survival standards a combination of spill, bypass diversion screen operations, surface collection bypass system operations, turbine replacement, and predator control measures would be utilized. The appropriate mix of measures would vary as the surface collection system is improved and its efficiency tested and quantified. Initial operations are described below.

Adult Fishway Operations

Chelan PUD has developed an operation and maintenance plan for the Project's fish passage facilities (Chelan PUD 2003A). The adult fishway facilities will be operated from March 1st to December 1st each year, although for operation and maintenance purposes, the primary fish passage season is considered to be April through November. From April 14th to November 14th the fishway is monitored 24 hours per day via digital recording equipment. Fish counters read the recordings from the previous day and report counts to the US Army Corps of Engineers. The adult fishway is composed of three

entrances in the tailrace, transportation channels, a common ladder, and an exit in the forebay near the west bank of the river. The fishway will be operated to maintain water velocities of 1.5 to 4.0 feet per second in entrance structures and transportation channels. The ladder will be operated such that water depths over weirs in the ladder will be maintained at 1.0 to 1.2 feet. During the migration season, the adult fishway will be inspected twice each day. WDFW personnel inspect the facilities on a monthly basis and provide monthly inspections reports to the Fish Passage Center.

Juvenile Bypass System Operations

Chelan PUD will operate the juvenile bypass system (JBS) each year from April 1 to August 31, 24 hours each day, to provide a non-turbine route of passage. This system includes a surface collector, intake screens for generating units 1 and 2, a bypass pipe, a sampling facility, and outfall. The procedures set forth in the operation and maintenance plan for the Project's fish passage facilities (Chelan PUD 2003A) will ensure that operators provide and maintain a safe, effective passage route for migrating smolts past the dam, and that fish collection, handling, and evaluating protocols are in keeping with the most current, best practices.

Sampling Facility Operations

The JBS will operate 24 hours each day from April 1 to August 31. The sampling facility will be operated periodically during this time to assess the condition and species composition of fish traveling through the JBS or to collect juveniles for use in approved studies. The sampling facility will be operated according to the criteria, protocols, and procedures agreed upon by the Coordinating Committee and described in the Rocky Reach and Rock Island Fish Passage Plans (Chelan PUD 2003a) and in "Biological Evaluations for the Rocky Reach Fish Bypass System – 2003" (Study Plan). These criteria, protocols, and procedures are expected to be modified periodically by the Coordinating Committee to correct observed or potential problems or to meet future monitoring and fish collection objectives.

Initial fish handling protocols and sampling plans for spring migrating juveniles are summarized in the Study Plan. The fish-handling protocols conform to those approved for use at smolt monitoring facilities at other mainstem hydroelectric projects. Sampling is conducted for one of two purposes: 1) to evaluate the species composition and the physical condition of juveniles passing through the JBS (Standard Operations), and 2) to collect fish for assessing potential problems within the JBS or to collect run-of-river fish for use in survival or behavioral studies (Special Operations). With respect to Standard Operations, the signatory parties have agreed to operate the sampler five days each week (Monday – Friday) for 2 hours (0800 to 1000 hours) or until roughly 1,500 fish have been collected (whichever comes first). In addition, sampling will be conducted in the evenings (1400 to 1600 and 1900 to 2100 hours) once each week to assess how well the 0800 to 1000 sample represents the migration in general.

This sampling effort should consistently attain the sampling goal of collecting 100 fish per species for assessing general fish condition and species composition. This sampling plan would likely result in the handling of up to 84,000 (1,500 fish per sample * 7

samples per week * 8 weeks of sampling) spring migrating smolts (steelhead, spring chinook, and sockeye). However, because fish numbers are low during the early and late portions of the migration, it is unlikely that more than half this number (42,000) would be sampled in any year.

The Signatory Parties have agreed that "threshold values" for descaling, injury, and mortality rates of 5%, 3%, and 2%, respectively, would trigger further evaluations of the JBS in order to ascertain whether or not a problem exists and where within the facility it is located.

Spillway Operations

Spill will be used to supplement the JBS in 2003 and as necessary in 2004 - 2006 to achieve agreed-upon minimum fish passage efficiencies. In 2007 and beyond, spill will supplement the JBS as necessary to achieve the HCP survival standards based on the results of Phase I survival studies (see HCP sections 3.3.1 and 3.3.2). Voluntary spill necessary to achieve these goals will encompass at least 95% of the spring and summer juvenile migration periods. Based on available information, the Parties agree that spring spill will generally begin no later than April 20th and end no later than June 15th of each year. Similarly, summer spill will generally begin no later than July 1st and end no later than August 15th of each year. However, the Coordinating Committee, based upon in-season migration information, may adjust the beginning and ending dates of the spring and summer spill periods.

Initially, Chelan PUD will spill 15% of the daily estimated flow to cover 95% of the spring and summer juvenile migration periods. In addition, during the spring period coinciding with the juvenile sockeye salmon migration, Chelan PUD will spill an additional 10% (25% total) of the daily estimated flow, for a period not to exceed 21 days. The Coordinating Committee may, based upon in-season migration information, adjust the beginning and ending dates of the sockeye spill period on an annual basis.

Voluntary spill in 2004 through 2006 may be modified from the 2003 spill levels as necessary (up or down) based on 2003 study results, with the goal of providing minimum fish passage efficiency (FPE) levels for each Plan species commensurate with those observed for juvenile yearling chinook salmon in past years - approximately 47 percent. Thus, spill will supplement the new JBS in 2004, 2005, and 2006 with the goal of ensuring that at least 47 percent of the individuals of each Plan species (during the previously defined spill periods) will pass the project via the JBS or spillway.

In 2007 and beyond, spill will supplement the bypass system as necessary (based on the results of 2004 - 2006 juvenile survival studies) and any subsequent survival studies to achieve the HCP juvenile survival standards.

Powerhouse Operations

Turbines will be operated as efficiently as possible (within 1% of peak efficiency) during the juvenile fish passage season. During the juvenile migration season, when the proposed juvenile bypass system is operating, the powerhouse units will be loaded

favoring those units nearest to the surface collector entrance. This will be done to enhance fish attraction flows in the vicinity of the surface collector.

Predator Control Measures

Chelan PUD, in cooperation with the Coordinating Committee, will refine and implement a comprehensive predator removal and harassment program for the protection of Plan species. For northern pikeminnow, activities may include, but not be limited to, angling and long-line fisheries and a sport fishing derby in the project area. For piscivorous birds (Caspian terns, double-crested cormorants, and various gull species), activities may include, but not be limited to, foraging deterrents (e.g., steel wires in the Project tailrace), hazing, and lethal removal of individual birds. These programs will generally occur in the spring and summer, coinciding with the juvenile outmigration.

Rock Island Project

To achieve the applicable survival standards a combination of spill, passive bypass system operations, possible turbine replacement, and predator control measures will be utilized. The appropriate mix of measures will vary depending upon the results of survival studies. Initial operations are described below.

Adult Fishway Operations

Chelan PUD has developed an operation and maintenance plan for the Project's fish passage facilities (Chelan PUD 2003a). The adult fishway facilities will be operated from March 1st to January 1st. The primary fish passage season is considered to be April through November. From January 2 through February 28 each year, the three fishways are dewatered one at a time in rotation to allow for inspections, maintenance and repairs. After completion of maintenance and repairs on one ladder, the ladder is watered up and made operational again and the next ladder is dewatered and readied for maintenance; this rotation keeps at least two fish ladders operating during the maintenance period at Rock Island.

From April 14th to November 14th the fishway is monitored 24 hours per day via digital recording equipment. Fish counters read the recordings from the previous day and report counts to the US Army Corps of Engineers. The adult fishways are composed of three separate ladders with entrances in the tailrace, and exits in the forebay near the east and west banks of the river and in the center of the river. The ladders are operated to maintain a head differential at the entrance and at the weirs within the fishway of 1.0 to 1.5 feet, which produces an attraction velocity of approximately 7 to 8 fps at the vertical entrances and 6 to 8 fps at orifices in the weirs. During the migration season, the adult fishways will be inspected twice each day. WDFW personnel inspect the facilities on a monthly basis and provide monthly inspections reports to the Fish Passage Center.

Measures to enhance safe passage of all Plan Species adults will be emphasized in order to give high priority to adult survival in the achievement of 91% Combined Adult and Juvenile Project Survival as described in the FEIS and HCP. The Coordinating Committee may agree to implement additional measures to meet or achieve and maintain the 91% Combined Adult and Juvenile Project Survival Standard.

Spillway Operations for Juvenile Bypass

For the years 2004 through 2006, Chelan PUD will voluntarily spill 20% of the daily estimated flow to cover 95% of the spring and summer juvenile migration periods. The Coordinating Committee, based upon in-season migration information, will adjust the beginning and ending dates of the spill period on an annual basis. Spill for fish bypass will encompass at least 95% of the spring and summer juvenile migration periods. Based on available information, the Signatory Parties agree that spring spill will generally begin no later than April 17 and end no later than June 15 of each year. Similarly, summer spill will generally begin no later than July 1 and end no later than August 15 of each year. However, the Coordinating Committee, based upon in-season migration information, may adjust the beginning and ending dates of the spring and summer spill periods.

Powerhouse Operations

Turbines will be operated as efficiently as possible (within 1% of the peak efficiency for a given head and megawatt output) during the juvenile fish passage season. During other times when anadromous juvenile migrants are not present, turbine operations generally do not change; the units are operated to achieve the highest efficiency possible for a given headwater elevation and energy output.

Rock Island Powerhouse 2 has a high generating efficiency. It has a 410 megawatt (Mw) generating capability. Powerhouse 2 currently generates the majority of the energy produced by the Rock Island Project; all turbines are "minimum gap" units, having a gap distance between the runner blade and the hub of less than 3 mm (0.118 inches). Rock Island Powerhouse 1 has a 210 Mw capability. Currently, Powerhouse 1 does not contain turbines with minimum gap characteristics. Chelan PUD is currently reviewing the feasibility of installing minimum gap runners on the turbines at Powerhouse 1. This feasibility study will be completed within the next three years.

Predator Control Measures

Chelan PUD, in cooperation with the Coordinating Committee, will refine and implement a comprehensive predator removal and harassment program for the protection of Plan Species. For northern pikeminnow, activities may include, but not be limited to, angling and long-line fisheries and a sport fishing derby in the project area. For piscivorous birds (Caspian terns, double-crested cormorants, and various gull species), activities may include, but not be limited to, foraging deterrents (e.g., steel wires in the Rock Island Dam tailrace), hazing, and lethal removal of individual birds. These programs will generally occur in the spring and summer, coinciding with the juvenile outmigration.

Wells Project

To achieve the applicable survival standards a combination of measures identified in the Wells juvenile and adult fish passage plans, including predator control measures, would be utilized at the Project. The appropriate mix of measures would vary depending upon the results of survival studies. Initial operations are described below.

Adult Fishway Operations

The adult fish passage plan includes requirements to have both adult fish ladders in operation from March 1 to December 1 of each year and at least one ladder in operation from December 1 to February 28. Maintenance of each individual fish ladder is scheduled during the December 1 to February 28 time period to avoid impacting adult fish migration. From May 1 to November15, the fishway is monitored 24 hours per day via digital recording fish counting equipment. Douglas PUD is required to fund fish counters to read the recordings from the previous day and report the fish counts to the U.S. Army Corps of Engineers. The two adult fishways are mirror image left and right bank fishway facilities. Each of the two fishways contains a single main entrance, a collection gallery, a fish ladder, an adult count station, trapping facilities, and an exit in the forebay adjacent to the earthen embankment section of the dam. Each fishway will be operated to maintain water velocities of 7 to 8 feet per second in entrance structures and 1 to 4 feet per second in the transportation channels. The ladder will be operated such that water depths over weirs in the ladder will be maintained at 1.0 to 1.2 feet. During the migration season, the adult fishway will be inspected once each day. WDFW personnel will inspect the facilities on a monthly basis and provide monthly inspection reports to the Fish Passage Center.

Measures to enhance safe passage of adult Plan Species will be emphasized in order to give high priority to adult survival in the achievement of 91% combined adult and juvenile project survival as described in the FEIS and Wells HCP Agreement. The Wells HCP Coordinating Committee may agree to implement additional measures to meet or achieve and maintain the 91% combined adult and juvenile project survival standard.

Juvenile Bypass, Spillway, and Turbine Operations

Douglas PUD will operate the juvenile bypass system each year in order to provide a non-turbine passage route through the dam for 95% of the spring-run and summer-run juvenile Permit Species outmigrations. This system includes five surface bypass entrances that convey water and fish into five modified spillways. The procedures set forth in the Wells HCP are intended to guide the operating criteria for the Wells juvenile bypass system. This plan also includes specific operating criteria for the turbines and spillways sufficient to maximize fish use and survival through the juvenile bypass system.

The District will operate the bypass system continuously between April 10 and August 15. Initiation of the bypass system may occur between April 1 and April 10 when it can be demonstrated that greater than 5% of the spring migration takes place prior to April 10. The basis for making this determination will be the historical hydro-acoustic index, verified by historical species composition information. Termination of the bypass system between August 15 and August 31 will occur when it can be demonstrated that 95% of the summer migration has passed
the project. The basis for making this determination shall be the historic hydro-acoustic index, verified by the historical species composition information. The bypass will not operate past August 31.

A more detailed description of juvenile bypass, spillway and turbine operations may be found in section 4.3 and appendix A of the Wells HCP Agreement, section 2.3.4.8 of the FEIS and in section 3 of the 2003 Wells BO.

Predator Control Measures

Douglas PUD, in cooperation with the Wells HCP Coordinating Committee, will refine and implement a comprehensive predator removal and harassment program for the protection of Plan Species. For northern pikeminnow, activities may include, but not be limited to, angling and long-line fisheries and a sport fishing derby in the project area. For piscivorous birds, including but not limited to Caspian terns, double-crested cormorants, and various gull species, activities may include, but not be limited to, foraging deterrents (e.g., steel wires in the Project tailrace), hazing, and lethal removal of individual birds. These programs will generally occur in the spring and summer, coinciding with the juvenile outmigration.

1.3.6. Tributary Conservation Plans

The Tributary Conservation Plans are detailed in Section 7 of the HCPs. To implement the Tributary Conservation Plans, Chelan and Douglas PUDs shall provide a "Plan Species Account" to fund projects for the protection and restoration of Plan Species habitat within the Columbia River watershed as well as the Okanogan, Methow, and Entiat and Wenatchee River watersheds, in order to compensate for up to 2% of Unavoidable Project Mortality (the assumed 9% Plan Species mortality caused by each project that is compensated through the tributary and hatchery programs).

The Tributary Committees are charged with the task of selecting projects and approving project budgets from each Plan Species Account for purposes of implementing their respective Tributary Conservation Plan. Whenever feasible, projects selected by the Tributary Committees shall take into consideration and be coordinated with other conservation plans or programs. Whenever feasible, the Tributary Committees shall cost-share with other programs, seek matching funds, and piggy-back programs onto other habitat efforts. Habitat protection and restoration projects may include, but are not limited to the following:

1) opening fish passage to blocked stream sections or oxbows,
2) changing the points of origin for problematic irrigation withdrawals to less sensitive site(s),
3) purchasing, on a willing buyer/seller concept, water shares for the Trust Water Rights Program,
4) providing alternative sources of irrigation and domestic water to mitigate impacts of problematic surface water diversions,
5) removing dams or other passage barriers on the tributaries,
6) using mechanical means to encourage natural development of riparian areas, and
7) using engineering techniques which increase complexity of permanently altered habitats.

The overarching goal of the Tributary Enhancement Funds is the long-term protection or enhancement of Permit Species' habitats in the tributaries, which in turn, should improve the productivity of salmon and steelhead populations in those basins. It is anticipated that some activities will require additional permitting and ESA consultation. Through these means and through active participation on the Tributary Committees, the parties to the HCPs would ensure that any negative impacts to Permit Species due to in-water or riparian tributary protection and enhancement activities would be minimized to the extent practical through choice of methodology, seasonal timing of work, and mitigation measures for short-term impacts and would not jeopardize ESA-listed Permit Species.

Rocky Reach Project

While the HCP remains in effect, Chelan PUD will contribute up to $229,800, in 1998 dollars, annually to the Rocky Reach Plan Species Account. By joint written request, the agency representatives to the Tributary Committee may elect for Chelan PUD to contribute, in advance, any of the annual payments to be made during the first fifteen years of the Agreement, provided that, (1) each annual payment will be adjusted by Chelan PUD for inflation based upon a nationally recognized index, (2) the total adjusted amount will be reduced to present value by the actual discount rate applicable to Chelan PUD, and reduced by Chelan PUD's actual cost of financing, and (3) each election will be for a minimum of three annual payments.

Chelan PUD will provide an additional $200,000 to monitor and evaluate the relative performance of projects approved by the Rocky Reach Tributary Committee. It is not the intent of the tributary assessment program to measure whether the Plan Species Account has provided a 2% increase in survival for Plan species, because any statistical evaluation of such small survival improvements would be lost within variation resulting from naturally fluctuating environment conditions. Instead, the program will ensure that the dollars allocated to the Plan Species Account are utilized in an effective and efficient manner.

Rock Island Project

While the HCP remains in effect, Chelan PUD will contribute $229,800, in 1998 dollars, annually to the Rock Island Plan Species Account. By joint written request, the agency representatives to the Tributary Committee may elect for Chelan PUD to contribute, in advance, any of the annual payments to be made during the first fifteen years of the Agreement, provided that, (1) each annual payment will be adjusted by Chelan PUD for inflation based upon a nationally recognized index, (2) the total adjusted amount will be reduced to present value by the actual discount rate applicable to Chelan PUD, and reduced by Chelan PUD's actual cost of financing, and (3) each election will be for a minimum of three annual payments. Chelan PUD will provide an additional $200,000 to monitor and evaluate the relative performance of projects approved by the Rock Island Tributary Committee. It is not the intent of the tributary assessment program to measure whether the Plan Species Account has provided a 2 percent increase in survival for Plan Species. Instead, the program will ensure that the dollars allocated to the Plan Species Account are utilized in an effective and efficient manner.

Wells Project

Once the Wells HCP Agreement has been approved by FERC, Douglas PUD will make an initial contribution of $1,982,000 in 1998 dollars to the Wells Plan Species Account. Five years after the initial contribution to the Plan Species Account, Douglas PUD will do one of the following: 1) make annual payments of $176,178 (2%) in 1998 dollars as long as the Wells HCP Agreement is in effect; or 2) provide an upfront payment of $1,761,780 (2% for 10 years) in 1998 dollars, but deducting the actual cost of bond issuance and interest.

Douglas PUD will provide an additional $200,000 to monitor and evaluate the relative performance of projects approved by the Wells Tributary Committee. It is not the intent of the evaluation to measure whether the Plan Species Account has provided a 2% increase in survival for Plan Species, because any statistical assessment of such small survival improvements would be lost within variation resulting from naturally fluctuating environmental conditions. Instead, the evaluation will ensure that the dollars allocated to the Wells Plan Species Account are utilized in an effective and efficient manner.

1.3.7. Hatchery Conservation Plans

The Hatchery Conservation Plans are detailed in Section 8 of the HCPs. To implement the Hatchery Conservation Plans, Chelan and Douglas PUDs will provide funding and support for hatchery propagation and evaluation programs, or measures to increase the off-site survival of naturally spawning fish or their progeny, in order to compensate for up to 7% of Unavoidable Project Mortality (the assumed 9% Plan Species mortality caused by each project that is compensated through the tributary and hatchery programs).

Chelan and Douglas PUDs will implement the specific elements of the hatchery program consistent with overall objectives of rebuilding natural populations and achieving NNI in an ESA-compliant manner. Species specific hatchery program objectives 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.

Hatchery production levels, except for original inundation mitigation, will be adjusted in 2013 and every 10 years thereafter as is required to adjust for changes in the average adult returns of Plan Species, for changes in the adult-to-smolt survival rate, and for changes to smolt-to-adult survival rate from the hatchery production facilities, considering methodologies described in the 1998 Biological Assessment and Management Plan (BAMP) (NOAA Fisheries et al. 1998). The Hatchery Committees will be responsible for determining program adjustments considering the methodology described in BAMP and providing recommended implementation plans to Chelan and Douglas PUDs.

The Hatchery Committees will oversee development of recommendations for implementation of the hatchery elements. This includes overseeing the implementation of improvements, monitoring and evaluation relevant to hatchery programs. Hatchery

Committee decisions will be based upon the likelihood of biological success, the time required to implement, and cost-effectiveness of solutions. The Hatchery Committees will also coordinate in-season information sharing and will discuss unresolved issues.

The Hatchery Conservation Plans involve specific propagation and monitoring and evaluation programs for steelhead hatchery facilities, spring chinook hatchery facilities, and non-listed anadromous species hatchery facilities. Each of these hatchery programs are funded by Chelan and Douglas PUDs and many of the associated activities are carried out by the Washington Department of Fish and Wildlife. Operations for each of these programs are briefly described below. Detailed descriptions of all activities associated with these programs may be found in the environmental assessments and biological opinions completed by NOAA Fisheries for issuance of the ESA Section 10(a)(1)(A) Research and Enhancement Permits for these programs (NOAA 2003d, NOAA 2003e, NOAA 2003f, NOAA 2004).

Steelhead Hatchery Program

Two hatchery facility complexes are operated by the WDFW within the middle and upper Columbia River Basin for the propagation of steelhead: Wells Fish Hatchery Complex and Eastbank Fish Hatchery Complex (Figure 2). The proposed artificial propagation programs are funded by Chelan and Douglas PUDs as mitigation for hydropower project operation impacts to the naturally spawning steelhead populations present in the Wenatchee, Methow, and Okanogan River Basins. The Wells Fish Hatchery Complex uses returning steelhead adults collected at Wells Dam on the Columbia River to supplement steelhead populations in the Methow and Okanogan River Basins. The Eastbank Fish Hatchery Complex uses steelhead broodstock collected at Dryden and Tumwater Dams on the Wenatchee River to supplement steelhead populations in the Wenatchee River Basin.

The WDFW proposes to purposely manage artificially propagated adult steelhead returning to the upper Columbia River Basin. Based on monitoring at Priest Rapids Dam, recommendations concerning broodstock collection strategies and the potential for other actions to utilize any excess hatchery steelhead would be made each year. Recommendations concerning management of hatchery steelhead proportions on spawning grounds and a means by which to remove excess hatchery steelhead would be made individually for the Wenatchee, Methow, and Okanogan Basins.

Research, monitoring, and evaluation are critical components of the proposed program. The three HCP agreements specifically require the formation of Hatchery Committees consisting of representatives from each signatory entity to each HCP. These HCP Hatchery Committees are charged with oversight of the artificial propagation programs to ensure that the programs are effective in meeting co-manager defined goals and objectives. The Upper Columbia River steelhead programs are intended to support naturally-spawning steelhead populations and to increase basin-wide steelhead productivity by ensuring adequate spawning escapements of the appropriate localized stocks. Specific research activities would be subject to approval of the HCP Hatchery Committees prior to implementation of the research.

Some specific activities associated with the steelhead hatchery programs that may affect bull trout include the following:

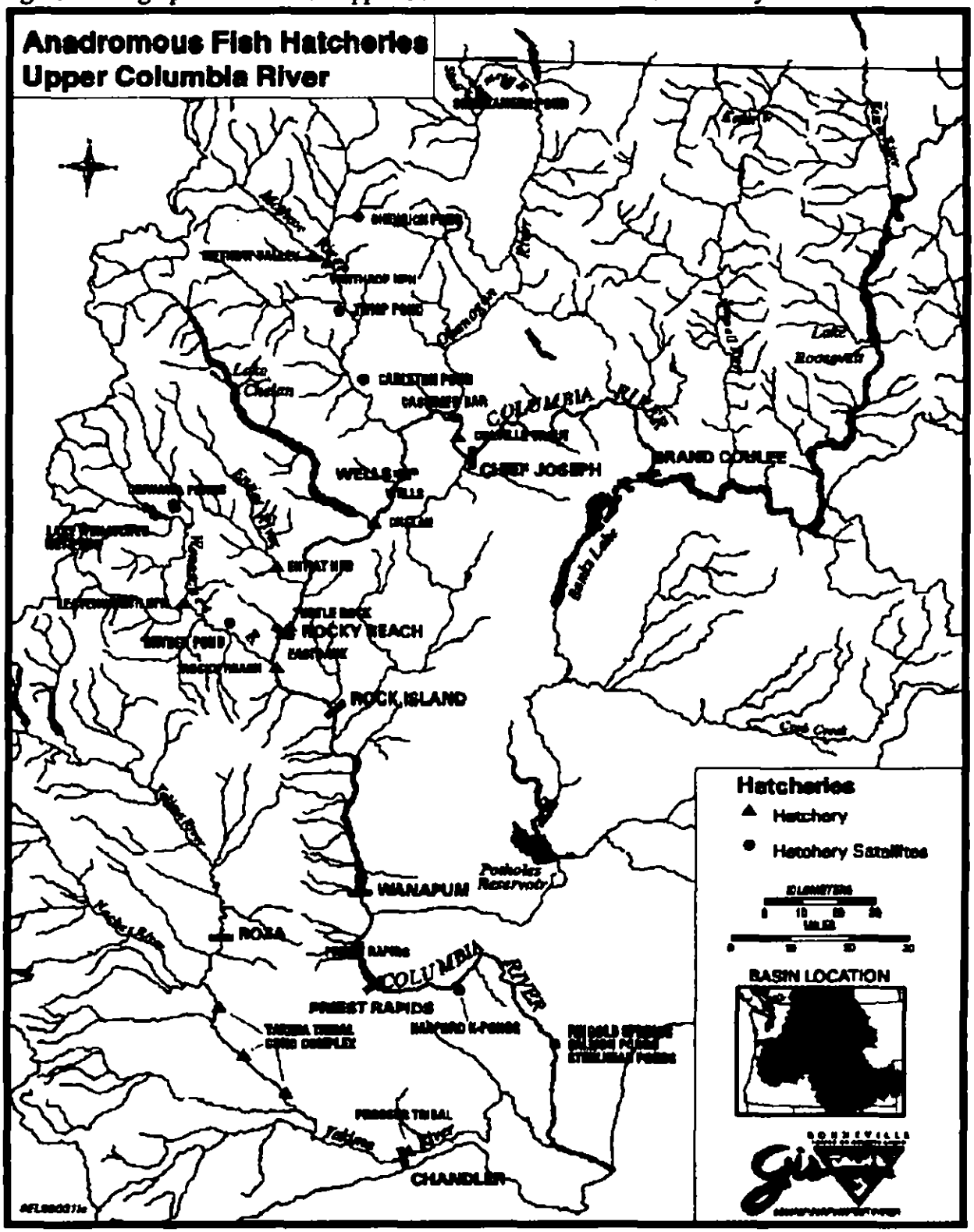
- Collection of steelhead broodstock fish at Wells Dam on the Columbia River for Methow and Okanogan Basin releases
- Collection of adult steelhead for broodstock from Omak Creek or Okanogan River
- Collect of steelhead broodstock fish at Dryden and Tumwater Dams for Wenatchee Basin releases
- Release of 350,000 smolts into the Methow and/or Okanogan Basins annually and release of 400,000 smolts into the Wenatchee Basin annually
- Release of up to 100,000 smolts in the Methow River annually
- Release of up to 40,000 smolts into the Okanogan Basin annually
- Removal of excess hatchery steelhead in the Wenatchee, Methow, and Okanogan Basins

Spring Chinook Hatchery Program

WDFW operates two hatchery complexes within the mid- and upper Columbia River Basin for the propagation of spring chinook salmon: Methow Fish Hatchery Complex and Rock Island Fish Hatchery Complex (Figure 2). These complexes are funded by the Public Utility Districts in the upper Columbia River region for the purpose of conducting supplementation programs for the naturally spawning chinook salmon populations present in the Methow and Wenatchee rivers, respectively (Chapman et al. 1995). The Methow Complex uses returning spring chinook salmon adults collected at weirs on the Methow River and its tributaries, the Twisp River and the Chewuch River. More recently, up-river-bound spring chinook salmon adults have been collected at Wells Dam and propagated at Methow State Fish Hatchery. The Rock Island Complex uses spring chinook salmon broodstock collected at weirs on the Chiwawa River and Nason Creek, tributaries of the Wenatchee River, and at Tumwater Dam on the mainstem Wenatchee River. WDFW's Eastbank Hatchery is part of the Rock Island Complex. WDFW-managed satellite programs included within the two complexes are the Twisp Pond, Chiwawa Ponds, Chewuch Pond, and the aforementioned adult collection weirs on the Methow, Chiwawa, Twisp, and Chewuch Rivers and Nason Creek.

Program activities that may affect bull trout include the collection of broodstock through WDFW trapping operations at Wells Dam for Methow River populations (with potential collection on the Twisp River, Chewuch River, at Foghorn Dam on the Methow River, and at Methow SFH) and on the Chiwawa River, Nason Creek and/or Tumwater Dam for Wenatchee River Basin-origin spring chinook salmon; and the release of smolts into the Methow, Chewuch, Twisp, and Chiwawa Rivers from the hatcheries and acclimation ponds on those systems.

Figure 2. Geographic location of Upper Columbia anadromous fish hatchery facilities.



(map courtesy of BPA Geographic Information Systems, 1999)

Non-listed Anadromous Fish Hatchery (FH) Program

Eastbank FH Programs

The Eastbank FH began operation in 1989 to mitigate for salmon smolt losses resulting from the operation of Rock Island Dam. The facility is located on the east side of the Columbia River near Rocky Reach Dam at river mile 474, seven miles north of Wenatchee, Washington. The hatchery complex operates with five satellite facilities, located on five different waters in the action area: Dryden Pond on the Wenatchee River, Chiwawa Pond on the Chiwawa River, Lake Wenatchee Net Pens on Lake Wenatchee, Carlton Pond on the Methow River, and Similkameen Pond on the Similkameen River. The hatchery is used for incubation and rearing of steelhead, and spring chinook, summer chinook, and sockeye salmon.

Broodstock are not collected at Eastbank FH. Sockeye and summer chinook salmon propagated at the hatchery originate from broodstock collected in the Wenatchee River (Dryden and Tumwater Dams) and at Wells Dam. Production goals for Eastbank FH would be: 864,000 summer chinook for acclimation and release into the Wenatchee River; 200,000 Wenatchee sockeye salmon for acclimation and release into Lake Wenatchee; 400,000 summer chinook for acclimation and release into the Methow River; and 576,000 summer chinook for acclimation and release into the Okanogan River Basin.

Wenatchee Sockeye Salmon Program

The program's purpose is to mitigate for the loss of sockeye salmon attributable to the construction and operation of Rock Island Dam. The program is funded by the Chelan PUD. Broodstock collection occurs at Tumwater Dam during the annual migration of sockeye adults returning to the Lake Wenatchee Basin generally from mid-July through early August. Eggs and juvenile sockeye salmon are incubated and early reared at the WDFW's Eastbank Fish Hatchery (FH), which is located on the mainstem Columbia River at river mile 474 near Rocky Reach Dam. After four to six months of rearing, the sockeye are liberated during September, October or November from the net pens into Lake Wenatchee. The hatchery sockeye fingerlings overwinter in the lake, and emigrate to the ocean the following spring as yearling smolts.

Wenatchee Summer Chinook Salmon Program - Dryden Pond

The purpose of this summer chinook salmon artificial propagation program in the Wenatchee River Basin is to mitigate for the loss of fish due to operation of Rocky Reach and Rock Island Dams. The WDFW's Eastbank FH, located on the mainstem Columbia River, is used for spawning, incubation and early rearing. Pre-smolt summer chinook salmon produced at Eastbank FH are transferred to acclimation sites in the Wenatchee Basin (primarily Dryden Pond) for
acclimation and release. Broodstock used in the Wenatchee summer chinook salmon artificial propagation program are taken from native fish returning to the Wenatchee River and its tributaries. Broodstock collection facilities include traps at Dryden (river mile 16) and Tumwater Dams (river mile 32) on the Wenatchee River. Trapping would occur primarily during July and August, but may extend through November in some years for late arriving summer chinook salmon. The progeny of these broodstock would be reared at Eastbank FH to the pre-smolt stage. Summer chinook salmon would be

transferred from Eastbank FH to acclimation sites in the Wenatchee Basin (usually Dryden Pond) for acclimation and release.

Methow Summer Chinook Salmon Program - Carlton Pond

The purpose of this summer-run chinook salmon artificial propagation program is to mitigate for the loss of summer chinook salmon adults that would have been produced in the Methow River Basin in the absence of the Wells, Rocky Reach, and Rock Island Dams. Summer chinook salmon presently used in the Methow (Carlton Pond) program would be the progeny of natural or hatchery-origin fish originating from the Methow and Okanogan River watersheds collected at Wells Dam. The Eastbank FH would be used for spawning, incubation and early rearing. Summer chinook salmon juveniles produced at Eastbank FH would be transferred to Carlton Pond on the Methow River for acclimation and release. Carlton Pond is located adjacent to the Methow River at river mile 36 near Twisp, Washington. Summer chinook salmon adults used for the Carlton Pond program are trapped by the WDFW at Wells Dam between early July and late August, and held through maturity at the Eastbank FH.

Okanogan Summer Chinook Salmon Program - Similkameen Pond

The purpose of the Okanogan summer chinook salmon artificial propagation program is to mitigate for the loss of summer chinook salmon adults that would have been produced in the Okanogan River Basin in the absence of Wells, Rocky Reach, and Rock Island Dams. The Eastbank FH would be used for spawning, incubation and early rearing. Summer chinook salmon juveniles produced at Eastbank FH would be transferred to acclimation sites in the upper Okanogan River watershed (primarily Similkameen Pond) for acclimation and release. Similkameen Pond is located adjacent to the Similkameen River (a tributary to the Okanogan River) near Oroville, Washington. Summer chinook salmon presently used in this program originate from natural or marked hatchery-origin fish collected at the Wells Dam concurrent with broodstock for the Carlton Pond Program described above.

Turtle Rock Summer Chinook Salmon Program

Turtle Rock FH is operated as a mitigation facility for fishery impacts caused by the construction and operation of Rocky Reach Dam. The hatchery is located adjacent to the Columbia River two miles upstream from Rocky Reach Dam at river mile 475 on the Columbia River. The facility includes the old Rocky Reach FH, located just downstream from Rocky Reach Dam, and rearing ponds on Turtle Rock Island located in the Rocky Reach Dam pool. The facility is used for summer chinook salmon incubation and rearing and steelhead rearing. Summer chinook salmon broodstock are not collected at Turtle Rock FH. Broodstock are provided through collection of summer chinook salmon volunteers to the Wells FH trap. Adults collected at Wells FH would be primarily hatchery origin fish with a few natural origin salmon. The Wells FH volunteer trap would operate from early July through late August. The summer chinook broodstock collection effort is curtailed in late August to minimize inclusion of fall chinook salmon into the summer chinook gene pool.

Wells Summer Chinook Salmon Program
Wells FH is located on the mainstem Columbia River at river mile 516 just below Wells Dam. The hatchery operates as a mitigation facility for salmon fishery impacts caused by Wells Dam. Summer chinook adults collected as broodstock for the Wells summer chinook program would be trapped at the hatchery volunteer trap concurrent with broodstock for the Turtle Rock Program described above.

1.4. Installation of Small Turbine Units at the Rocky Reach and Rock Island Projects

FERC proposes to authorize the construction of a small, 0.8 Megawatt, fixed-blade propeller turbine generator in the attraction water conduit that provides flow to the spillway entrance of the adult fishway at the Rocky Reach Project and in the attraction water conduit that provides supplemental flow to the spillway entrance of the left bank adult fishway at the Rock Island Project. These actions have already undergone consultation with the Service and will not be considered further in this opinion. On July 27, 2001, FERC provided a letter and an attached biological assessment/environmental assessment (BA/EA) requesting that the Service and NOAA Fisheries concur with its finding that the installation of a small turbine generator in the adult fishway water conduits at Rocky Reach and Rock Island Dams was not likely to adversely affect ESA-listed UCR steelhead or UCR spring-run chinook salmon, bull trout, bald eagles, and Ute ladies'-tresses. The Service responded on August 17, 2001 and concurred with the BA findings that installation and operation of the units was not likely to adversely affect bull trout, bald eagles or Ute ladies'-tresses.

1.5. Impact Minimization Measures

Rocky Reach Project

Juvenile Passage
Passage of juvenile bull trout through the project has not been addressed during the Rocky Reach relicensing study process. Due to small numbers of individuals encountered at the projects, juvenile studies would require an alternative means of sampling fish for a valid study. However, to the extent feasible, Chelan PUD will document age-group, year-class, length-weight information, and degree and frequency of descaling for all juvenile bull trout that are observed in the juvenile bypass system sampling facility.

Bull Trout Management Plan
Chelan PUD is proposing to complete a Rocky Reach Comprehensive Bull Trout Management Plan. The goal of the plan is to: protect and enhance, to the extent feasible, bull trout populations in the Rocky Reach and Rock Island project areas according to the guiding principles of the USFWS recovery plan, and/or by mitigating any specific adverse impacts to bull trout shown to be caused by continued operation of the Rock Island and Rocky Reach projects.

Bull Trout Monitoring and Evaluation Program
Upon completion of a signed and executed Settlement Agreement for relicensing of Rocky Reach Project, Chelan PUD will implement a bull trout Monitoring and Evaluation Program. If a project effect is identified through the Monitoring and Evaluation Program, Chelan PUD will work with the USFWS to address a solution. Funding may be applied off-site where appropriate. Implementation of the Monitoring and Evaluation Program will begin within one year after the new license is accepted.

Adult Passage Monitoring
Chelan PUD will continue to capture digital pictures of bull trout passing through fishways at Rocky Reach Dam. These photographs will provide information on the size, age, and condition of bull trout that move upstream via the adult fishways.

Chelan PUD will conduct the following to monitor adult bull trout passage at Rocky Reach Dam: (1) continue ladder counts; (2) maintain adult fishways in accordance with anadromous fish criteria; and (3) expand video counts to off-season for an experimental period of 1 year. Off-season video counting will be continued throughout the remainder of the new license term if need for the data is biologically justified and useable.

Chelan PUD will investigate the feasibility of providing video monitoring of the adult separator at the Rocky Reach Juvenile Fish Bypass to enumerate adult bull trout entering the sampling facility during index sampling periods.

USFWS Recovery Plan
Chelan PUD will participate in the USFWS bull trout recovery plan for areas affected by project operations.

Tributary Habitat Enhancement
Chelan PUD will consider collecting and hauling large woody debris from Rocky Reach Dam and placing it in tributaries as part of the HCP tributary enhancement plan.

Rock Island Project

Juvenile Passage
Chelan PUD will continue to collect and evaluate passage events for adult and juvenile bull trout in order to monitor monthly passage trends through adult fishways. Chelan PUD will implement a bull trout monitoring and evaluation program as part the Protection, Mitigation and Enhancement measures of the Rocky Reach relicensing settlement agreement, upon signing and execution of such agreement. As noted previously, the goal of the Comprehensive Bull Trout Management Plan is to: protect and enhance, to the extent feasible, bull trout populations in both the Rocky Reach and Rock Island project areas according to the guiding principles of the USFWS recovery plan, and/or by mitigating any specific adverse impacts to bull trout shown to be caused by

continued operation of the Project. Chelan PUD will continue to capture digital pictures of bull trout passing through fishways at Rock Island Dam. These photographs will provide information on the size, age, and condition of bull trout that move upstream via the adult fishways.

Adult Passage Monitoring

Chelan PUD will conduct the following to monitor adult bull trout passage at Rock Island Dam: (1) continue ladder counts; (2) maintain adult fishways in accordance with anadromous fish criteria; and (3) expand video counts to off-season for an experimental period of 1 year. Off-season video counting will be continued throughout the remainder of the new license term if need for the data is biologically justifiable.

Tributary Habitat Enhancement

Chelan PUD will consider hauling and placing large woody material collected at Rock Island Dam into tributaries as part of the HCP tributary enhancement fund.

Compliance with Recovery or Management Plans

The USFWS has completed a draft federal recovery plan to guide recovery for listed (threatened) Upper Columbia River bull trout. The Rock Island HCP action area in the mainstem Columbia and associated tributaries (Wenatchee, Entiat, and Methow) are within the geographic recovery boundary of the Upper Columbia Bull Trout Recovery Plan. Expected duration for full recovery leading to delisting of bull trout Upper Columbia River Recovery Unit is 25 to 50 years. Chelan PUD is currently a technical member of the Bull Trout Recovery Team for the Upper Columbia River Bull Trout Recovery Unit. Chelan PUD will continue to participate in ongoing recovery plan meetings and assist with recovery tasks to address uncertainties on project effects on bull trout that are outlined in the recovery plan.

Wells Project

Adult and Juvenile Passage

Bull trout that may become stranded during fish ladder and turbine maintenance will be collected, counted and returned to the river immediately upstream of the project. All observations of bull trout recovered during these operations will be reported to the Service.

Information on the number of bull trout passing through the fish ladders at Wells Dam, outside the normal fish counting period, will be collected during the winter of 2004-2005. Winter bull trout counts will begin on November 16, 2004 and will continue until April 31, 2005. After the winter bull trout counts have been compiled and examined by all interested entities, the District and the Service will determine whether or not winter bull trout counts should be collected during future years.

Hatchery Conservation Plan

Brood stock traps located in the fish ladder at Wells Dam will not be operated when water temperatures within the ladder exceed 69 degrees farenheight. Operation of the fish ladder traps will be limited to a maximum of 16-hours per day for no more than

three days per week. The ladder traps will be manned to ensure that bull trout are safely returned to the fish ladder upstream of the trap. Should a bull trout be mistakenly anesthetized, the fish will be allowed to recover, transported to a quiet location upstream of the dam and released.

Brood stock traps operated in the Methow Basin will be checked at least once per day during trapping operations. Bull trout collected in the tributary brood collection traps will be safely removed from the traps and released a sufficient distance upstream of the trap to ensure that the released bull trout do not become stranded on the dam, weir or on the trap intake screens.
Hatchery evaluation activities may result in the harassment of migratory bull trout during spawning ground and snorkel surveys. During these surveys, spawning bull trout will be avoided whenever possible. Whenever observed, the location of spawning bull trout will be shared with Service and US Forest Service biologists.

Juvenile spring chinook and steelhead smolt trapping activities on the Methow, Twisp and Chewuch rivers may result in the inadvertent collection of juvenile and adult bull trout. To reduce capture and handling stress, the traps will be checked and cleaned at least twice per day. Upon encountering a bull trout in one of the juvenile traps, each bull trout will be anesthetized, measured, weighed, PIT-tagged and, after recovering from the affects of the anesthetic, released downstream of the trapping facility. The information collected on each incidentally captured bull trout will be provided to the Service for use in monitoring bull trout populations in the Upper Columbia River.

2. Status of the Species

2.1. Bull trout

Taxonomy

The bull trout (*Salvelinus confluentus*, family Salmonidae) is a char native to the Pacific Northwest and western Canada, first described as *Salmo spectabilis* by Girard in 1856 from a specimen collected on the lower Columbia River, and subsequently described as *Salmo confluentus* and *Salvelinus malma* (Cavender 1978). Bull trout and Dolly Varden (*Salvelinus malma*) were previously considered a single species (Cavender 1978, Bond 1992). Cavender (1978) presented morphometric, meristic, osteological, and distributional evidence to document specific distinctions between Dolly Varden and bull trout. Bull trout and Dolly Varden were formally recognized as separate species by the American Fisheries Society in 1980 (Robins *et al.* 1980). Although bull trout and Dolly Varden co-occur in several northwestern Washington river drainages, there is little evidence of introgression (Haas and McPhail 1991), and the two species appear to be maintaining distinct genomes (Leary *et al.* 1993, Williams *et al.* 1995, Kanda *et al.* 1997, Spruell and Allendorf 1997). Lastly, the bull trout and the Dolly Varden each appear to be more closely related genetically to other species of *Salvelinus* than they are to each other (Grewe *et al.* 1990, Pleyte *et al.* 1992, Crane *et al.* 1994, Phillips *et al.* 1995). For example, the bull trout is most closely related to the Japanese char (*S. leucomaenis*) whereas the Dolly Varden is most closely related to the Arctic char (*S. alpinus*).

Physical Description

The bull trout is a long slender fish with a large head and jaws relative to its body-size. Its tail fin is only slightly forked, and even less so in young fish. Bull trout coloration can be variable, but generally, the body's background color is gray infused with green. Bull trout found in lakes may be silvery grey. The body is covered with small white and/or pale yellowish spots with intermingling pink or red spots that not be always be present. The ventral region can range from white to orange. Bull trout typically have 15-19 gill rakers, 63-66 vertebrae, and 22-35 pyloric caeca. Bull trout of large size can be differentiated from Dolly Varden with bull trout having a larger head and jaws in addition to the head being more flat. Bull trout have spotless fins with the lower fins having white anterior borders. The spotless fin characteristic of bull trout is often used by fisheries agencies to help promote angler identification of bull trout versus other fish, such as brook trout (*Salvelinus fontinalis*)(Behnke 2002).

Distribution

The historical range of the bull trout includes major river basins in the Pacific Northwest at about 41 to 60 degrees North latitude, from the southern limits in the McCloud River in northern California and the Jarbidge River in Nevada to the headwaters of the Yukon River in the Northwest Territories, Canada (Cavender 1978, Bond 1992). To the west, the bull trout's range includes Puget Sound, various coastal rivers of British Columbia,

Canada, and southeast Alaska (Bond 1992). Bull trout occur in portions of the Columbia River and tributaries within the basin, including its headwaters in Montana and Canada. Bull trout also occur in the Klamath River basin of south-central Oregon. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta and Montana and in the MacKenzie River system in Alberta and British Columbia, Canada, (Cavender 1978, Brewin *et al.* 1997).

Listing History

On June 10, 1998, the Service issued a final rule listing the Columbia River and Klamath River populations of bull trout as threatened (63 FR 31647) under the authority of the Endangered Species Act of 1973. This decision conferred full protection of the Endangered Species Act on bull trout occurring in four northwestern States. The Jarbidge River population was listed as threatened on April 8, 1999 (64 FR 17110). The Coastal-Puget Sound and St. Mary-Belly River populations were listed as threatened on November 1, 1999 (64 FR 58910), which resulted in all bull trout in the coterminous United States being listed as threatened. The five populations discussed above are listed as distinct population segments, *i.e.*, they meet the joint policy of the U.S. Fish and Wildlife Service and NOAA Fisheries regarding the recognition of distinct vertebrate populations (61 FR 4722).

The Service proposed to designate critical habitat for the bull trout on November 29, 2002 (67 FR 71235).

Distinct Population Segments and Population Units

Population units of bull trout exist in which all fish share an evolutionary legacy and which are significant from an evolutionary perspective (Spruell *et al.* 1999). These population units can range from a local population to multiple populations, and theoretically should represent a DPS. Although such population units are difficult to characterize, genetic data have provided useful information on bull trout population structure. For example, genetic differences between the Klamath River and Columbia River populations of bull trout were revealed in 1993 (Leary *et al.* 1993). The boundaries of the five listed DPSs of bull trout are based largely on this 1993 information.

Since the bull trout was listed, additional genetic analyses have suggested that its populations may be organized on a finer scale than previously thought. Data have revealed genetic differences between coastal populations of bull trout, which includes the lower Columbia River and Fraser River, and inland populations in the upper Columbia River and Fraser River drainages (Williams *et al.* 1997, Taylor *et al.* 1999). There is also an apparent genetic differentiation between inland populations within the Columbia River basin. This differentiation occurs between the (a) mid-Columbia River (John Day, Umatilla) and lower Snake River (Walla Walla, Clearwater, Grande Ronde, Imnaha rivers, etc.) populations and the (b) upper Columbia River (Methow, Clark Fork, Flathead River, etc.) and upper Snake River (Boise River, Malheur River, Jarbidge River, etc.)

populations (Spruell *et al.* 2003). Genetic data indicate that bull trout inhabiting the Deschutes River drainage of Oregon are derived from coastal populations and not from inland populations in the Columbia River basin (Leary *et al.* 1993, Williams *et al.* 1997, Spruell and Allendorf 1997, Taylor *et al.* 1999, Spruell *et al.* 2003). In general, evidence since the time of listing suggests a need to further evaluate the distinct population segment structure of bull trout DPSs.

Life History

Bull trout exhibit both resident and migratory life-history strategies (Rieman and McIntyre 1993). Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. Migratory bull trout spawn in tributary streams where juvenile fish rear one to four years before migrating to either a lake (adfluvial form), river (fluvial form) (Fraley and Shepard 1989, Goetz 1989), or in certain coastal areas, to saltwater (anadromous) (Cavender 1978, McPhail and Baxter 1996, WDFW *et al.* 1997). Resident and migratory life-history forms may be found together but it is unknown if they represent a single population or separate populations (Rieman and McIntyre 1993). Either form may give rise to offspring exhibiting either resident or migratory behavior (Rieman and McIntyre 1993). The multiple life-history strategies found in bull trout populations represent important diversity (both spatial and genetic) that help protect these populations from environmental stochasticity.

The size and age of bull trout at maturity depends upon the life-history strategy and habitat limitations. Resident fish tend to be smaller than migratory fish at maturity and produce fewer eggs (Fraley and Shepard 1989, Goetz 1989). Resident adults usually range from 150 to 300 millimeters (6 to 12 inches) total length (TL). Migratory adults however, having lived for several years in larger rivers or lakes and feeding on other fish, grow to a much larger size and commonly reach 600 millimeters (24 inches) TL or more (Pratt 1985, Goetz 1989). The largest verified bull trout was a 14.6-kilogram (32-pound) adfluvial fish caught in Lake Pend Oreille, Idaho, in 1949 (Simpson and Wallace 1982). Size differs little between life-history forms during their first years of life in headwater streams, but diverges as migratory fish move into larger and more productive waters (Rieman and McIntyre 1993).

Ratliff (1992) reported that bull trout under 100 mm (4 inches) in length were generally only found in the vicinity of spawning areas, and that fish over 100 mm were found downstream in larger channels and reservoirs in the Metolius River Basin. Juvenile migrants in the Umatilla River were primarily 100-200 mm long (4 to 8 inches) in the spring and 200-300 mm long (8 to 12 inches) in October (Buchanan *et al.* 1997). The age at migration for juveniles is variable. Ratliff (1992) reported that most juveniles reached a size to migrate downstream at age 2, with some at ages 1 and 3 years. Pratt (1992) had similar findings for age-at-migration of juvenile bull trout from tributaries of the Flathead River. The seasonal timing of juvenile downstream migration appears similarly variable.

Bull trout normally reach sexual maturity in 4 to 7 years and may live longer than 12 years. The species is iteroparous (i.e., can spawn multiple times in their lifetime) and

adults may spawn each year or in alternate years (Batt 1996). Repeat-spawning frequency and post-spawning mortality are not well documented (Leathe and Graham 1982, Fraley and Shepard 1989, Pratt 1992, Rieman and McIntyre 1996) but post-spawn survival rates are believed to be high.

Bull trout typically spawn from late August to November during periods of decreasing water temperatures (below 9 degrees Celsius/48 degrees Fahrenheit). Redds are often constructed in stream reaches fed by springs or near other sources of cold groundwater (Goetz 1989, Pratt 1992, Rieman and McIntyre 1996). Migratory bull trout frequently begin spawning migrations as early as April and have been known to move upstream as far as 250 kilometers (km) (155 miles) to spawning grounds in Montana (Fraley and Shepard 1989, Swanberg 1997). In Idaho, bull trout moved 109 km (67.5 miles) from Arrowrock Reservoir to spawning areas in the headwaters of the Boise River (Flatter 1998). In the Blackfoot River, Montana, bull trout began spring spawning migrations in response to increasing temperatures (Swanberg 1997). Depending on water temperature, egg incubation is normally 100 to 145 days (Pratt 1992), and after hatching, juveniles remain in the substrate. Time from egg deposition to emergence of fry may surpass 220 days. Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows (Pratt 1992, Ratliff and Howell 1992).

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macro-zooplankton, and small fish (Boag 1987, Goetz 1989, Donald and Alger 1993). Adult migratory bull trout feed on various fish species (Leathe and Graham 1982, Fraley and Shepard 1989, Brown 1992, Donald and Alger 1993). In coastal areas of western Washington, bull trout feed on Pacific herring (*Clupea pallasi*), Pacific sand lance (*Ammodytes hexapterus*), and surf smelt (*Hypomesus pretiosus*) in the ocean (WDFW *et al.* 1997).

Habitat Affinities

Bull trout have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993). Habitat components that influence the species' distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrate, and availability of migratory corridors (Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Howell and Buchanan 1992; Pratt 1992; Rieman and McIntyre 1993, 1995; Rich 1996; Watson and Hillman 1997). Watson and Hillman (1997) concluded that watersheds must have specific physical characteristics to provide the habitat requirements necessary for bull trout to successfully spawn and rear and that these specific characteristics are not necessarily present throughout these watersheds. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993), individuals of this species should not be expected to simultaneously occupy all available habitats (Rieman *et al.* 1997a).

Bull trout are found primarily in cold streams, although individual fish are found in larger, warmer river systems throughout the Columbia River basin (Fraley and Shepard 1989; Rieman and McIntyre 1993, 1995; Buchanan and Gregory 1997; Rieman *et al.* 1997a). Water temperature above 15 degrees Celsius (59 degrees Fahrenheit) is believed to limit bull trout distribution, a limitation that may partially explain the patchy distribution within a watershed (Fraley and Shepard 1989, Rieman and McIntyre 1995).

Spawning areas are often associated with cold-water springs, groundwater infiltration, and the streams with the coldest summer water temperatures in a given watershed (Pratt 1992, Rieman and McIntyre 1993, Rieman *et al.* 1997a, Baxter *et al.* 1999). Water temperatures during spawning generally range from 5 to 9 degrees Celsius (41 to 48 degrees Fahrenheit) (Goetz 1989). The requirement for cold water during egg incubation has generally limited the spawning distribution of bull trout to high elevations in areas where the summer climate is warm. Rieman and McIntyre (1995) found in the Boise River Basin that no juvenile bull trout were present in streams below 1613 m (5000 feet). Similarly, in the Sprague River basin of south-central Oregon, Ziller (1992) found in four streams with bull trout that "numbers of bull trout increased and numbers of other trout species decreased as elevation increased. In those streams, bull trout were only found at elevations above 1774 m [5500 feet]."

Goetz (1989) suggested optimum water temperatures for rearing bull trout of about 7 to 8 degrees Celsius (44 to 46 degrees Fahrenheit) and for egg incubation of 2 to 4 degrees Celsius (35 to 39 degrees Fahrenheit). For Granite Creek, Idaho, Bonneau and Scarnecchia (1996) observed that juvenile bull trout selected the coldest water [8 to 9 degrees Celsius (46 to 48 degrees Fahrenheit), within a temperature gradient of 8 to 15 degrees Celsius (46 to 60 degrees Fahrenheit)] available in a plunge pool.

In Nevada, adult bull trout have been collected at sites with a water temperature of 17.2 degrees Celsius (63 degrees Fahrenheit) in the West Fork of the Jarbidge River (S. Werdon, *pers. comm.*, 1998) and have been observed in Dave Creek where maximum daily water temperatures were 17.1 to 17.5 degrees Celsius (62.8 to 63.6 degrees Fahrenheit) (Werdon, *in litt.* 2001). In the Little Lost River, Idaho, bull trout have been collected in water having temperatures up to 20 degrees Celsius (68 degrees Fahrenheit); however, these fish made up less than 50 percent of all salmonids when maximum summer water temperature exceeded 15 degrees Celsius (59 degrees Fahrenheit) and less than 10 percent of all salmonids when temperature exceeded 17 degrees Celsius (63 degrees Fahrenheit)(Gamett 1999).

All life-history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Fraley and Shepard 1989, Goetz 1989, Hoelscher and Bjornn 1989, Sedell and Everest 1991, Pratt 1992, Thomas 1992, Rich 1996, Sexauer and James 1997, Watson and Hillman 1997). Jakober (1995) observed bull trout overwintering in deep beaver ponds or pools containing large woody debris in the Bitterroot River drainage, Montana, and suggested that, because of the need to avoid anchor ice in order to survive, suitable winter habitat may be more restricted than summer habitat. Maintaining bull trout habitat requires stability of stream channels

and of flow (Rieman and McIntyre 1993). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997). These areas are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns. For example, altered stream flow in the fall may disrupt bull trout during the spawning period, and channel instability may decrease survival of eggs and young juveniles in the gravel from winter through spring (Fraley and Shepard 1989, Pratt 1992, Pratt and Huston 1993).

Preferred bull trout spawning habitat consists of low-gradient stream reaches with loose, clean gravel (Fraley and Shepard 1989). In the Swan River, Montana, abundance of bull trout redds (spawning areas) was positively correlated with the extent of bounded alluvial valley reaches, which are likely areas of groundwater to surface water exchange (Baxter *et al.* 1999). Survival of bull trout embryos planted in stream areas of groundwater upwelling used by bull trout for spawning were significantly higher than embryos planted in areas of surface-water recharge not used by bull trout for spawning (Baxter and McPhail 1999). Pratt (1992) indicated that increases in fine sediment reduce egg survival and emergence.

Migratory corridors link seasonal habitats for all bull trout life-history forms. For example, in Montana, migratory bull trout make extensive migrations in the Flathead River system (Fraley and Shepard 1989), and resident bull trout in tributaries of the Bitterroot River move downstream to overwinter in tributary pools (Jakober 1995). The ability to migrate is important to the persistence of bull trout (Rieman and McIntyre 1993, M. Gilpin, *in litt.* 1997, Rieman *et al.* 1997a). Migrations facilitate gene flow among local populations when individuals from different local populations interbreed, or stray, to non-natal streams. Local bull trout populations that are extirpated by catastrophic events may also become re-established by migrants.

Population Dynamics

Although bull trout are widely distributed over a large geographic area, they exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993). Increased habitat fragmentation reduces the amount of available habitat and increases isolation from other populations of the same species (Saunders *et al.* 1991). Burkey (1989) concluded that when species are isolated by fragmented habitats, low rates of population growth are typical in local populations and their probability of extinction is directly related to the degree of isolation and fragmentation. Without sufficient immigration, growth for local populations may be low and probability of extinction high (Burkey 1989, 1995).

Metapopulation concepts of conservation biology theory have been suggested relative to the distribution and characteristics of bull trout, although empirical evidence is relatively scant (Rieman and McIntyre 1993, Dunham and Rieman 1999, Rieman and Dunham 2000). A metapopulation is an interacting network of local populations with varying frequencies of migration and gene flow among them (Meffe and Carroll 1994). For inland bull trout, metapopulation theory is likely most applicable at the watershed scale

where habitat consists of discrete patches or collections of habitat capable of supporting local populations; local populations are for the most part independent and represent discrete reproductive units; and long-term, low-rate dispersal patterns among component populations influences the persistence of at least some of the local populations (Rieman and Dunham 2000). Ideally, multiple local populations distributed throughout a watershed provide a mechanism for spreading risk because the simultaneous loss of all local populations is unlikely. However, habitat alteration, primarily through the construction of impoundments, dams, and water diversions has fragmented habitats, eliminated migratory corridors, and in many cases isolated bull trout in the headwaters of tributaries (Rieman *et al.* 1997a, Dunham and Rieman 1999, Spruell *et al.* 1999, Rieman and Dunham 2000). Accordingly, human-induced factors as well as natural factors affecting bull trout distribution have likely limited the expression of the metapopulation concept for bull trout to patches of habitat within the overall distribution of the species (Dunham and Rieman 1999). However, despite the theoretical fit, the relatively recent and brief time period during which bull trout investigations have taken place does not provide certainty as to whether a metapopulation dynamic is occurring (e.g., a balance between local extirpations and recolonizations) across the range of bull trout or whether the persistence of bull trout in large or closely interconnected habitat patches (Dunham and Rieman 1999) is simply reflective of a general deterministic trend towards extinction of the species where the larger or interconnected patches are relics of historically wider distribution (Rieman and Dunham 2000). Recent research (Whiteley *et al.* 2003) does, however, provide stronger genetic evidence for the presence of a metapopulation process for bull trout, at least in the Boise River basin of Idaho.

Reasons for Listing

Bull trout distribution, abundance, and habitat quality have declined rangewide (Bond 1992, Schill 1992, Thomas 1992, Ziller 1992, Rieman and McIntyre 1993, Newton and Pribyl 1994, IDFG *in litt.* 1995, McPhail and Baxter 1996). Several local extirpations have been documented, beginning in the 1950's (Rode 1990, Ratliff and Howell 1992, Donald and Alger 1993, Goetz 1994, Newton and Pribyl 1994, Berg and Priest 1995, Light *et al.* 1996, Buchanan *et al.* 1997, WDFW 1998). Bull trout were extirpated from the southernmost portion of their historic range, the McCloud River in California, around 1975 (Moyle 1976, Rode 1990). Bull trout have been functionally extirpated (*i.e.*, few individuals may occur there but do not constitute a viable population) in the Coeur d'Alene River basin in Idaho and in the Lake Chelan and Okanogan River basins in Washington (USFWS 1998).

These declines result from the combined effects of habitat degradation and fragmentation, the blockage of migratory corridors; poor water quality, angler harvest and poaching, entrainment (process by which aquatic organisms are pulled through a diversion or other device) into diversion channels and dams, and introduced nonnative species. Specific land and water management activities that depress bull trout populations and degrade habitat include dams and other diversion structures, forest management practices, livestock grazing, agriculture, agricultural diversions, road construction and maintenance, mining, and urban and rural development (Beschta *et al.* 1987; Chamberlain *et al.* 1991;

Furniss *et al.* 1991; Meehan 1991; Nehlsen *et al.* 1991; Sedell and Everest 1991; Craig and Wissmar 1993; Frissell 1993; Henjum *et al.* 1994; McIntosh *et al.* 1994; Wissmar *et al.* 1994; MBTSG 1995a-e, 1996a-f; Light *et al.* 1996; USDA and USDI 1995, 1996, 1997).

Rangewide Trend

In the rules listing bull trout as threatened, the Service identified subpopulations (*i.e.*, isolated groups of bull trout thought to lack two-way exchange of individuals), for which status, distribution, and threats to bull trout were evaluated. Because habitat fragmentation and barriers have isolated bull trout throughout their current range, a subpopulation was considered a reproductively isolated group of bull trout that spawns within a particular river or area of a river system. Overall, 187 subpopulations were identified in the 5 distinct population segments, 7 in the Klamath River, 141 in the Columbia River, 1 in the Jarbidge River, 34 in the Coastal-Puget Sound, and 4 in the St. Mary-Belly River populations. No new subpopulations have been identified and no subpopulations have been lost since listing. More detailed information on the range-wide trend of the bull trout is currently being developed for the 5-year status review and is not yet available.

New Threats

Since listing, no substantial new threats have been identified.

Consulted-on Effects

Consulted-on effects are those effects that have been analyzed through section 7 consultation as reported in a biological opinion. These effects are an important component of objectively characterizing the current condition of the species. To assess consulted-on effects to bull trout, we analyzed all of the biological opinions received by the Region 1 and Region 6 Offices, from the time of listing until August 2003; this summed to 137 biological opinions. Of these, 124 biological opinions (91 percent) applied to activities affecting bull trout in the Columbia Basin DPS, 12 biological opinions (9 percent) applied to activities affecting bull trout in the Coastal-Puget Sound DPS, 7 biological opinions (5 percent) applied to activities affecting bull trout in the Klamath Basin DPS, and 1 biological opinion (<1 percent) applied to activities affecting the Jarbidge and St. Mary Belly DPSs (Note: these percentages do not add to 100, because several biological opinions applied to more than one DPS). The geographic scale of these consultations varied from individual actions (e.g., construction of a bridge or pipeline) within one basin to multiple-project actions occurring across several basins.

Our analysis showed that we consulted on a wide array of actions which had varying level of effects. Many of the actions resulted in only short-term adverse effects – some with long-term beneficial effects. Some of the actions resulted in long-term adverse effects. No actions that have undergone consultation were found to appreciably reduce the likelihood of survival and recovery of the bull trout. Furthermore no actions that have

undergone consultation were anticipated to result in the loss of any subpopulations or local populations of bull trout. A more detailed analysis of consulted-on effects to the bull trout is available in our files and is hereby incorporated by reference.

Ongoing Conservation Actions

Federal Conservation Actions

Federal conservation actions include: (1) the development of a draft *Bull Trout Recovery Plan*; (2) ongoing implementation of the *Interim Strategy for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California* (PACFISH; USDA and USDI 1995) and the *Interim Strategy for Managing Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana and Portions of Nevada* (INFISH; USDA 1995); (3) ongoing implementation of the Northwest Forest Plan; (4) ongoing implementation of the Northwest Power and Conservation Council Fish and Wildlife Program targeting subbasin planning; (5) ongoing implementation of the Federal Caucus Fish and Wildlife Plan; and, (6) ongoing implementation of Department of Agriculture Conservation Reserve Programs.

State Conservation Actions

Idaho: Conservation actions by the State of Idaho include: (1) the development of a management plan for bull trout in 1993 (Conley 1993); (2) the approval of the *State of Idaho Bull Trout Conservation Plan* (Idaho Plan) in July 1996 (Batt 1996); (3) the development of 21 problem assessments involving 59 key watersheds; (4) the implementation of conservation actions identified in the problem assessments; and, (5) the implementation of more restrictive angling regulations.

Montana: Conservation actions by the State of Montana include: (1) development of the *Montana Bull Trout Restoration Plan* issued in 2000 (MBTRT 2000), which defines strategies for ensuring the long-term persistence of bull trout in Montana; (2) formation of the Montana Bull Trout Restoration Team (MBTRT) and Montana Bull Trout Scientific Group (MBTSG) to produce a plan for maintaining, protecting, and increasing bull trout populations; (3) the development of watershed groups to initiate localized bull trout restoration efforts; (4) funding of habitat restoration projects, recovery actions, and genetic studies throughout the state; (5) the abolition of brook trout stocking programs; and, (6) implementation of stricter angling regulations have also become more restrictive than in the past.

Nevada: Conservation actions by the State of Nevada include: (1) the preparation of a *Bull Trout Species Management Plan* that recommends management alternatives to ensure that "human activities will not jeopardize the future of bull trout in Nevada" (Johnson 1990); (2) implementation of more restrictive State angling regulations in an attempt to protect bull trout in the Jarbidge River in Nevada; and, (3) the abolition of a rainbow trout stocking in the Jarbidge River.

Oregon: Since 1990, the State of Oregon has taken several actions to address the conservation of bull trout, including: (1) Establishing bull trout working groups in the Klamath, Deschutes, Hood, Willamette, Odell Lake, Umatilla and Walla Walla, John Day, Malheur, and Pine Creek river basins for the purpose of developing bull trout conservation strategies; (2) establishment of more restrictive harvest regulations in 1990; (3) reduced stocking of hatchery-reared rainbow trout and brook trout into areas where bull trout occur; (4) angler outreach and education efforts are also being implemented in river basins occupied by bull trout; (5) research to further examine life history, genetics, habitat needs, and limiting factors of bull trout in Oregon; (6) reintroduction of bull trout fry from the McKenzie River watershed to the adjacent Middle Fork of the Willamette River, which is historical unoccupied, isolated habitat; (7) the Oregon Department of Environmental Quality (DEQ) established a water temperature standard such that surface water temperatures may not exceed 10 degrees Celsius (50 degrees Fahrenheit) in waters that support or are necessary to maintain the viability of bull trout in the State (Oregon 1996); and, (8) expansion of the Oregon Plan for Salmon and Watersheds (Oregon 1997) to include all at-risk wild salmonids throughout the State.

Washington: Conservation actions by the State of Washington include: (1) establishment of the Salmon Recovery Act (ESHB 2496) and Watershed Management Act (ESHB 2514) by the Washington State legislature to assist in funding and planning salmon recovery efforts; (2) abolition of a brook trout stocking in streams or lakes connected to bull trout-occupied waters; (3) changing angling regulations in Washington prohibit the harvest of bull trout, except for a few areas where stocks are considered "healthy"; (4) collecting and mapping updated information on bull trout distribution, spawning and rearing areas, and potential habitat; and, (5) adopting new emergency forest practice rules based on the "Forest and Fish Report" process. These rules address riparian areas, roads, steep slopes, and other elements of forest practices on non-Federal lands.

Tribal Conservation Activities

Many Tribes throughout the range of the bull trout are participating on bull trout conservation working groups or recovery teams in their geographic areas of interest. Some tribes are also implementing projects which focus on bull trout or that address anadromous fish but benefit bull trout (e.g., habitat surveys, passage at dams and diversions, habitat improvement, and movement studies).

Conservation Needs

Conservation needs reflect those biological and physical requirements of a species for its long-term survival and recovery. Based on the best available scientific information (Rieman and McIntyre 1993, MBTSG 1998, Hard 1995, Healey and Prince 1995, Rieman and Allendorf 2001), the conservation needs of the bull trout are to: (1) Maintain and restore multiple, interconnected populations in diverse habitats across the range of each DPS; (2) Preserve the diversity of life-history strategies (e.g., resident and migratory forms, emigration age, spawning frequency, local habitat adaptations); (3) Maintain genetic and phenotypic diversity across the range of each DPS; and, (4) Protect

populations from catastrophic fires across the range of each DPS. Each of these needs is described below in more detail.

Maintain and Restore Multiple, Interconnected Populations in Diverse Habitats Across the Range of Each DPS

Multiple local populations distributed and interconnected throughout a watershed provide a mechanism for spreading risk from stochastic events (Rieman and McIntyre 1993, Hard 1995, Healey and Prince 1995, Spruell *et al.* 1999, Rieman and Allendorf 2001). Current patterns in bull trout distribution and other empirical evidence, when interpreted in view of emerging conservation theory, indicate that further declines and local extinctions are likely (Rieman *et al.* 1997a, Dunham and Rieman 1999, Rieman and Allendorf 2001, Spruell *et al.* 2003). Based in part on guidance from Rieman and McIntyre (1993), bull trout core areas with fewer than five local populations are at increased risk of extirpation; core areas with between 5 to 10 local populations are at intermediate risk of extirpation; and core areas which have more than 10 interconnected local populations are at diminished risk of extirpation.

Maintaining and restoring connectivity between existing populations of bull trout is important for the persistence of the species (Rieman and McIntyre 1993). Migration and occasional spawning between populations increases genetic variability and strengthens population variability (Rieman and McIntyre 1993). Migratory corridors allow individuals access to unoccupied but suitable habitats, foraging areas, and refuges from disturbances (Saunders *et al.* 1991).

Because bull trout in the coterminous United States are distributed over a wide geographic area consisting of various environmental conditions, and because they exhibit considerable genetic differentiation among populations, the occurrence of local adaptation is expected to be extensive. Some readily observable examples of differentiation between populations include external morphology and behavior (e.g., size and coloration of individuals; timing of spawning and migratory forays). Conserving many populations across the range of the species is crucial to adequately protect genetic and phenotypic diversity of bull trout (Leary *et al.* 1993, Rieman and McIntyre 1993, Hard 1995, Healey and Prince 1995, Spruell *et al.* 1999, Taylor *et al.*1999, Rieman and Allendorf 2001). Changes in habitats and prevailing environmental conditions are increasingly likely to result in extinction of bull trout if genetic and phenotypic diversity is lost.

Preserve the Diversity of Life-history Strategies

The bull trout has multiple life history strategies, including migratory forms, throughout its range (Rieman and McIntyre 1993). Migratory forms appear to develop when habitat conditions allow movement between spawning and rearing streams and larger rivers or lakes where foraging opportunities may be enhanced (Frissell 1997). For example, multiple life history forms (e.g., resident and fluvial) and multiple migration patterns have been noted in the Grande Ronde River (Baxter 2002). Parts of this river system

have retained habitat conditions that allow free movement between spawning and rearing areas and the mainstem of the Snake River. Such multiple life history strategies help to maintain the stability and persistence of bull trout populations to environmental changes. Benefits to migratory bull trout include greater growth in the more productive waters of larger streams and lakes, greater fecundity resulting in increased reproductive potential, and dispersing the population across space and time so that spawning streams may be recolonized should local populations suffer a catastrophic loss (Frissell 1997, Rieman and McIntyre 1993, MBTSG 1998).

Maintain the Genetic Diversity and Evolutionary Potential of Bull Trout Populations

When the long-term persistence of a species, taxon, or phylogenetic lineage is considered, it is necessary to consider the amount of genetic variation necessary to uphold evolutionary potential which is needed for that taxon to adapt to a changing environment. Effective population size provides a standardized measure of the amount of genetic variation that is likely to be transmitted between generations within a population. Effective population size is a theoretical concept that allows one to predict potential future losses of genetic variation within a population due to small population size and genetic drift. Individuals within populations with very small effective population sizes are also subject to inbreeding depression because most individuals within small populations share one or more immediate ancestors (parents, grandparents, etc.) after only a few generations and will be closely related.

The effective population size parameter (N_e) incorporates relevant demographic information that determines the evolutionary consequences of members in a population contributing to future generations (Wright 1931). When prioritizing populations for conservation, N_e is an important parameter because it is inversely related to the rate of loss of genetic diversity and the rate of increase in inbreeding in a population that is finite, but otherwise randomly mating (Waples 2002). Within a population, the census number of sexually mature adults per generation (N) and N_e are the same when the following conditions are met: constant and large population size, variance in reproductive success is binomial (number of progeny per parent follows a Poisson distribution), and sex ratio is equal. Because most populations do not conform to these conditions, the N_e to N ratio is usually below 1.0 (Frankham 1995), and the N_e to N ratio is thought to be between 0.15 and 0.27 in bull trout populations based on computer modeling (Rieman and Allendorf 2001).

A N_e of 50 or more is recommended to avoid the immediate effects of inbreeding and should be considered a minimum requirement for the short-term conservation of populations (Franklin 1980, Soulé 1987). Increased homozygosity of deleterious recessive alleles is thought to be the main mechanism by which inbreeding depression decreases the fitness of individuals within local populations (Allendorf and Ryman 2002). Deleterious recessive alleles are introduced into the genome via random mutations, and natural selection is slow to purge them because they are usually found in the heterozygous form where they are not detrimental. When populations become small, heterozygosity decreases at the rate of $1/(2\ N_e)$ per generation which in turn causes an

increase in the frequency of homozygosity of the deleterious recessive alleles. Hedrick and Kalinowski (2000) provide a review of studies demonstrating inbreeding depression in wild populations.

Effective population sizes of 500 to 5000 have been recommended for the retention of evolutionary potential (Franklin and Frankham 1998, Lynch and Lande 1998). Populations of this size are able to retain additive genetic variation for fitness related traits gained via mutation (Franklin 1980).

Bull trout specific benchmarks have been developed concerning the minimum N_e necessary to maintain genetic variation important for short-term fitness and long-term evolutionary potential. These benchmarks are based on the results of a generalized, age-structured, simulation model, VORTEX (Miller and Lacy 1999), used to relate effective population size to the number of adult bull trout spawning annually under a range of life histories and environmental conditions (Rieman and Allendorf 2001). In this study, the authors estimated N_e for bull trout to be between 0.5 and 1.0 times the mean number of adults spawning annually. Rieman and Allendorf (2001) concluded that an average of 100 (i.e., 100 x 0.5 = 50) adults spawning each year would be required to minimize risks of inbreeding in a population and 1000 adults (i.e., 1000 x 0.5 = 500) is necessary to maintain genetic variation important for long-term evolutionary potential. This latter value of 1000 spawners may also be reached with a collection of local populations among which gene flow occurs.

The combination of resident forms completing their entire life cycle within a stream and the homing behavior of the migratory forms returning to the streams where they hatched to spawn promotes reproductive isolation among local bull trout populations. This reproductive isolation creates the opportunity for genetic differentiation and local adaptations to occur. Nevertheless, within a core area local populations are usually connected through low rates of migration. This connection of local populations, linked by migration, is termed a metapopulation (Hanski and Gilpin 1997). Within a metapopulation, evolution primarily occurs at the local population level (i.e., it is the main demographic and genetic unit of concern). However, when longer time frames are considered (e.g., 10 plus generations), metapopulations become important. For example, metapopulations allow for the reintroduction of lost alleles and recolonization of extinct local breeding populations. Migration and gene flow among local populations ensures that the alleles within a metapopulation will be present in most local breeding populations and can be acted upon by natural selection (Allendorf 1983).

Maintain Phenotypic Diversity

Healy and Prince (1995) reported that, because phenotypic diversity is a consequence of the genotype interacting with the habitat, the conservation of phenotypic diversity is achieved through conservation of the sub-population within its habitat. They further note that adaptive variation among salmonids has been observed to occur under relatively short time frames (e.g., changes in genetic composition of salmonids raised in hatcheries; rapid emergence of divergent phenotypes for salmonids introduced to new

environments). Healy and Prince (1995) conclude that while the loss of a few sub-populations within an ecosystem might have only a small effect on overall genetic diversity, the effect on phenotypic diversity and, potentially, overall population viability could be substantial. This concept of preserving variation in phenotypic traits that is determined by both genetic and environmental (i.e., local habitat) factors has also been identified by Hard (1995) as an important component in maintaining intraspecific adaptability (i.e., phenotypic plasticity) and ecological diversity within a genotype. He argues that adaptive processes are not entirely encompassed by the interpretation of molecular genetic data; in other words, phenotypic and genetic variation in adaptive traits may exist without detectable variation at the molecular genetic level, particularly for neutral genetic markers. Therefore, the effective conservation of genetic diversity necessarily involves consideration of the conservation of biological units smaller than taxonomic species (or DPSs). Reflecting this theme, the maintenance of local sub-populations has been specifically emphasized as a mechanism for the conservation of bull trout (Rieman and McIntyre 1993, Taylor *et al* 1999).

Protect Bull Trout from Catastrophic Fires

The bull trout evolved under historic fire regimes in which disturbance to streams from forest fires resulted in a mosaic of diverse habitats. However, forest management and fire suppression over the past century have increased homogeneity of terrestrial and aquatic habitats, increasing the likelihood of large, intense forest fires in some areas. Because the most severe effects of fire on native fish populations can be expected where populations have become fragmented by human activities or natural events, an effective strategy to ensure persistence of native fishes against the effects of large fires may be to restore aquatic habitat structure and life history complexity of populations in areas susceptible to large fires (Gresswell 1999).

Rieman and Clayton (1997) discussed relations among the effects of fire and timber harvest, aquatic habitats, and sensitive species. They noted that spatial diversity and complexity of aquatic habitats strongly influence the effects of large disturbances on salmonids. For example, Rieman *et al.* (1997b) studied bull trout and redband trout responses to large, intense fires that burned three watersheds in the Boise National Forest in Idaho. Although the fires were the most intense on record, there was a mix of severely burned to unburned areas left after the fires. Fish were apparently eliminated in some stream reaches, whereas others contained relatively high densities of fish. Within a few years after the fires and after areas within the watersheds experienced debris flows, fish had become reestablished in many reaches, and densities increased. In some instances, fish densities were higher than those present before the fires or in streams that were not burned (Rieman *et al.* 1997b). These responses were attributed to spatial habitat diversity that supplied refuge areas for fish during the fires, and the ability of bull trout and the redband trout to move among stream reaches. For bull trout, the presence of migratory fish within the system was also important (Rieman and Clayton 1997, Rieman *et al.*1997b).

In terms of conserving bull trout, the appropriate strategy to reduce the risk of fires on bull trout habitat is to emphasize the restoration of watershed processes that create and maintain habitat diversity, provide bull trout access to habitats, and protect or restore migratory life-history forms of bull trout. Both passive (e.g., encouraging natural riparian vegetation and floodplain processes to function appropriately) and active (e.g., reducing road density, removing barriers to fish movement, and improving habitat complexity) actions offer the best approaches to protect bull trout from the effects of large fires.

2.2. Proposed Bull Trout Critical Habitat

The proposed critical habitat designation includes approximately 8,958 miles of streams and
205,639 acres of lakes and reservoirs in the State of Idaho; 3,319 miles of streams and 217,577 acres of lakes and reservoirs in the State of Montana; 3,687 miles of streams and 78,609 acres of lakes and reservoirs in the State of Oregon; and 2,507 miles and 30,896 acres of lakes and reservoirs in the State of Washington. Only the waterways are included in the proposed designations; adjacent lands are not included.

The proposed critical habitat designations account for approximately 3.1 percent of the stream miles in Oregon, 8.4 percent of the stream miles in Idaho, 2.5 percent of the stream miles in Washington and 10.2 percent of the stream miles in western Montana. In addition to these stream miles, the proposal also includes 537.4 miles of the main stem Columbia River (73.5 percent of the total U.S. miles) and 343.1 miles of the Snake River (41.3 percent of the total). Across the four states included in the current proposal, the adjacent land ownership is 58 percent Federal, 36 percent private, 4 percent State and local, and 2 percent Tribal.

As required by the Act and regulations at 50 CFR 424.12, the Service used the best scientific data available to determine critical habitat, giving consideration to those physical and biological features that are essential to the conservation of the bull trout. As described at 50 CFR 424.12(b), such requirements include, but are not limited to, the following: (1) Space for individual and population growth and for normal behavior; (2) Food, water, or other nutritional or physiological requirements; (3) Cover or shelter; (4) Sites for breeding, reproduction, rearing of offspring; and generally; (5) Habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species.

All areas proposed as critical habitat for bull trout are within the historic geographic range of the species and contain one or more of these physical or biological features essential to the conservation of the species. The regulations also require that we include a list of known primary constituent elements with the critical habitat description. As described in the regulations, the primary constituent elements (PCE) may include, but are not limited to, features such as spawning sites, feeding sites, and water quality or quantity. The PCE's are briefly described in Table 1 (see the Federal Register, Vol. 67, No. 230, p. 71243 for a more detailed discussion).

Table 1. Brief description of Primary Constituent Elements (PCEs) for proposed bull trout critical habitat.

PCE #	PCE Description
1	Permanent water having low levels of contaminants
2	Water temperatures ranging from 2 to 15 degrees C
3	Complex stream channels with features such as woody debris, side channels, pools *etc.*
4	Substrate of sufficient amount, size, and composition
5	Natural hydrograph, including peak, high, low and base flows within historic ranges
6	Springs, seeps, groundwater sources, and subsurface water connectivity
7	Migratory corridors with minimal physical, biological, or chemical barriers
8	Abundant food base
9	Few or no predatory, interbreeding, or competitive nonnative species present

3. Environmental Baseline

The environmental baseline includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

The action area, as defined in the "Description of the Proposed Action" section above, includes a portion of the proposed Upper Columbia Critical Habitat Unit and a portion of the proposed Mainstem Columbia River Critical Habitat Unit (see Federal Register, Vol. 67, No. 230, p. 71243). The action area also encompasses a portion of the Upper Columbia River Columbia Recovery Unit (Recovery Unit) of the 2002 draft *Bull Trout Recovery Plan* (USFWS 2002). Within this Recovery Unit there are three "core areas" (Wenatchee, Entiat, and Methow) with 16 known populations supporting migratory bull trout, plus several resident populations. This core area may function as a meta-population, but further research is necessary. Under the assumption that this Recovery Unit represents the closest approximation to a biologically functioning meta-population for this species, the following discussion characterizes the environmental baseline of bull trout.

Unless otherwise noted, the following environmental baseline information is excerpted from the 2002 draft *Bull Trout Recovery Plan* (USFWS 2002).

3.1. Geographic Description

Wenatchee Core Area. The Wenatchee basin encompasses approximately 3,551 square kilometers (1,371 square miles) in central Washington (NPPC 2001a; USFS 1999a;

1999b; WSCC 2001). The watershed heads at the Cascade crest and flows east towards the Columbia Plateau. The Wenatchee River drains into the Columbia River at the town of Wenatchee. Major tributaries are the White and Little Wenatchee Rivers, which drain into Lake Wenatchee (source of the Wenatchee River), Chiwawa River, and Nason Creek. Additional tributaries to the Wenatchee River include Icicle Creek, Peshastin Creek, and Mission Creek.

Higher elevations within the Wenatchee River basin are characterized by heavy precipitation with accumulations close to 385 centimeters (150 inches) annually (WSCC 2001). Lower portions of the basin receive less than 22 centimeters (8.5 inches) of precipitation annually. Average monthly discharge in the basin varies from a low of 24 cubic meters per second (836 cubic feet per second) in September to 258 cubic meters per second (9,043 cubic feet per second) in June (Parametrix, Inc. 2000). Mean annual discharge is approximately 96 cubic meters per second (3,390 cubic feet per second).

Entiat Core Area. The Entiat River drains an area of approximately 1,085 square kilometers (419 square miles) (NPPC 2001b; WSCC 1999). The headwaters of the Entiat River are in glaciated basins near the Cascade Crest. Flowing southeasterly the Entiat River enters the Columbia River near the town of Entiat, approximately 32 kilometers (20 miles) upstream from Wenatchee. Approximately 90,720 hectares (224,000 acres) of the 108,540- hectare (268,000 acre) drainage area are in public ownership, primarily U.S. Forest Service lands, with lesser amounts of land administered by the Bureau of Land Management and Washington Department of Fish and Wildlife (USFS 1996a). Agriculture is an important land use in the lower portion of the valley that includes 527 hectares (1,300 acres) of orchards. About one-half of the Entiat River flows through the Wenatchee National Forest. The two major tributaries are the North Fork Entiat River and the Mad River.
Precipitation ranges from about 25.4 centimeters (10 inches) at the mouth of the Columbia River to 228 centimeters (90 inches) in the headwaters (WSCC 1999). Summer thunderstorms can produce flash floods in narrow tributary channels. The steep topography, pinnate drainage pattern, relatively low drainage density and short drainage length is conducive to rapid mainstem flow response time and can result in a "flashy" flow regime. Mean annual peak flow is approximately 99 cubic meters per second (3,500 cubic feet per second) and mean annual base flow is around 2.3 cubic meters per second (80 cubic feet per second).

Methow Core Area. The Methow Core Area drains an area of approximately 4,895 square kilometers (1,890 square miles) (NPPC 2001c). The Middle Methow watershed contains approximately 86,670 hectares (214,000 acres), of which about 52,893 hectares (130,600 acres) are U.S. Forest Service lands, 33,615 hectares (83,000 acres) are privately owned, and the remaining 162 hectares (400 acres) are managed by the Washington State Department of Wildlife. The watershed drains in a northwest to southeast direction and major tributaries include Early Winters Creek, Twisp River, Chewuch River, and the Lost River.

Over 60 percent of the annual precipitation within the Methow River basin occurs between October and March (NPPC 2001c; Parametrix, Inc. 2000). Precipitation is primarily in the form of snow with summer thunderstorms contributing minor amounts. The upper reaches of the basin along the Cascade Crest receive as much as 203.2 centimeters (80 inches) of precipitation annually. The amount of precipitation drops with elevation, with only about 25.4 centimeters (10 inches) occurring in the lower elevations each year. Average monthly flows within the lower Methow River range from 12 cubic meters per second (424 cubic feet per second) in January and February, to 170 cubic meters per second (5,963 cubic feet per second) in June (Parametrix, Inc. 2000).

3.2 Current Distribution and Abundance of Bull Trout within the Action Area

The Lake Chelan basin is historic bull trout habitat, but their presence has not been documented since the late 1950's, and they may have been extirpated from the basin (WDFW 1992; WDG 1984). Complete surveys in remote tributary reaches of the Lake Chelan basin have not been conducted, however, and further investigation is needed. Bull trout are known to occur in the Okanogan River in British Columbia (McPhail and Carveth 1992). While there are anecdotal reports on bull trout occurrence in the Okanogan River (United States portion), the current distribution within the Okanogan basin is unknown (Wells, N. pers. comm., 2000). The Upper Columbia Recovery Unit Team recommends that expanded surveys be conducted in each basin to verify status and distribution.

Based on survey data and professional judgment, the Upper Columbia Recovery Unit Team identified three core areas (Wenatchee, Entiat, and Methow Rivers) within the recovery unit. Genetic information for distinguishing local populations was lacking for the Upper Columbia Recovery Unit. Tributaries that comprise migratory local populations were grouped based on professional judgment and geographic proximity. Future genetic studies may revise the current classification. Currently there are six local populations in the Wenatchee Core Area, two in the Entiat Core Area, and eight in the Methow Core Area.

Wenatchee Core Area. The Upper Columbia Recovery Unit Team has identified six migratory local populations within the Wenatchee River including the Chiwawa River (including Chikamin, Phelps, Rock, Alpine, Buck and James Creeks), White River (including Canyon and Panther creeks), Little Wenatchee River (below the falls), Nason Creek (including Mill Creek), Chiwaukum Creek, and Peshastin Creek (including Ingalls Creek). Recent information indicates that Icicle Creek is a seventh migratory population (De La Vergne, pers. comm., 2002). Adfluvial, fluvial, and resident forms of bull trout currently exist in the Wenatchee River Core Area (WDFW 1998). The majority of the spawning and fry rearing habitat are within U.S. Forest Service lands, including the Glacier Peak and Alpine Lake Wilderness areas.

Chiwawa River

The Chiwawa River local population complex is the strong-hold for bull trout in the upper Wenatchee (WDFW 1998). Spawning has been documented in Rock Creek, Chikamin Creek, and Phelps Creek. Spawning has also been documented in the mainstem Chiwawa River and in Buck Creek (J. DeLaVergne, U.S. Fish and Wildlife Service, pers. comm., 2001). A minor amount of spawning has been documented in Alpine and James Creeks (WDFW 1992). Spawning surveys have been conducted by the U.S. Forest Service in cooperation with Washington Department of Fish and Wildlife and the U.S. Fish and Wildlife Service in Rock, Chikamin, and Phelps Creeks since 1989. A change in fishing regulations in 1992 has apparently helped stabilize the Chiwawa local population of bull trout. Rock Creek represents the strongest population in the basin, and since 1995, annual surveys have documented between 151 and 355
redds. Habitat in Phelps Creek is in good condition and bull trout surveys have documented between 22 and 33 redds since 1995. While both Rock and Phelps Creeks contain similar high quality habitat features, production in Phelps Creek is limited by an impassable barrier falls located approximately 1 mile upstream from the confluence with the Chiwawa River (K. MacDonald, U.S. Forest Service, pers. comm., 2001).

Juvenile bull trout and redds have been observed in the upper reaches of the Chiwawa River (Hillman and Miller 1993, 1994, 1995). The majority of the juveniles have been found between Rock Creek and the old mining site at Trinity, which corresponds with where spawning has been observed in the mainstem. Adult bull trout 46 to 61 centimeters (18 to 24 inches) in length have been found throughout the river. While these are definitely migratory fish, whether they are fluvial (from the mainstem Chiwawa River, Wenatchee River, or possibly the Columbia River), or adfluvial fish from Lake Wenatchee, or a combination is not known. Smaller, possibly resident bull trout have also been observed during the surveys.

White River

The White River local population is a major tributary to Lake Wenatchee and is an important spawning stream for sockeye salmon (*O. nerka*), spring chinook salmon (*O. tshawytcha*), steelhead, and bull trout (WDFW 1998). Bull trout have access to the system up to an impassable barrier at White River Falls. Recently, bull trout spawning in the mainstem White River has been documented at least down to the Napeequa River (WDFW 1992; MacDonald, pers. comm. 2001). Bull trout have been observed in the smaller tributaries of Canyon and Sears creeks.

Canyon Creek is a very flashy system moving large amounts of bedload, which may make it marginally suitable. Presently the mouth of Canyon Creek flows subsurface in late summer and fall due to deposition of coarse substrate at the mouth.

The Napeequa River is a major tributary to the White River and approximately 2 miles of this glacier-fed stream is potentially available before a potential barrier falls. In 1999, 5 to10 large migratory bull trout were observed in the Napeequa River (DeLaVergne, pers.

comm., 2001). Whether or not these bull trout spawned in the Napeequa River is unknown. Rough terrain and glacial flour limit the ability to effectively conduct spawning ground surveys in this tributary.

Panther Creek is a known spawning stream for bull trout and consistent redd surveys have been conducted since 1989. Bull trout spawn in the lower reach, approximately 1 mile before a barrier falls. While spawning counts ave fluctuated, Panther Creek represents an important spawning tributary in the White River system (USFWS 1999a; MacDonald, pers. comm., 2001).

Little Wenatchee River

The Little Wenatchee River local population is the other major tributary to Lake Wenatchee. Like the White River, the Little Wenatchee is used by sockeye salmon, spring chinook salmon, and steelhead. In the past, redd surveys for bull trout have been very difficult due to the combination of spring chinook redds and sockeye redds. Migratory bull trout have access to the Little Wenatchee up to Little Wenatchee Falls at river kilometer 11 (river mile 6.8). A few redds were identified during recent surveys in the mainstem Little Wenatchee and further survey work is needed. There are anecdotal accounts of migratory spawners below the falls but no adults have been observed recently. Resident bull and brook trout (*S. fontinalis*) have been observed below the falls and some hybridization may have occurred (WDFW 1992; Hillman and Miller 1995). Limited snorkel survey data indicates that resident bull trout may exist above the falls in Rainy Creek (MacDonald, pers. comm., 2001). More intensive survey work is needed above the falls in order to characterize the status and distribution of bull trout.

Nason Creek

Nason Creek originates at Steven's Pass and flows into the Wenatchee River just below the outlet of Lake Wenatchee. Limited redd surveys indicated that spawning for this local population of bull trout occurs in Nason Creek and Mill Creek. Large migratory fish have been observed in lower Nason Creek. Nason Creek is sparsely populated by adult and juvenile bull trout throughout but fish are primarily found in the upstream reaches (WDFW 1992; USFS 1996c). Resident bull trout exist in Mill Creek up to a barrier falls about a mile from the confluence with Nason Creek. Bull trout redd counts are low in Mill and Nason Creeks and both resident and migratory bull trout are believed to spawn in the system (USFWS 1999a). Bull trout redds were identified during spot surveys near the Whitepine campground in 2000, by the U.S. Fish and Wildlife Service, and adult bull trout were observed in the vicinity of Nason Creek campground
(De La Vergne, pers. comm., 2001).

Chiwaukum Creek

Chiwaukum Creek joins the Wenatchee River at the head of Tumwater Canyon. There is a potential barrier falls approximately 4 miles upstream from the mouth. Brown (1992) reports anecdotal accounts of a localized fishery for adult bull trout in the late summer

and fall. There have been no recent intense surveys of potential bull trout habitat in Chiwaukum Creek. Two approximately 25 to 30 centimeter (10 to 12 inch) bull trout were identified during U.S. Forest Service snorkel surveys in 1997 (MacDonald, pers. comm., 2001). A subsequent foot survey was conducted for approximately 1 mile upstream, but no redds were observed. In 2001, intensive snorkel surveys were conducted and 27 juvenile, 12 migratory-size fish, and 29 redds were observed (USFWS, *in litt.* 2002). The status and distribution of bull trout in Chiwaukum Creek is unknown and expanded surveys are needed.

Peshastin Creek

Peshastin Creek serves as a bull trout migrational corridor to Ingalls Creek. Ingalls Creek is the only tributary within the Peshastin Creek watershed known to support bull trout. Brown (1992) indicated that in the 1950's, Peshastin Creek had a large run of bull trout in the late summer. Bull trout migration into Ingalls Creek was documented through angler interviews. Bull trout were still present during surveys by the Service in Ingalls Creek (USFWS 1997). However, bull trout were not found during the same surveys in Peshastin Creek (USFWS 1997). More recently, three bull trout were observed in lower Peshastin Creek, and one radio-tagged bull trout was located in Peshastin Creek during the winter of 2001-2002 (USFWS *in litt.* 1998a; Kreiter 2002).

Icicle Creek

Large migratory fish have been observed in Icicle Creek below the dam at Leavenworth National Fish Hatchery, however, it is unclear whether successful spawning has occurred (WDFW 1992; USFWS 1999b). Resident bull trout are known to occur upstream of the dam in low densities (USFWS 1997). Bull trout have also been observed in French Creek (USFWS 1999c). The status and distribution of these resident bull trout is unknown.

Snorkel surveys conducted below the spillway dam at the hatchery resulted in documentation of 8 bull trout in 1996; 6 in 1997; 40 in 1998; 7 in 1999; and 40 in 2000 (USFWS 2002). Four dead bull trout were removed from the hatchery's water diversion at river mile 4.5 (B. Kelly-Ringel, U.S. Fish and Wildlife, pers. comm., 2001). Bull trout radio-tagged in the spillway pool have been documented moving downstream past Dryden Dam. One bull trout radio-tagged in the Columbia River moved into Icicle Creek in 2001. Use of Icicle Creek by migratory bull trout, and the status and interaction with the upstream resident component, is considered a research need.

Resident bull trout occur in Icicle Creek above the barrier falls, and migratory bull trout are known to frequent the area below the falls, most likely while foraging. Until 2002, when several migratory-size fish were observed above it, it was unclear whether migratory bull trout could pass the falls (De La Vergne, pers. comm., 2002). The distribution and status of resident bull trout in Icicle Creek is unknown and the role of Icicle Creek in bull trout recovery is considered a research need.

Entiat Core Area. Currently two local populations of bull trout are found in the Entiat Core Area (mainstem Entiat River, and Mad River). The two local populations are thought to be isolated from each other due to a natural thermal barrier (USFS 1996a). Bull trout in the Entiat River are believed to be primarily fluvial. The Washington Department of Fish and Wildlife has classified the status of bull trout in the mainstem Entiat River as "Unknown," while bull trout in the Mad River have been classified as "Healthy," based on the trends in available abundance data (WDFW 1998). However, the U.S. Forest Service expressed concern for the long-term persistence of bull trout in the Entiat Core Area due to the low number of spawning fish, restricted spawning distribution, and limited opportunities for refounding (USFS 1996a).

Mainstem Entiat

Bull trout have been found in small numbers throughout the mainstem Entiat River up to Entiat Falls (WDFW 1992). Bull trout in the mainstem Entiat are considered to be fluvial, rearing there, or possibly the Columbia River. A very small amount of spawning has been observed below the falls, but no spawning aggregations have been found (USFS 1996a). Habitat may be a potentially limiting factor for bull trout in tributaries to the Entiat (USFS 1996a). The tributaries are either low in the drainage where thermal regimes are not believed to be suitable for bull trout, or the streams are blocked by natural falls. Incomplete spawning ground surveys have been conducted in the Entiat since 1995. These surveys indicate that the local population abundance is very low. Additional tributary surveys are needed to identify potential spawning areas.

Mad River

The majority of the known bull trout spawning and rearing in the Entiat River occurs in its 40 kilometer (25 mile) tributary, the Mad River (WDFW 1998). The Mad River flows into the mainstem Entiat at the town of Ardenvoir. Most bull trout spawning occurs over a 12.4 kilometer (7.7 mile) reach between Young Creek and Jimmy Creek (USFS 1996a). A barrier falls upstream of Jimmy Creek prevents further access. Bull trout spawning surveys have been conducted
annually on the Young Creek to Jimmy Creek index reach since 1989. Redd counts have varied from a high of 45 in 2000, to a low of 10 in 1993. Bull trout in the Mad River may be a combination of fluvial and resident fish (WDFW 1992). Bull trout may also spawn in Tillicum Creek (a tributary to the lower Mad River) (WDFW 1998). Additional survey information is needed to characterize the current use and potential importance of Tillicum Creek within the Mad River.

Methow Core Area. Bull trout are known to occur in Gold Creek, Twisp River, Chewuch River, Wolf Creek, Early Winters Creek, Upper Methow River, Lost River, and Goat Creek. The Washington Department of Fish and Wildlife classifies the status of bull trout in the Lost River as "Healthy," but the remaining bull trout in the Methow River are classified as "Unknown" (WDFW 1998). Within the Methow River, adfluvial, fluvial and resident life history forms are present. The resident form is usually found in portions above passage barriers and the distribution and abundance of the resident form is a

research need. Sporadic and incomplete redd surveys have been conducted in selected areas of the Methow River basin since 1992.

Gold Creek

The lower Methow River (below the town of Carlton) is an important spawning area for summer chinook and steelhead as well as for bull trout (WSCC 2000). Bull trout most likely use the lower Methow River as a migratory corridor, moving in and out of the Columbia River (DeLaVergne, pers. comm., 2001). Crater Creek, a tributary to Gold Creek, has the only documented fluvial spawning population within the Gold Creek watershed (USFS 1996b). During a 1998 spawning survey, a 15 centimeter (6 inch) dead bull trout was found in Gold Creek (DeLaVergne, pers.comm., 2001). A radio-tagged bull trout was tracked into Libby Creek in 2001, but limited snorkel surveys by the U.S. Forest Service did not result in any bull trout. Additional survey work in the lower Methow River is needed to accurately understand current and potential bull trout distribution.

Beaver Creek

Bull trout in the South Fork Beaver Creek and Eightmile Creek in the Methow system may have been extirpated due to brook trout introgression (WDFW 1998, USFS 1993). However, there may be a few bull trout remaining in Bluebuck Creek and the mainstem of Beaver Creek (USFS *in litt.* 1992, USFS 1993, Proebstel *et al.* 1998).

Twisp River

Bull trout in the Twisp River local population are comprised of migratory and resident forms in mainstem Twisp River, Buttermilk Creek, Bridge Creek, Reynolds Creek, and North Creek. Redd count surveys for migratory adults have been conducted in the mainstem Twisp River since 1992. While older surveys are incomplete, more recent sampling indicates that the mainstem is an important spawning area. Bull trout are known to spawn and rear in the upper reaches of the Twisp River (USFS 1995a). The Twisp River is also an important spring chinook spawning and steelhead spawning and rearing stream. There is considerable spatial and temporal overlap of bull trout, salmon, and steelhead spawning areas in the Twisp River, and consequently some observational error may occur.

Buttermilk Creek may be an important spawning and rearing stream for bull trout. Bull trout are found throughout the mainstem to at least river kilometer 8 (river mile 5). Bull trout also inhabit the first 11 kilometers (6.8 miles) of the East Fork and 7.9 kilometers (4.9 miles) of the West Fork (DeLaVergne, pers. comm., 2001). Both fluvial and resident bull trout have been located in the Buttermilk Creek drainage (WDFW 1998). Four redds were found during surveys on the West Fork in 1995 (DeLaVergne, pers. comm., 2001). Additional survey information is needed to delineate bull trout distribution within Buttermilk Creek.

Reynolds Creek is used by both resident and fluvial fish, with the distribution of fluvial fish limited below a barrier falls at river kilometer 1.1 (river mile 0.7) (WDFW 1998). Spawning occurs between the falls and U.S. Forest Service Road number 4430, with a single redd observed in 1990 and 1992 (DeLaVergne, pers. comm., 2001; WDFW 1998). Resident-sized bull trout have also been located in North Creek, but their distribution and status is unknown (WDFW 1998).

Wolf Creek

The Wolf Creek local population is an important spawning and rearing stream for migratory bull trout. Distribution within the watershed extends up to approximately river kilometer 18 (river mile 11 mile) where a natural rock and log barrier blocks upstream passage. Only westslope cutthroat (*O. clarki lewisi*) have been found above the rock barrier (USFS 1995b). Redd counts have been conducted in the mainstem since 1996 and the population appears to be highly variable. From 1999 to 2001, adfluvial sized bull trout were seen at the base of these falls and within the surveyed spawning reach (DeLaVergne, pers. comm., 2001). Resident bull trout have also been located in Wolf Creek (WDFW 1998).

Chewuck River

The Chewuck River local population currently consists of bull trout in Lake Creek. Bull trout in Lake Creek (Upper Chewuck River) are thought to be an adfluvial population inhabiting Black Lake (DeLaVergne, pers. comm., 2001). Redd surveys conducted since 1995 are low and highly variable. Above Black Lake, bull trout have been observed in Lake Creek up to Three Prong Creek (USFS 1995c). Additional surveys are needed to determine distribution upstream of Three Prong Creek. Bull trout have also been observed in Black Lake during a survey conducted by the U.S. Forest Service (USFS 1994). A few bull trout (possibly of fluvial origin) have been caught in the lower and middle reaches of the Chewuck River, and occasionally show up in the Methow Salmon Hatchery fish trap (WDFW 1998; DeLaVergne, pers. comm., 2001). In 2001, bull trout redds were seen in the Chewuch River near Thirty Mile Creek (De La Vergne, pers. comm., 2002). Historically, Eightmile and Boulder Creeks may have supported bull trout (USFS 1994).

Upper Methow River

The Upper Methow River local population includes the West Fork of the Methow River, Trout Creek, Robinson Creek, and Rattlesnake Creek. There are resident and fluvial life-history forms present in the Upper Methow River local population. Redd surveys in the West Fork Methow have been conducted since 1995. The redd counts are highly variable ranging from 1 redd in 1999 to 27 redds in 1995. Surveys have been inconsistent and the available information indicates that the West Fork Methow is not in a secure condition (USFS 1998a). A few bull trout have been observed spawning in the lower portions of Trout Creek (WDFW 1998). While bull trout

have not been documented in Robinson or Rattlesnake Creeks, the lower portions of these systems are accessible to bull trout and may provide additional spawning habitat (DeLaVergne, pers. comm., 2001).

Goat Creek

Little survey work has been conducted in the Goat Creek local population, however, 11 migratory bull trout redds were found during surveys in 2000, and this may be an important spawning area (DeLaVergne, pers. comm., 2001). The watershed contains both resident and fluvial fish, but the status of each life-history form is unknown (USFS 1995d). The resident bull trout component was determined through size at maturity of females (WDFW 1998).

Early Winters Creek

Bull trout in the Early Winters Creek local population apparently continue to exist in very low numbers. The Early Winters Creek local population includes the mainstem, Cedar Creek, and Huckleberry Creek. Incomplete redd surveys in the mainstem have been conducted since 1995, with a high redd count of nine occurring in the same year. Redd surveys are conducted from Klipchuck Campground up to the falls at river kilometer 13 (river mile 8.0) near the crossing of Highway 20. The falls are thought to be a barrier to chinook salmon and steelhead. Migratory-sized bull trout were found above the falls during recent electrofishing surveys by the U.S. Fish and Wildlife Service (DeLaVergne, pers. comm., 2001). Resident bull trout are known to be above these falls and are thought to spawn in the upper reaches (WDFW 1998). Cedar and Huckleberry creeks are tributaries to Early Winters in the lower reaches of stream. Two and one bull trout redds were found during incomplete redd surveys in Cedar Creek during 1996 and 1997, respectively (USFS 1998a). In 1988, the Washington Department of Fish and Wildlife estimated the population to be 4 fish per 100 square meters (WDFW 1998). The location of spawning is thought to occur below a falls on Cedar Creek at about river kilometer 4 (river mile 2.4) (WDFW 1998). While bull trout have access to Huckleberry Creek, it is unknown if bull trout use this area for spawning, and additional survey information is needed.

Lost River

The Lost River local population may be represented by resident, fluvial, and adfluvial forms (USFS 1999c). In 1993, the Washington Department of Fish and Wildlife estimated the bull trout population size in the Lost River to be 1,092 fish (WDFW 1998). This estimate did not distinguish between resident and migratory life-history forms and was based on a catch per unit effort of 210 fish per mile. Timing and distribution of bull trout migration in the Lost River is unknown. Many holding areas in the upper Lost River and near the outlet of Cougar Lake were identified during snorkel surveys conducted by the Service and U.S. Forest Service (DeLaVergne, pers. comm., 2001). Other information indicates that the current population of bull trout in the Lost River is most likely greater than 500 adults (DeLaVergne, pers. comm., 2001). This number includes the populations

in Cougar Lake, First Hidden Lake, and Middle Hidden Lake, as well as fish downstream of the gorge. Migratory bull trout redd surveys in the Lost River are incomplete and surveys are complicated due to the inaccessibility of stream reaches and rough terrain.

Intermittent connectivity exists between headwater lakes during spring runoff and early summer. Downstream connectivity is also intermittent between the lakes and the mainstem Lost River. The Lost River periodically goes subsurface near the downstream end of the gorge above Monument Creek. Currently in the Lost River, spawning seems to be occurring upstream of the gorge and in Monument Creek (WDFW 1998; DeLaVergne, pers. comm., 2001).

Mainstem Columbia River. In 2001, Chelan PUD began a radio telemetry study of 39 bull trout captured at Rock Island, Rocky Reach, and Wells Dams (Kreiter 2001). Fish were released upstream and downstream at each facility. All bull trout released downstream moved back upstream, and those released upstream continued moving upstream. Tagged bull trout have been located in the Wenatchee River mainstem (4), Icicle Creek (1), Peshastin Creek (1), Chiwawa River (1), Entiat River mainstem (6), Mad River (7), Methow River mainstem (3), and Methow River tributaries Libby Creek (1), Twisp River (10) , and Twisp River tributary Buttermilk Creek (1). Some bull trout were tracked moving up more than one of the mainstem dams. One of the tagged bull trout ventured into the Okanogan River, but left shortly after detection, and immigrated into the Methow River.

In 2002, Chelan PUD tagged 40 additional bull trout. This represents about 20% of the total bull trout that are detected annually at the three dams in the area. Movement patterns were similar to 2001, with some fish migrating to each of the three main tributaries, mostly by the end of June (Chelan PUD 2003a). In 2002, one bull trout was detected near the I-90 highway bridge near Vantage, Washington (DeLaVergne, pers. comm., 2002).

In 2003, Chelan PUD did not tag more bull trout but did continue to monitor the fish tagged in 2002. Most of these moved into one of the three main tributaries in June as in previous years. Several fish passed below Wanapum Dam and one passed downstream of Priest Rapids Dam (Chelan PUD 2003b). Most bull trout in the Wenatchee and Entiat Rivers returned to the Columbia beginning in October, but none of the fish that entered the Methow were detected leaving that river. The only particular Columbia River location that appeared to attract bull trout was the hatchery outfall at the Wells Hatchery. Numerous aerial overflights detected fish distributed widely along the Columbia River between Wanapum and Chief Joseph Dams (Chelan PUD 2003a).

In 2000, during a Service bull trout radio telemetry study in the Wenatchee River, movements of two bull trout were monitored in the Chiwawa River and Rock Creek during the spawning migration (USFWS 2000a, 2001). After spawning, the tagged fish moved downstream and overwintered most likely in the mainstem Columbia River. In 2001, these bull trout migrated back to the Chiwawa River and Rock Creek. Other fish tagged in the Lake Wenatchee area overwintered in the lake and did not visit the Columbia River during the study period.

2002 and 2003 data from this study indicated a similar pattern of fish using tributaries of Lake Wenatchee to spawn, and spending most of the year in the lake. Other fish may have spawned in Chiwaukum, Chiwawa, Icicle, or Nason Creeks and then overwintered in the lower Wenatchee River and/or the Columbia River. Some of these may also have gone to the Entiat River via the Columbia (De La Vergne, pers. comm. 2003). Further mainstem and tributary studies are needed to elucidate movements and habitat requirements of adult and subadult bull trout in the recovery unit.

3.3. Reasons for the Decline of Bull Trout Populations within the Action Area

Within the Action Area, historic and current land use activities have impacted bull trout habitat and local populations. Some of the historic activities, especially water diversions, hydropower development, forestry, and agriculture within the core areas, may have significantly reduced important fluvial populations. Lasting effects from some, but not all, of these early land and water developments still act to limit bull trout production in core areas. Threats from current activities are also present in all core areas of the Upper Columbia Recovery Unit.

Dams

Mainstem Columbia River dams (Rock Island, Rocky Reach, and Wells) have significantly altered historic habitat conditions within the recovery unit. Dams on the Columbia River can affect salmonids by delaying or impeding migration of adults and by injuring or killing juveniles that pass downstream. In 2000, the Service issued a Biological Opinion on the Effects to Listed Species from Operations of the Federal Columbia River Power System (FCRPS BiOp) (USFWS 2000b). Effects of the Federal Columbia River Power System included: 1) fish passage barriers and entrainment, 2) inundation of fish spawning and rearing habitat, 3) modification of the streamflow and water temperature regime, 4) dewatering of shallow water zones during power operations, 5) reduced productivity in reservoirs, 6) gas supersaturation of waters downstream of dams, 7) loss of native riparian habitats, 8) water level fluctuations interfering with establishment of riparian vegetation along reaches affected by power peaking operations, and 9) establishment of non-native riparian vegetation along affected reaches. Similar effects most likely occur with the operation of Rock Island, Rocky Reach, and Wells Dams within the Upper Columbia Recovery Unit. Recent information indicates that adult bull trout do use the mainstem Columbia River for foraging, overwintering, and as a migrational corridor.

Historically, dams on the major tributaries in the Upper Columbia Recovery Unit probably contributed to the decline in bull trout by blocking migratory corridors, and restricting connectivity to upstream spawning areas and downstream overwintering areas. Large dams for generating power and dams for irrigation water were located on the mainstem Wenatchee, Entiat,

and Methow Rivers (Bryant and Parkhurst 1950). Fish movements were blocked for several years in the late 1800's and early 1900's in each of these major tributaries. Migrations to and from the Columbia River would have been blocked, and long-term effects to life-history patterns are unknown.

Within the Wenatchee River system, Dryden Dam at river kilometer 28.3 (river mile 17.6) was constructed in 1908. Originally designed for power production, the facility is currently used as a water diversion structure to provide water to the Wenatchee Reclamation District Canal and to the Washington Department of Fish and Wildlife for fish rearing. Tumwater Dam at river kilometer 51.5 (river mile 32) was constructed in 1909. Both Dryden and Tumwater dams were reladdered with vertical slot fishways in 1986 and 1987. Two radio-tagged bull trout in the Chiwawa River have been tracked moving downstream past the dams in 2000 and 2001, and returning upstream in 2001(USFWS 2000a; 2001). Data from 2002 and 2003 indicates a similar pattern. Some concern exists regarding the operation of each facility and the possible delaying of bull trout migration.

The Leavenworth National Fish Hatchery has blocked upstream fish passage in Icicle Creek at river kilometer 4.5 (river mile 2.8) since 1941. As part of the Icicle Creek Restoration Project the Service has proposed to improve fish passage through Icicle Creek, and to improve habitat conditions adjacent to the hatchery (USFWS 2002). A natural boulder obstacle exists upstream of the hatchery at river kilometer 8.9 (river mile 5.5). Prior to 2002 it was unknown whether fish could negotiate upstream passage. Several migratory-size bull trout were observed during a snorkel survey above the boulder area on September 15, 2002 (De La Vergne, pers. comm., 2002).

In 2001, the Washington Legislature approved a $250,000 grant to undertake a water storage feasibility study on Lake Wenatchee in the Wenatchee River basin (Partridge, *in litt.*, 2001). The Legislature acted upon recommendations of the State's Water Storage Task Force to study the issue of water storage across the State. If a project is implemented, it would involve construction of a dam on the Wenatchee River downstream of Lake Wenatchee. The project would flood the lower parts of the Little Wenatchee and White Rivers, and possibly Nason Creek, depending on the location of the dam. Project effects to the lake ecosystem, including lake productivity, predator and prey population dynamics, and habitat suitability are unknown. The majority of the bull trout in the Wenatchee basin migrate between Lake Wenatchee and the Chiwawa River for spawning. Juveniles moving into the lake for rearing, and spawning adults, would need to migrate over the dam and up its ladder. Construction of a new dam in important bull trout spawning, rearing, and migratory habitat is a significant concern.

Forest Management Practices

Both direct and indirect impacts from timber harvest have altered habitat conditions in portions of the Upper Columbia Recovery Unit. Impacts from timber harvest management included the removal of large woody debris, reduction in riparian areas, increases in water temperatures, increased erosion, and simplification of stream channels

(Quigley and Arbelbide 1997). Past timber harvest practices include the use of heavy equipment in channels, skidding logs across hillslopes, splash damming to transport logs downstream to mills, and road construction. Today the legacy of these activities still persists where roads, channel changes, and compaction of hill slopes remain. The aquatic assessment portion of the Interior Columbia Basin Ecosystem Management Project provided a detailed analysis of the relationship between road densities and bull trout status and distribution (Quigley and Arbelbide 1997). The assessment found that bull trout are less likely to use streams for spawning and rearing in highly roaded areas, and were typically absent at mean road densities above 1.1 kilometer per square kilometer (1.7 miles per square mile). Road construction and maintenance can affect bull trout habitat when sedimentation, channel connectivity, high erosion and slope hazards, culvert sizes, and access are not addressed concurrently with land management proposals. Roads can promote simplification and channelization, which reduce the connectivity of surface and ground waters.

Wenatchee Core Area. In the Wenatchee River, natural channel complexity and riparian conditions have been altered over time by past timber related activities (WSCC 2001). These activities have resulted in reduced riparian and wetland connectivity, reduced high flow refuge habitat, reduced sinuosity and side channel development, increased bank erosion, reduced large woody debris, and reduced pool frequency. Road construction associated with timber harvest adjacent to streams or rivers has resulted in the straightening of stream channels, alteration of stream gradients, decreased gradients, and an overall change in habitat type (USFS 1999a).

High road densities within certain portions of U.S. Forest Service lands in the Wenatchee River basin may contribute to habitat degradation (USFS *in litt.* 2002). Areas of special concern, where road densities need to be reduced, include: Lower Chiwawa River, Middle Chiwawa River, Lake Wenatchee, Lower White River, Lower Little Wenatchee, Upper Little Wenatchee, Lower Nason Creek, Upper Nason Creek, the headwaters of Nason Creek, Wenatchee River (Upper, Middle, and Lower portions), Lower Icicle Creek drainage, and Peshastin Creek.

Entiat Core Area. Fish habitat in the lower Entiat River (Deposition Zone) has been impacted by human activity. Channelization, bank stabilization, and wood removal have resulted in a wider than natural, simplified channel with a loss of pool habitat, large pools, cover, and off-channel habitat (WSCC 1999). Large pool habitat has declined by 88 percent between surveys in 1935 - 1937, and in 1990, 1994, and 1995 (USFS 1998b). Agricultural development precludes future wood recruitment and development of off-channel habitat. Juvenile bull trout are often positively associated with cover; lack of suitable rearing habitat negatively impacts bull trout (Hillman and Miller 1993, 1994, 1995, Reiman and McIntyre 1993). Water temperatures in the deposition zone are higher than generally accepted for bull trout rearing habitat. The degree to which artificial widening and channelization have contributed to elevated temperatures is not known.

Much of the deposition zone of the Entiat River may never have had temperatures conducive to juvenile rearing. The habitat simplification may have had a greater effect on adult bull trout given the preference of adult fish for pool habitat.

The transition zone of the Entiat River has not been impacted to the same degree as the deposition zone. Bull trout spawning has been documented in the transition zone. The river has not been channelized, but salvage logging and stream clean-out after the 1970 fires has removed in-channel wood and diminished the potential for future wood recruitment. A comparison of 1935 to 1937 surveys with 1990 to 1994 surveys in the Entiat River shows large pool habitat has decreased by 31 to 60 percent (USFS 1996a).

Loss of pools in the lower Mad River and mainstem Entiat River may have had an adverse effect on adult bull trout. Habitat diversity is provided by plunge pools and pocket pools in riffles that are formed by boulders and wood (USFS 1996a). There has been a history of wood removal in the 1970's in the Mad River, and during the 1994 Tyee Fire, wood in the channel was "bucked" during suppression. Bucking the in-channel wood destabilized some known spawning gravel. Most management activity (*e.g.*, timber harvest) in the Mad River has occurred in the headwaters of tributary streams.

High road densities within portions of U.S. Forest Service lands in the Entiat River basin may contribute to habitat degradation (USFS *in litt.* 2002). Areas of special concern, where road densities need to be reduced, include: Lower Entiat River, Middle Entiat River, Lower Mad River, Middle Mad River, and the Upper Mad River.

Methow Core Area. In the Methow River area, roads that accessed timbered lands are located in the narrow floodplains, with extensive networks in the Twisp watershed including sensitive bull trout tributaries (*e.g.*, Little Bridge and Buttermilk Creeks). A similar situation exists in Lake Creek in the Chewuch watershed (WSCC 2000). This road location practice can result in multiple impacts. Ground-based skidding is still a common practice on the private lands in these watersheds and can be a significant source of sediment. High road densities within portions of U.S. Forest Service lands in the Methow River Core Area may contribute to habitat degradation (USFS 2002, 2001a, 2001b).

Livestock Grazing

Historically, grazing of cattle, horses, and sheep has occurred throughout the Upper Columbia Recovery Unit (USFS 1999a, 1998c, 1996a, and WSCC 1999, 2000, 2001). Annual operating plans are usually drawn up for each allotment, and continued monitoring of these allotments is necessary to ensure compliance with the Endangered Species Act and Forest Plan Standards and Guidelines. Concerns associated with grazing include water withdrawals, loss of riparian vegetation, and redd trampling.

Methow Core Area. Over 60 percent of the private bottom lands in the Methow River area have erosion problems related to grazing (USFWS 1992). Cattle have access to the main channels and eroded stream banks (and associated sediment inputs) are an existing

problem. Of specific concern are riparian areas adjacent to the Twisp River, lower Wolf Creek, Upper Methow River, Chewuch River, Buttermilk Creek, Gold Creek, and Goat Creek (USFWS *in litt.* 1998b).

Agricultural Practices and Irrigation Diversions

Irrigation diversions can result in passage barriers by creating structural blockages, reducing or dewatering stream flows, and increasing water temperatures. Decreased stream flow and high temperatures can create barriers to upstream habitat and poor habitat conditions. High temperatures can result in negative effects to foraging and migrational patterns. Historically, there were many irrigation diversions in the Upper Columbia Recovery Unit that may have totally or partially blocked migrating fish (USFWS 1992). Other irrigation diversions, although not located in bull trout spawning streams, remove instream flow and may impact important foraging and high water refuge habitat.

Wenatchee Core Area. The Peshastin Irrigation District operates an irrigation diversion dam that presents a barrier to summer and fall migration, partially blocking migrating spring chinook salmon and migrating bull trout. In low water years, the stream directly downstream of the diversion is dewatered for 100 feet during late summer, completely blocking all fish passage (USFS 1998d). In October 2001, several large salmonids, including a large adult bull trout and a large rainbow/steelhead, were found dead at the screening structure by a Washington Department of Fish and Wildlife biologist (DeLaVergne, pers. comm., 2001).

The Tandy irrigation ditch is located upstream of the Peshastin Irrigation Ditch diversion about one-half mile. The ditch is screened; however, the effects to bull trout from water diversion and instream flow manipulation of the ditch channel are unknown. Similarly, Mill Creek (tributary to Peshastin Creek) has multiple irrigation diversions and the impact to bull trout is also unknown.
Numerous unnamed intermittent tributaries exist in Lower Peshastin Creek that have irrigation diversions, and effects of these on bull trout are unknown. Diversion dams can limit the potential to transport wood, sediment, water, and nutrients during spring run-off and winter and summer storm events (USFS 1999d). Diversion dams may also limit high flow refuge habitat for rearing
subadult or adult bull trout during certain times of the year.

In Icicle Creek, the water diversion dam for the Leavenworth National Fish Hatchery and the Cascade Orchards Irrigation District intake, blocks fish passage at low flows and is improperly screened (USFWS 2002). During drought years, the stream is dewatered from the diversion downstream to the fish hatchery. Upstream, the Icicle/Peshastin Irrigation District water diversion also has an instream structure that may impact bull trout migration. The screens at the
Icicle/Peshastin Irrigation District diversion do not currently meet National Marine Fisheries Service and Service criteria. Within Icicle Creek, diversions for irrigation, hatchery operations, and municipal use remove significant portions of water during

August, September, and October (USFWS 1992). Low flows in the lower reach are the result of natural conditions compounded by public water supply needs, irrigation diversions, and the fish hatchery diversions (Hindes 1994).

Within the upper Wenatchee River, there are several water diversions and a diversion dam located on Chiwaukum Creek (USFS 1999b). It is unknown whether these diversions meet National Marine Fisheries Service and Service screening criteria. The Chiwawa Irrigation District water diversion is located at river kilometer 5.8 (river mile 3.6) on the Chiwawa River and can divert up to 0.94 cubic meters per second (33.3 cubic feet per second), but more commonly diverts 0.3 to 0.4 cubic meters per second (12 to 16 cubic feet per second) (USFS 1999b). The diversion is screened (updated in the mid 1990's), but it is unclear if the screen meets the National Marine Fisheries Service and Service fish screen criteria, or how the altered flow regime may effect rearing or subadult fish. The U.S. Forest Service and the Chiwawa Irrigation District currently monitor flows and temperatures above and below the diversion to determine impacts to aquatic habitat.

A diversion in the upper Chiwawa River in Phelps Creek is located within spawning and rearing habitat (USFS 1999b). The Trinity water diversion is located approximately 1.2 kilometers (0.75 miles) upstream of the 2.4 meter (8 foot) natural falls at river kilometer 0.6 (river mile 1.0), which blocks upstream fish passage. Bull trout have not been found in the area of the diversion headgate structure, but have been located spawning within the return channel from the settling ponds and in Phelps Creek below the falls. The Trinity diversion is currently being relicensed under a Federal Energy Regulatory Commission process. It is unknown how the changes in instream flows affect rearing and spawning bull trout downstream in Phelps Creek.

Entiat Core Area. Currently, there are no identified passage barriers for bull trout in the Entiat Core Area. The McKenzie Irrigation Diversion was modified in 1994 to be fully passable at all flows. However, the Entiat River has been listed on the 303d list for instream flow deficiencies, high stream temperatures, and exceeding pH standards (USFS 1996a). Natural low summer flows in the Entiat River may be exacerbated by irrigation withdrawals.

Methow Core Area. In the Twisp watershed, the mainstem Methow River, Little Bridge Creek, and East Fork Buttermilk Creek have full or partial barriers. There is a diversion dam across the Twisp River on non-Federal land at approximately river kilometer 8 (river mile 5) which is used by the Twisp Power Irrigation Ditch and the Washington Department of Fish and Wildlife for adult chinook brood stock collection (WSCC 2000). It is assumed that this dam does not impede passage.

Prior to 1999, two irrigation dams on Little Bridge Creek were partial passage barriers to bull trout. Both structures have been improved in an attempt to pass fish. Bull trout have been observed in the lower 2 miles of Little Bridge Creek between the lower and upper diversions (WSCC 2000). No bull trout have been seen above the upper irrigation dam barrier which may still impede adult bull trout migration during the spawning season.

Other irrigation withdrawal points that may impact bull trout as passage barriers or by contributing to low instream flow problems include:

1. The Eightmile Ranch Ditch is owned by the U.S. Forest Service and irrigates pasture for horse and mule stock (WSCC 2000).
2. The Lucille Mason Ditch located on the opposite bank from the Eightmile Ranch Ditch is adequately screened but contributes to low flow conditions in the Lower Chewuch River (WSCC 2000).
3. Irrigation withdrawal by three diversions (Wolf Creek Reclamation District Irrigation Ditch) operated in the Wolf Creek watershed (including use of Patterson Lake for irrigation storage) may be adversely impacting bull trout (WSCC 2000). The Wolf Creek diversion is one of the largest irrigation ditches in the Methow Valley and has been in operation since 1921.

Dewatering of channels as a result of irrigation or water withdrawals may act as a barrier to bull trout passage. In the Methow basin, the Lost River and the mainstem upper Methow River typically go subsurface. Ground water and irrigation withdrawals may have a compounding effect on maintaining perennial flows. Where subsurface flows are natural, the condition may be exasperated by instream and aquifer withdrawals. Specific areas of concern include: Lower Early Winters Creek, Methow River from Robinson Creek to Weeman Bride, Lost River, Wolf Creek, Twisp River, and Gold Creek.

Mining

Mining can degrade aquatic habitats used by bull trout by altering water chemistry (*e.g.*, pH); altering stream morphology and flow; and causing sediment, fuel, and heavy metals to enter streams (Martin and Platts 1981, Spence *et al.* 1996, Harvey *et al.* 1995). Mining activities within Washington State are guided by published rules entitled "Rules and Regulations for Mineral Prospecting and Placer Mining in Washington State" (also known as the "Gold and Fish" pamphlet) (WDFW 1999b). The pamphlet describes streams, timeframes, and equipment that are permitted for small scale prospecting and mining. Currently, small scale recreation gold mining occurs within the Wenatchee River (*e.g.*, Peshastin Creek and Chiwawa River) (USFS 1999a).

The U.S. Forest Service has issued a special use permit in the upper Chikamin Creek drainage for an exploratory mining operation. Bull trout spawn just downstream in Chikamin Creek and hold within the Chiwawa River for most of the year. In addition, the potential for establishing a gold mine in the Twisp River (North Creek) is being considered (DeLaVergne, pers. comm., 2001). The Twisp River is an important local population of bull trout in the Methow River.

Residential Development

Numerous areas within the Upper Columbia Recovery Unit are experiencing a socio-economic shift from a natural resource based economy reliant on agriculture, forestry, and mining to an economy more dependent on industries associated with tourism,

recreation, and general goods and services. Population growth in Chelan and Okanogan Counties have been 27.5 percent and
18.6 percent in the 1990's, respectively (WSOFM 2000). Concerns over impacts to bull trout center around the degradation of water quality, instream habitat, and riparian habitat in migratory corridors within the Wenatchee and Methow Rivers (WSCC 2000, 2001, Parametrix, Inc 2000).

Areas of concern in the Wenatchee Core Area include:

1. The Wenatchee River downstream of Leavenworth (loss of side channels, bank revetment, and floodplain development).
2. Wenatchee River through communities of Plain and Ponderosa (degraded water quality due to improperly functioning septic systems).
3. Peshastin Creek (below Ingalls Creek confluence, the natural channel and floodplain function has been disturbed due to channel constriction and confinement).
4. Icicle Creek (lower portion of the river has been impacted from loss of riparian vegetation, bank hardening, and residential development).
5. Nason Creek (lower Nason Creek impacts include channel confinement, removal of riparian vegetation, and reduction in large woody debris recruitment).
6. White River (below Panther Creek impacts due to loss of riparian and large woody debris recruitment).
7. Lake Wenatchee (shoreline development and associated loss of riparian vegetation, increased nutrient loading, and inadequate sewage treatment).

Areas of concern in the Methow Core Area basin include:

1. Early Winters Creek (riprap and diking of the lower 0.5 miles).
2. Mainstem Methow River (bank erosion and loss of vegetation from the Early Winters Creek confluence downstream to Mazama).
3. Mainstem Methow River (Wolf Creek confluence bank erosion and loss of vegetation).

Recreational Development

Campgrounds, trails, and other recreational development in the Upper Columbia Recovery Unit frequently overlap areas of bull trout spawning, juvenile rearing, and adult migration (USFS 1999a; 1999b; 1996a). Impacts of these recreational developments can include reduction in large woody debris and its recruitment, loss of riparian vegetation, and diking or bank hardening to protect campgrounds. These developments can also increase stream access, which can lead to poaching of bull trout.

Fisheries Management: Nonnative Species

Problems with non-native species in the Upper Columbia Recovery Unit focus primarily on brook trout (WSCC 1999; 2000; 2001). Brook trout are well established above Entiat Falls, and have been observed at lower levels below the falls (WDFW 1998, USFS

1996a, WSCC 1999). The presence of this strong brook trout population directly upstream of the primary bull trout habitat in the Entiat River is a concern.

In the Wenatchee River, a major concern is presence of brook trout in the Chiwawa River including Chikamin and Big Meadow creeks (USFS 1999b). The introduction of brook trout into Schaefer Lake in the 1940's was most likely the source population. Efforts to eradicate brook trout from Schaefer Lake have been unsuccessful. Given the importance of the Chiwawa River system to bull trout, the potential for brook trout to invade additional areas is a concern.

Brook trout are widespread within the Methow River and the potential for introgression with bull trout is a concern (NPPC 2001c). Brook trout are well established in Beaver and Eightmile Creeks and are thought to have resulted in the loss of bull trout from these systems (WDFW 1998). Brook trout are also known to inhabit portions of the Twisp River (NPPC 2001c).

Fisheries Management: Harvest

Currently, the harvest of bull trout is prohibited on all stocks in the Upper Columbia Recovery Unit with the exception of the Lost River in the Methow drainage. Fishing may have been a factor leading to the decline of bull trout in the Upper Columbia Recovery Unit. Certain areas within the recovery unit (*e.g.,* Lake Wenatchee) were targeted bull trout fisheries, and large numbers of bull trout were harvested (WDFW 1992). Bull trout were rarely targeted in the mainstem Entiat but may have been harvested incidentally in trout fisheries, especially when hatchery rainbows were planted. Hatchery trout have not been stocked since 1996. With the cessation of stocking in the Entiat, selective fishery regulations, and the closure of steelhead fishing, incidental harvest should be reduced. However, bait fishing is legal in some areas, and may result in incidental hooking mortality. It is suspected that a few anglers (and poachers) may still target bull trout in certain areas of the Mad and Methow Rivers (DeLaVergne, pers. comm., 2001).

The Lost River above Drake Creek is the only area within the recovery unit open to bull trout harvest (WDFW 1998). The abundance of bull trout in this area (210 catchable-sized fish per mile) was thought to be sufficient to allow retention of bull trout as part of a two fish catch limit. Fishery rules include a bait prohibition and a 36 centimeter (14 inch) minimum size intended to permit most females to spawn at least once. Angling is minimized by the lack of direct access to the lower end of this reach. The canyon reach is accessible only in late summer when stream flows recede enough for fording. Almost no fishing occurs in this reach. Some fishing occurs below Cougar Lake, in the vicinity of the horse camp around Diamond Creek, and in the area just above the mouth of Drake Creek

Although fishing regulations for bull trout have been restricted, there are still some current regulations that may result in the incidental take of bull trout. Incidental catch of bull trout during otherwise lawful fishing seasons has been raised as a concern in Lake Wenatchee, the Lost River, and portions of the Chiwawa River (DeLaVergne, pers.

comm., 2001). Incidental catch during open seasons for mountain whitefish (*Prosopium williamsoni*) has also been implicated as a possible source of bull trout mortality in the Wenatchee, Entiat, and Methow Rivers. In addition, harvest of bull trout may occur within their range due to misidentification. Schmetterling and Long (1999) found that only 44 percent of anglers correctly identified bull trout, and anglers frequently confused related species.

Eggs and alevins in redds are vulnerable to wading-related mortality during the incubation period. Under Statewide regulations most streams are open June 1 through October 31. Most bull trout in this recovery unit spawn during September and October. Egg mortality of up to 46 percent can occur from a single wading event (Roberts and White 1992).

Fisheries Management: Forage (Prey) Base

Throughout the Upper Columbia Recovery Unit there have been declines in the numbers of native salmonids. Both spring chinook salmon and steelhead are listed under the Endangered Species Act in this area, and with few exceptions, continue to exhibit low abundances. In addition to decreasing the forage base for bull trout, the decline of salmon and steelhead has reduced a historic energy source coming into the basin through the dying and recycling of nutrients from adult carcasses, eggs, and juveniles.

Fisheries Management: Spring Chinook Egg Collection and Captive Broodstock Collection

The collection of Upper Columbia River spring chinook salmon eggs and juveniles occurs in the supplementation and captive broodstock program by the Washington Department of Fish and Wildlife (WDFW 1999a). This program is in response to projects that were developed as part of the Mid-Columbia River Habitat Conservation Plan with the Chelan and Douglas PUD's. In the Wenatchee River, eggs and juveniles are collected in Nason Creek and the White River. Bull trout temporally and spatially overlap spring chinook spawning areas in both of these Wenatchee River tributaries. Future plans have identified possible collection sites in the Methow River. Misidentification of redds may occur in these overlapping spawning areas resulting in direct bull trout mortality.

Isolation and Habitat Fragmentation: Dikes

In the Methow Core Area, lotic habitats have been fragmented, resulting in loss of floodplain and off-channel habitats that could provide important rearing areas for bull trout (WSCC 2000). Existing dikes in the Methow River that contribute to habitat fragmentation are the McKinney Mountain Dike, People Mover Dike, and the dike on the Lost River. Alteration of habitat from channel modification (*e.g.*, bank revetment and riparian alterations) have disconnected floodplains and impacted normal stream function. Specific areas of concern include: Goat Creek, lower Early Winters Creek, and the Twisp River.

Isolation and Habitat Fragmentation: Road Culverts

Road culverts in watersheds with bull trout can block or impede upstream passage (WSCC 1999, 2000, 2001, NPPC 2001a, 2001b, 2001c). Culverts may preclude bull trout from entering a drainage during spawning migrations, outmigration of juveniles, and foraging activities, and may also limit access to refuge habitat needed to escape high flows, sediment, or higher temperatures.
Culverts have been identified as a limiting factor for salmonids in the Methow River basin (NPPC 2001c, WSCC 2000. Culverts that have been identified as possible passage barriers include: Peshastin and Nason Creeks (Wenatchee River); Twisp River, Beaver Creek, Gold Creek, Little Bridge Creek, and East Fork Buttermilk Creek (Methow River).

3.4. Ongoing Conservation Measures within the Action Area

The Entiat and Mad Rivers are classified as a "key watersheds" under the Record of Decision for the Northwest Forest Plan. Road restoration work has been on-going in the watershed, particularly in the mainstem and headwaters of Mad River tributaries. As noted previously, the Mad River has been closed to all angling within the range of bull trout, and the Entiat River within the range of bull trout is under selective fishery regulations with no harvest of bull trout allowed. Stocking of hatchery trout has stopped in the mainstem Wenatchee and Entiat Rivers. Specifically, there is no longer an active stocking program for brook trout within the basin.

Currently, timber management on U.S. Forest Service lands is guided by several land management plans. The Northwest Forest Plan is implemented in the Wenatchee River, Entiat River, and the west half of the Methow River (USFS and BLM 1994). Land management activities relative to bull trout in the eastern half of the Methow River are guided by standards contained in INFISH (USFS 1995e). These strategies are overlaid with on-site forest management plans that, when implemented, are designed to reduce impacts to aquatic species, riparian areas, and listed fish.

3.5. Conservation Needs of Bull Trout in Action Area

A core area represents the closest approximation of a biologically functioning unit for bull trout. The combination of core habitat (*i.e.*, habitat that could supply all the necessary elements for the long-term security of bull trout, including for both spawning and rearing, foraging, migrating, and overwintering) and a core population (*i.e.*, bull trout inhabiting a core habitat) constitutes the basic core area upon which to gauge recovery within a recovery unit. Within a core area, many local populations may exist.

For purposes of recovery, the Upper Columbia Recovery Unit has three core areas, including the Wenatchee, Entiat, and Methow Rivers. Although we know bull trout in the Upper Columbia migrate to the Columbia River and back, we do not clearly understand the extent of their use and distribution in the Columbia River mainstem. Factors considered when identifying core areas included: the extent of historic and current

migratory connectivity, existence natural barriers, survey and movement data, and genetic information where available. Except where supported by biological or geographic evidence, core areas are considered to be distinct, and their boundaries do not overlap. Additional genetic information within the Upper Columbia Recovery Unit may help refine the current classification.

Within each core area, many local populations may exist. A local population is defined as a group of bull trout that spawn within a particular stream or portion of a stream system. A local population is assumed to be the smallest group of fish that is known to represent an interacting reproductive unit. For most waters where specific information is lacking, a local population may be represented by a single headwater tributary or complex of headwater tributaries. Based on survey data and professional judgment, the Upper Columbia Recovery Team identified 16 local populations in the Wenatchee (6), Entiat (2) and Methow (8) core areas.

Recovery Goals and Objectives

The goal of the bull trout recovery plan is to ensure the long-term persistence of self-sustaining, complex, interacting groups of bull trout distributed across the native range of the species, so that it can be delisted. To achieve this goal, the following objectives have been identified for bull trout in the Upper Columbia Recovery Unit:

I. Maintain the current distribution of bull trout and restore distribution in previously occupied areas within the Upper Columbia Recovery Unit.
II. Maintain stable or increasing trends in abundance of bull trout.
III. Restore and maintain suitable habitat conditions for all bull trout life history stages and strategies.
IV. Conserve genetic diversity and provide opportunities for genetic exchange.

Rieman and McIntyre (1993) and Rieman and Allendorf (2001) evaluated the bull trout population numbers and habitat thresholds necessary for long-term viability of the species. They identified four elements, and the characteristics of those elements, to consider when evaluating the viability of bull trout populations. These four elements are: 1) number of local populations; 2) adult abundance (defined as the number of spawning fish present in a core area in a given year); 3) productivity, or the reproductive rate of the population (as measured by population trend and variability); and 4) connectivity (as represented by the migratory life history form and functional habitat). For each element, the Upper Columbia Recovery Unit Team classified bull trout into relative risk categories based on the best available data and the professional judgment of the team.

The Upper Columbia Recovery Unit Team also evaluated each element under a potential recovered condition to produce recovery criteria. Evaluation of these elements under a recovered condition assumed that actions identified within this section had been implemented. Recovery criteria for the Upper Columbia Recovery Unit reflect: 1) the

stated objectives for the recovery unit, 2) evaluation of each population element in both current and recovered conditions, and 3) consideration of current and recovered habitat characteristics within the recovery unit. Recovery criteria will probably be revised in the future as more detailed information on bull trout population dynamics becomes available. Given the limited information on bull trout, both the level of adult abundance and the number of local populations needed to lessen the risk of extinction should be viewed as a best estimate.

In this approach to developing recovery criteria, the status of populations in some core areas may fall short of ideals described by conservation biology theory. Some core areas may be limited by natural attributes or by patch size, and may always remain at a relatively high risk of extinction. Because of limited data within the Upper Columbia Recovery Unit, the recovery unit team relied heavily on the professional judgment of its members.

Local Populations

Metapopulation theory is important to consider in bull trout recovery. A metapopulation is an interacting network of local populations with varying frequencies of migration and gene flow among them. Multiple local populations distributed and interconnected throughout a watershed provide a mechanism for spreading risk from stochastic events. In part, distribution of local populations in such a manner is an indicator of a functioning core area. Based in part on guidance from Rieman and McIntyre (1993), bull trout core areas with fewer than 5 local populations are at increased risk, core areas with between 5 and 10 local populations are at intermediate risk, and core areas with more than 10 interconnected local populations are at diminished risk.

Currently, local populations of migratory bull trout in the Wenatchee Core Area include: Chiwaukum Creek, Chiwawa River (including Chikamin, Rock, Phelps, Alpine, Buck, and James Creeks), White River (including Canyon and Panther Creeks), Little Wenatchee (below the falls), Peshastin Creek (including Ingalls Creek), Nason Creek (including Mill Creek), and Icicle Creek (including above the boulder area at RM 5.5). Migratory local populations in the Entiat Core Area include the mainstem Entiat and Mad Rivers. The Methow Core Area has migratory bull trout local populations in Gold Creek (including Crater Creek), Twisp River (including North and Reynolds Creeks and mainstem, East and West Fork Buttermilk Creeks), Wolf Creek, Chewuch River, Goat Creek, Early Winters Creek (including Cedar and Huckleberry Creeks), Lost River (including Cougar Lake, First Hidden Lake, Middle Hidden Lake and Monument Creek), and Upper Methow River. Bull trout in the Wenatchee and Methow Core Areas are considered at an intermediate risk, while bull trout in the Entiat Core Area are at an increased risk. Resident bull trout are known to occur in each core area within the recovery unit. However, an accurate description of their current distribution is unknown, and the identification of resident local populations is considered a research need.

Adult Abundance

The recovered abundance levels in the Upper Columbia Recovery Unit were determined by considering theoretical estimates of effective population size, historical census information, and the professional judgment of recovery team members. In general, effective population size is a theoretical concept that allows us to predict potential future losses of genetic variation within a population due to small population sizes and genetic drift. For the purpose of recovery planning, effective population size is the number of adult bull trout that successfully spawn annually. Based on standardized theoretical equations (Crow and Kimura 1970), guidelines have been established for maintaining minimum effective population sizes for conservation purposes. Effective population sizes of greater than 50 adults are necessary to prevent inbreeding depression and a potential decrease in viability or reproductive fitness of a population (Franklin 1980). To minimize the loss of genetic variation due to genetic drift and to maintain constant genetic variance within a population, an effective population size of at least 500 is recommended (Franklin 1980, Soule 1980, Lande 1988).

For bull trout, Rieman and Allendorf (2001) estimated that a minimum number of 50 to 100 spawners per year is needed to minimize potential inbreeding effects within local populations. In addition, a population size of between 500 and 1,000 adults in a core area is needed to minimize the deleterious effects of genetic variation from drift.

For the purposes of bull trout recovery planning, abundance levels were conservatively evaluated at the local population and core area levels. Local populations containing fewer than 100 spawning adults per year were classified as at risk from inbreeding depression. Bull trout core areas containing fewer than 1,000 spawning adults per year were classified as at risk of genetic drift.

Overall, bull trout in the Wenatchee, Entiat, and Methow core areas persist at low abundance. The strongest population in the Wenatchee Core Area is the Chiwawa River. Since 1999, the Chiwawa River has ranged between 246 and 462 redds annually. Conservative estimates (2 fish per redds) would result in an estimate of 492 to 924 spawning adults in the Chiwawa local population. Based on the aforementioned guidance, the Chiwawa River local population is not at risk of inbreeding depression. All other local populations in the Wenatchee Core Area persist at low abundance levels, and are considered at risk of inbreeding depression. Accurate abundance estimates for the Wenatchee Core Area are not available. However, results from the 2001 redd surveys in the Wenatchee Core Area indicate that the annual spawning population is probably less than 1,000 individuals, and should be considered at risk of genetic drift. Both local populations in the mainstem Entiat and Mad rivers persist at low abundance levels (less than 100 individuals), and are considered at risk of inbreeding depression. The low abundance in the Entiat Core Area places it at risk of genetic drift. Seven of the local populations in the Methow Core Area are mostly under 100 adults annually and are at risk of inbreeding depression. The most recent 4-year average for adult abundance (174) in the Twisp River indicates that this local population may not be at risk of inbreeding depression. However, the high variability in redd counts in the Twisp River is a source of

concern, and the genetic risk for this local population should continue to be monitored. Based on available information, adult spawning abundance in the Methow Core Area is probably less than 1,000 adults and therefore is at risk of the deleterious effects of genetic drift.

Productivity

A stable or increasing population is a key criterion for recovery under the requirements of the Endangered Species Act. Measures of the trend of a population (the tendency to increase, decrease, or remain stable) include population growth rate or productivity. Estimates of population growth rate (*i.e.*, productivity over the entire life cycle) that indicate a population is consistently failing to replace itself also indicate an increased risk of extinction. Therefore, the reproductive rate should indicate that the population is replacing itself, or growing.

Since estimates of the total population size are rarely available, the productivity or population growth rate is usually estimated from temporal trends in indices of abundance at a particular life stage. For example, redd counts are often used as an index of a spawning adult population. The direction and magnitude of a trend in the index can be used as a surrogate for the growth rate of the entire population. For instance, a downward trend in an abundance indicator may signal the need for increased protection, regardless of the actual size of the population. A population that is below recovered abundance levels, but that is moving toward recovery, would be expected to exhibit an increasing trend in the indicator.

The population growth rate is an indicator of probability of extinction. This probability cannot be measured directly, but it can be estimated as the consequence of the population growth rate and the variability in that rate. For a population to be considered viable, its natural productivity should be sufficient for the population to replace itself from generation to generation. Evaluations of population status will also have to take into account uncertainty in estimates of population growth rate or productivity. For a population to contribute to recovery, its growth rate must indicate that the population is stable or increasing for a period of time.

In the Upper Columbia Recovery Unit, bull trout were classified as having an increased risk due to either the short duration of population census information, or the incomplete record of the redd count surveys within each core area.

Connectivity

The presence of the migratory life history form within the Upper Columbia Recovery Unit was used as an indicator of the functional connectivity of the recovery unit. If the migratory life form was absent, or if the migratory form was present but local populations lacked connectivity, the core area was considered to be at increased risk. If the migratory life form was persisting in at least some local populations, with partial ability to connect with other local populations, the core area was judged to be at intermediate risk. If the

migratory life form was present in all or nearly all local populations, and had the ability to connect with other local populations, the core area was considered to be at diminished risk.

Within the Wenatchee and Entiat Core Areas, the migratory life history form is predominant within the existing local populations, and both areas were considered at a diminished risk. While localized habitat problems currently exist that may impede connectivity, there are no large scale man-made migration barriers within either system. Conversely, habitat degradation within the Methow Core Area has fragmented bull trout populations within the basin. Reduction in habitat quality resulting from irrigation water withdrawals, diversion dams, grazing, and passage barriers associated with culverts have collectively contributed to the decline of bull trout in the basin. Bull trout in the Methow Core Area were considered to be at an increased risk.

3.6. Likelihood of Species Presence in the Action Area

Bull trout are present in the action area for Rocky Reach, Rock Island, and Wells reservoirs, as well as the Wenatchee, Entiat, and Methow Rivers. Three life history forms, adfluvial, fluvial, and resident, are believed to occur in the action area. Bull trout are observed each year using the adult fish passage facilities to pass Rocky Reach, Rock Island, and Wells Dams, affirming their presence and use of the mainstem. Juvenile bull trout have been observed in the juvenile sampling facilities at the dams as well, although very infrequently. Bull trout were sampled in the Rocky Reach prototype juvenile bypass collector in 1998, 1999, 2000, 2001 2002, with 23, 30, 8, 4, and 5 fish observed, respectively. In 2003, no juvenile bull trout were sampled at the new Rocky Reach juvenile collector sampling facility.

Both adult and juvenile bull trout are routinely observed (and counted) by Chelan and Douglas PUD employees while the fish are passing through the fish ladders. Before the installation of computer video monitoring, fish were observed by direct observation at fish ladder windows. Since 1992, fish have been counted utilizing round-the-clock computer video recordings during adult salmon passage periods. Counts prior to 1998 did not differentiate bull trout from other trout.

Chelan and Douglas PUDs began to enumerate bull trout using the adult passage facilities in 1998. A total of 83 bull trout passed Rocky Reach Dam between May 3 and July 31 that year (Chelan PUD, 2002a unpublished data). In 1999 from May 10 to November 14, 128 bull trout passed the project. In 2000, 2001, and 2002, counts of bull trout using the fish ladder from April 20 to November 14 were 216, 204, and 201, respectively. More than 80% of bull trout passage for these years occurred from May 1 to July 31. In 2003 (April 14 to September 3), 206 bull trout passed Rocky Reach Dam. In all years on record, the majority of the bull trout passed the Project in May and June (75 to 90 percent). Although the extent of bull trout passage at other times of the year is unknown, some bull trout do use fish ladder facilities to pass the facilities in September, October, and November. Similar trends were observed at Wells Dam. Fish counting ends around November 15 each year.

Fewer bull trout are observed at Rock Island Dam each year compared with Rocky Reach Dam. In 1998, 1999, 2000, and 2001, the numbers of bull trout observed at Rock Island were 48, 56, and 88, and 82, respectively (Chelan PUD, 2002a unpublished data). Between 55 and 70 percent of the fish that passed Rock Island Dam in those years did so in May and June. In 2002, 87 bull trout passed Rock Island Dam from April 14 to November 14; most of these fish passed in May and June (75 percent). From April 14 to September 3, 2003, 77 bull trout passed Rock Island Dam, 55 of those during May and June.

To gather additional information on adult bull trout migratory behavior in the mid-Columbia River region, a 3-year radio telemetry study was initiated in 2001 (BioAnalysts, 2002, 2003 Draft). Results indicate that some bull trout reside for considerable periods of time in the mainstem reservoirs, and then move upstream through the adult fish ladders in spring and early summer to enter tributary habitats, presumably to spawn. A total of 79 bull trout were tagged in 2001 and 2002 (15 fish at Rock Island Hydroelectric Project, 45 fish at Rocky Reach Hydroelectric Project, and 19 fish at Wells Hydroelectric Project). Approximately half of the fish were released upstream of the dam where they were captured, and the other half were released downstream of the respective project. All of the tagged fish, despite their release location, migrated into the Wenatchee, Entiat, or Methow rivers, presumably to spawn. After exiting tributaries in late fall, some of the tagged bull trout moved downstream of Rocky Reach Dam through turbines. One fish passed downstream through turbines at both Rocky Reach and Rock Island Dams after exiting the Entiat River in November 2001. This fish overwintered downstream of Rock Island Dam, then migrated back through adult ladders at Rock Island and Rocky Reach in May of 2002. Again, it entered the Entiat River in mid-June 2002, three days later than it did in 2001.

No mortalities were detected during upstream or downstream passage through Rock Island, Rocky Reach, or Wells Dams. The radio telemetry study did not identify adverse effects on movement or survival of tagged bull trout. Detailed results are available in the 2002 final report (BioAnalysts 2002), and the draft report completed in 2003 (BioAnalysts 2003 Draft).

3.7 Proposed Critical Habitat

Within the action area, the Service proposed the Entiat, Wenatchee, Chelan, Methow, and Okanogan basins, as well as the mainstem Columbia River for designation as bull trout critical habitat on November 29, 2002 (Federal Register, Vol. 67, No. 230, p. 71277). These areas are essential to the conservation of the species because they: 1) currently support local bull trout populations that are important to the continued survival of the recovery unit; 2) are presently used by bull trout and have the potential to support increasing use by local populations; or 3) were formerly used by bull trout and possess quality habitat containing several primary constituent elements for bull trout. All of the areas proposed for critical habitat designation require special management consideration and protection to ensure their contribution to the species recovery.

The mainstem Columbia River within the action area currently serves as foraging, overwintering and migratory habitat for bull trout. Areas proposed for critical habitat designation within the Entiat, Wenatchee and Methow basins function as spawning, rearing, foraging, migratory, or overwintering habitat. Habitat conditions of stream reaches proposed for critical habitat designation range from pristine to degraded. The primary causes of the degraded conditions are lack of sufficient flows, inadequate water temperatures and migrational barriers. Threats to these areas are similar to those described above in section 3.3.

The Chelan Basin, including the Stehekin River, and the Okanogan River Basin are two areas identified as research needs to determine current status of bull trout and recovery potential. The Lake Chelan basin is historic bull trout habitat, but their presence has not been documented since the late 1950's, and they may have been extirpated from the basin (WDFW 1992). However, complete surveys in remote tributary reaches of the Lake Chelan Basin have not been conducted, and further investigation is needed. Habitat remains largely intact although introduction of other species since the disappearance of this bull trout population could compromise recovery efforts. Little is known about historical or current use of the Okanogan River by bull trout.

4. Effects of the Action

"Effects of the action" refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action that will be added to the environmental baseline. Direct effects are considered as immediate effects of the project on the species or its habitat. Indirect effects are those caused by the proposed action and are later in time, but are still reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend upon the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consultation. Both interrelated and interdependent activities are assessed by applying the "but-for test" which asks whether any action and its resulting impact would occur "but-for" the proposed action.

"Insignificant effects" relate to the size of the impact and should never reach the scale where take occurs. "Discountable effects" are those extremely unlikely to occur. Based on best judgement, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur. Effects that result in "take" of listed species will be further addressed in the accompanying Incidental Take Statement.

Some of the major effects of the proposed actions include the following: 1) continued presence of fish passage barriers and entrainment; 2) inundation of fish spawning and

rearing habitat; 3) modification of the streamflow and water temperature regime; 4) dewatering of shallow water zones during power operations; 5) reduced productivity in reservoirs; 6) gas supersaturation of waters downstream of dams; 7) loss of native riparian habitats; 8) water level fluctuations interfering with establishment of riparian vegetation; and 9) establishment of non-native riparian vegetation along affected reaches.

Rocky Reach, Rock Island, and the Wells projects have fish passage facilities, but these fishways were designed for anadromous fish, not resident fish such as bull trout. Small numbers of bull trout have been observed using fish passage facilities, however these facilities may be a factor isolating bull trout subpopulations if they are not readily passable by bull trout. Migratory bull trout formerly linked resident bull trout to the overall gene pool for this species. Migration barriers have isolated these populations, potentially causing a loss of genetic diversity. Entrainment of bull trout through turbines is likely to occur at these projects. Bull trout can be killed or injured when passing the dams. Those that survive passage may be isolated in downstream reaches. Reservoirs created by these projects have inundated mainstem and tributary habitat used by bull trout. However, these reservoirs now provide habitat for adfluvial populations of bull trout. This habitat was not available prior to reservoir fill and the creation of these water bodies.

Flow releases from the projects alter the natural flow regime, affect water temperature, and cause repeated and prolonged changes to the wetted perimeter. Load following operations, which change the flow of the river on a frequent basis, cause large areas of the river margins to become alternately wet and then dry, adversely affecting aquatic insect survival and production (Hauer and Stanford, 1997). Changes in water depth and velocity, and physical loss or gain of wetted habitat can cause juvenile trout to be displaced, thus increasing their vulnerability to predation (Hoffman et al. 2000) and causing adverse effects to their survivability. These effects, in turn, indirectly adversely affect bull trout by degrading the habitat of their prey (small fish) and the food upon which it depends (aquatic insects).

High levels of gas supersaturation can cause gas bubble trauma in fish. Uncontrolled spill at the projects can produce extremely high levels of total dissolved gas and may impact bull trout and other species.

Specific effects associated with each of the projects are discussed below.

4.1. Turbine Operation

Operation of the hydroelectric turbines is expected to result in the injury and mortality of adult and juvenile bull trout.

Rocky Reach Project

Studies to assess turbine impacts on juvenile and adult bull trout have not been conducted at any hydropower facility. Related turbine studies, (Eicher et al. 1987) found that in general, smaller fish survive at a higher rate than do larger fish in turbine passage. There

is no evidence to suggest that juvenile bull trout would survive at higher rates than juvenile anadromous species; however, important differences in physiological and behavioral stress tolerances may or may not exist for resident and anadromous salmonids (Miller and Hillman 1994).

Direct or indirect effects on adult and juvenile bull trout are likely to occur as a result of downstream movement through turbines at Rocky Reach Dam. These effects may include physical injury or mortality from contact with turbine structures including wicket gates, turbine runners, or the spiral case. Indirect effects may include increased susceptibility to predation caused by disorientation following turbine passage or increased susceptibility to infection caused by scale loss or non-lethal wounds incurred during turbine passage. A total of eight adult radio tagged bull trout moved downstream past Rocky Reach Dam during telemetry studies in from 2001 through 2003; no mortalities were observed (BioAnalysts 2002, 2003).

Rock Island Project

Direct or indirect effects on adult and juvenile bull trout are likely to occur as a result of downstream movement through turbines. These effects may include physical injury or mortality from contact with turbine structures including wicket gates, turbine runners, or the spiral case. Indirect effects may include increased susceptibility to predation caused by disorientation following turbine passage or increased susceptibility to infection caused by scale loss or non-lethal wounds incurred during turbine passage.

Wells Project

Direct or indirect effects on adult and juvenile bull trout are likely to occur as a result of downstream movement through turbines. These effects may include physical injury or mortality from contact with turbine structures including wicket gates, turbine runners, or the spiral case. Indirect effects may include increased susceptibility to predation caused by disorientation following turbine passage or increased susceptibility to infection caused by scale loss or non-lethal wounds incurred during turbine passage. Indirect effects may include increased susceptibility to predation caused by disorientation following turbine passage or increased susceptibility to infection caused by scale loss or non-lethal wounds incurred during turbine passage.

4.2. Juvenile Bypass Operation

During periods of operation, juvenile bypass facilities are likely to result in increased downstream passage survival of juvenile and adult bull trout. Operation of associated juvenile sampling facilities may result in the entrainment and capture of adult and juvenile bull trout.

Rocky Reach Project

Operation of the Rocky Reach Juvenile Fish Bypass (JFB) may positively affect downstream movement juvenile bull trout using mainstem habitats. Bull trout were sampled in the prototype juvenile bypass collector in 1998 through 2002 with 23, 30, 8,

4, and 5 fish observed, respectively. Length measurements were not taken on these fish; however, anecdotal information from sampling facility personnel indicated that most were juvenile or sub-adult fish. Facility personnel could recall observing only two or three adult bull trout in the sampling facility during all years of prototype operation (Hemstrom, pers. Comm.., 2003). In 2003, no juvenile bull trout were captured in the new juvenile bypass sampling facility, and adults were not observed or handled due to the adult separator feature in the new facility. Adults are not physically handled and do not enter the sample raceway, but are separated from the juveniles via the adult separator structure and re-routed into a bypass pipe. Juvenile sampling in 2003 occurred for only two hours (8-10 am) each day, and in the evening (4-6 pm and 7 to 9pm) one day per week. It is probable that some juvenile and adult bull trout pass undetected during periods when the sampling facility is not operating. The JFB will be used in future years to collect juvenile salmon (sockeye, spring chinook, summer/fall chinook) and steelhead to conduct juvenile fish passage studies (passage efficiency and survival) at Rocky Reach and Rock Island dams. Study fish are captured at the juvenile collection facility during index sampling periods (normally two hours), but the collection period may run longer to obtain enough fish to meet sample size requirements. Juvenile bull trout may be captured during periods when study fish are being collected at the JFB.

Rock Island Project

Downstream passage facilities for juvenile fish are incorporated into the second powerhouse and right bank fishway. The downstream migrant facilities consist of two separate bypass systems that fish enter volitionally. Both systems combine to utilize a common 36-inch discharge pipeline. The intake gatewell system (GWS) consists of a series of ports at a second powerhouse intake gate slots, and a bypass channel that extends along the upstream face of the powerhouse structure. One system, the traveling water screen bypass, consists of ports and vertical riser pipes that are provided at the traveling water screen system, located at the exit of the right bank fishway. Incorporated in the discharge pipeline is a fish trapping facility for the collection and

examination of downstream migrating smolts. The second bypass system, called the gatewell collection system, consists of two 8-inch diameter ports in the upstream wall at each of the intake gate slots for powerhouse 2. Each of the eight units in powerhouse 2 has two intake gate slots for a total of 32 ports. The ports discharge into a bypass channel that extends for the full length of the powerhouse; the bypass channel then delivers fish to the 36-inch bypass pipe.

Numbers of bull trout captured in the Rock Island Bypass smolt trap facility from 1997 through 2002 were 2, 7, 31, 1, 8, and 8, respectively. No juvenile bull trout were captured in the Rock Island Juvenile Bypass trap in 2003 (L. Praye, WDFW, pers. comm., 2003). Most the bull trout captured at the bypass are small bull trout. Bypass attendants very infrequently observe an adult bull trout in the trap (L. Praye, WDFW, pers. comm., 2003). Some mortality of juvenile salmon and steelhead occurs with the operation of the Rock Island bypass. Although the mortality rate is low the same mortality rate could apply to bull trout that coincidentally enter the bypass system. To date, no injuries or mortalities have been reported for bull trout at this facility.

Wells Project

The Wells juvenile bypass system consists of five evenly spaced surface collector entrances that convey water and fish into five modified spillways and into the tailrace of the dam. The juvenile bypass system provides a non-turbine passage route for downstream migrating juvenile and adult bull trout during the months of April, May, June, July and August.

When the bypass is operating, greater than 92% of downstream migrating anadromous fish utilize the juvenile bypass system (Skalski, 1993). Because juvenile bull trout are morphologically similar to anadromous salmonids, and because radio-tagged bull trout are frequently observed along the shorelines of the Columbia River in water less than 50 feet of water, it is expected that a similarly high proportion of juvenile bull trout will also utilize the surface bypass system rather than sounding over 75 feet to pass through the turbines. Survival for juvenile plan species passing through the Wells surface bypass system and through the Wells spillways is estimated to be greater than 98%. Survival for juvenile bull trout passing through the Wells surface bypass system and spillways is expected to be comparably high due to similarities in fish size, shape and location in the water column.

4.3. Adult Fishway Operation

Continued operation of the adult fishways is likely to result in delays in upstream movement of adult bull trout, impeded upstream passage of juveniles, and injury or mortality of adults due to contact with structures within the fishways and "fallback".

Rocky Reach Project

The adult fish passage system at Rocky Reach Dam consists of a single fish ladder with three separate entrances, one entrance on each side of the powerhouse, and an additional entrance at the spillway. Water flow includes both pumped and gravity auxiliary water

sources. In 2003, from April 14 to August 19, 202 bull trout passed Rocky Reach Dam via the adult fishway (Chelan PUD 2003c). Most of these fish passed the dam in May and June, which is consistent with past observations of bull trout passing Rocky Reach. Mainstem migrations by adult bull trout in May and June are consistent with an adaptive behavior shown by other bull trout populations in the DPS to gain access to spawning tributaries that have reduced flows and suboptimal temperatures following the peak of the hydrograph in the spring (USFWS 2002b; Pratt and Houston 1993; Baxter 2002).

Some additional time is likely to be required for actively migrating bull trout to pass Rocky Reach Dam (BioAnalysts 2003). It is not clear, however, whether these bull trout required more time to find fishway entrances or whether these fish held up to take advantage of potential foraging opportunities in the tailrace. It is not known whether minimal passage delay results in late arrival at spawning locations and subsequently decreased spawning success, or increased adult mortality. However, the temporal distribution of bull trout spawning activity in the Wenatchee, Entiat, and Methow Rivers is within the ranges reported for other fluvial and adfluvial populations in the Columbia River Basin (USFWS 2002b; Pratt and Huston 1993; Fraley and Shepard 1989; Goetz 1989). In 2003, NOAA concluded that small delays for listed steelhead and spring chinook at Rocky Reach Dam and Rock Island Dam are compensated for by faster travel through the slower flowing reservoirs (NOAA 2003a). In addition, NOAA also concluded that any delays that do occur are more likely to affect species that spawn soon after completing their migration (summer/fall-run chinook salmon or sockeye salmon are more likely to be affected than those that hold in the rivers or streams for considerable periods of time prior to spawning). Lastly, NOAA wrote..... *"the effect of delays passing the fishway on Permit Species is likely non-existent for currently ESA-listed Permit Species and non-existent to very small for currently unlisted Permit Species. Thus the proposed action [continued operation of fishways] should have no effect, or a slight beneficial effect, on upstream migrating adults compared to the migration observed under unimpounded conditions."* (NOAA 2003a). Passage times for radio-tagged bull trout are comparable to those found for anadromous salmonids (Table 2) and similar effects for bull trout should be expected.

Table 2: Comparison of adult salmon, steelhead and bull trout median passage rates at Rock Island, Rocky Reach, and Wells dams.

	Median passage (hrs)		
	Rock Island	Rocky Reach	Wells
Bull trout	4-18	14	5-8
Spring chinook	20-39	31-37	27-29
Steelhead	4	13	12
Summer chinook	15	23-30	33-47
Fall chinook	19	60	31-46
Sockeye	17	36	5-21

Sources: Stuehrenberg et al. 1995; Swan et al. 1994; Alexander et al. 1998; English et al. 1998, 2001; BioAnalysts 2003.

The potential exists for adult bull trout migrating upstream through the fishladder to "fallback" through the dam, resulting in increased contact with structural features of the dam (spillways, turbines or fish ladders) and potential injury. "Fallback" is a term used to describe an undesirable effect on salmon and steelhead as they migrate past hydro dams, and is generally defined as voluntary or involuntary movement of a fish downstream past a dam once upstream passage has been achieved. Adult "fall back", and the associated effects documented for Pacific salmon and steelhead, may or may not affect bull trout in the same manner, given that bull trout may take advantage of forage opportunities both upstream and downstream of the project. No studies have been designed to specifically assess bull trout "fall back" at Rocky Reach Dam or other hydro facilities on the Columbia River.

It is likely that upstream movement of juvenile bull trout within the mainstem of the Columbia River may be impeded by the Project, however, no studies have been conducted to assess the ability of juvenile bull trout to successfully negotiate the adult fishway. Isolation of juveniles below the project may result in altered growth and survival due to differences in the abundance and location of prey and altered flow patterns. Life history traits may also be influenced by the lack of free movement throughout the system. Fish that may have exhibited a fluvial life history pattern could tend toward an adfluvial life history pattern due to changes in environmental factors. Genetic isolation is not anticipated as reproductive age class fish are able to negotiate the adult fishways.

Rock Island Project

The adult fish passage facilities at Rock Island Dam consist of a left and right bank ladder, and a center ladder located mid-river between spillbays 14 and 16. Each ladder has a single entrance at the tailrace and exit in the forebay. In 2003, 77 bull trout passed using the adult fish ladder facilities. Most of these fish passed the dam in May and June, which is consistent with past observations of bull trout passing Rock Island. Mainstem migrations in May and June by adult bull trout are consistent with adaptive behavior shown by other bull trout populations in the DPS to gain access to spawning tributaries that may have reduced flows and less than optimal temperatures following the peak of the hydrograph in the spring (USFWS 2002b; Pratt and Houston 1993; Baxter 2002).

A three year radio telemetry study conducted by Chelan PUD (BioAnalysts 2003) evaluated passage durations associated with bull trout movement past Rock Island Dam and through Rock Island Reservoir. In general, actively migrating fish (fish that had not been immediately tagged and released in the tailrace) required more time (mean = 1.56 days) to pass the dam and reach a fixed detection point inside the Wenatchee River, than for the same fish to reach the same fixed site once they exited the fish ladder in the Rock Island forebay (BioAnalysts, 2003). Although some additional time may be required for actively migrating bull trout to pass Rock Island Dam (BioAnalysts 2003), the short delay may or may not be bioenergetically or temporally significant to spawning migrations or spawning success. The temporal distribution of bull trout spawning in the Wenatchee and Entiat Rivers is within the ranges reported for other fluvial and adfluvial populations in

the Columbia River Basin (USFWS 2002b; Pratt and Huston 1993; Fraley and Shepard 1989; Goetz 1989). It is not clear whether bull trout monitored in the radio telemetry studies required more time to find fishway entrances or whether these fish voluntarily spent time below the dam to take advantage of potential foraging opportunities in the tailrace. There is no indication that passage delay results in late arrival at tributary spawning locations, decreased spawning success, or increased adult mortality.
The effects of adult "fallback", delays in upstream movement of adults, and impeded upstream passage of juveniles are similar to those discussed above for the Rocky Reach Project.

Wells Project

The majority of bull trout ascend Wells Dam during the months of May, June and July with the preponderance of these fish destined for the Methow River (BioAnalyst, 2002; BioAnalyst, 2003). Wells Dam has two adult fishways that are mirror image left and right bank fishway facilities. Each of the two fishways contains a single main entrance, a collection gallery, a fish ladder, an adult count station, trapping facilities, and an exit in the forebay adjacent to the earthen embankment section of the dam. Although under normal conditions it is likely that very few adult bull trout are directly killed or injured when traveling upstream through the adult fish ladders, the potential does exist for fish to come in contact with components of the fishways.

Similar to both the Rocky Reach and Rock Island Projects, the potential also exists for adult bull trout migrating upstream through the fishladder to "fallback" through the dam, resulting in increased contact with structural features of the dam (spillways, turbines or fish ladders) and potential injury. In addition to direct injury and mortality resulting from potential contact with structural elements within the fish ladder, upstream movement of bull trout may also be delayed. It is also likely that upstream movement of juvenile bull trout within the mainstem of the Columbia River may be impeded by the operation of Wells Dam.

4.4. Spillway Operation

The elevation of the Mid-Columbia reservoirs is generally regulated during high flow periods using spillway gates, which open individually and allow water to pass through separate spillway bays. The gates pass water seasonally that is surplus to power generation needs, or as directed by the HCP for assisting downstream migration of juvenile salmon and steelhead.

Chapman et al. (1994a; 1994b) concluded that spillways are currently the most benign routes for juvenile salmonids to pass the Mid-Columbia River dams. However, spill may result in supersaturated levels of TDG. Supersaturated gases in fish tissues tend to pass from the dissolved state to the gaseous phase as internal bubbles or blisters. This condition, called gas bubble trauma (GBT) or gas bubble disease (GBD), can be debilitating or even fatal. For these reasons, the Mid-Columbia PUDs limit voluntary spillway discharge levels during the fish passage season to ensure that TDG does not exceed 120% of saturation in Project tailraces, or 115% of saturation in project forebays

for more than 12 hours over a 24-hour period, or as otherwise ordered by TDG waivers issued by the Washington Department of Ecology. Due to these operational constraints, spill can be limited under normal operating conditions. In a regulated river environment, the ability of a fish to survive high TDG levels may depend on its ability to avoid supersaturated water conditions (Weitkamp and Katz 1980). Stevens et al. (1980) found that in laboratory conditions, coho, sockeye and chinook salmon smolts, and rainbow trout avoided water saturated at 125% to 145%. Avoidance behavior of saturated water was not as strongly correlated at levels reduced to 115%. Other laboratory and field experiments suggest that juvenile and salmonids will remain in deeper water, if it is available, to compensate for total gas pressure of 120% - 125% (Weitkamp and Katz 1980). Hydrostatic pressure at depth compensates for approximately 10% of gas saturation for each 1 meter of depth.

In a review of hydropower effects on bull trout, Miller and Hillman (1994) found no information on TDG effects on this species. Ryan et al. (2000) reported that 3.9% of all resident non-salmonid fish sampled in the lower Snake and mid-Columbia rivers, Washington, showed signs of gas bubble disease, and at continuous levels of 120 to 125 percent, approximately 5% showed signs of GBD. More recently, Weitkamp et al. (2003a; 2003b) studied fish behavior during high TDG periods in the Lower Clark Fork River, Idaho, and the effects of supersaturation and incidence of GBD on bull trout and other resident freshwater fish. During spill periods in 1999, TDG levels ranged between 120 and 130 percent of saturation continuously for nearly two months in May and June. Only 5.9 percent of all fish sampled (2,709) showed any signs of GBD. Eight bull trout captured by electrofishing (sampling efficient to only 6-7 feet of depth) during this period showed no signs of GBD; the highest incidence of GBD was observed in largescale suckers (14.3%) and yellow bullhead (11.4%) in 1999. During the 2000 spill season, TDG commonly spiked from 115 to 130 percent of saturation for a few hours on a daily basis; three bull trout captured in this period showed no signs of GBD. Very few (0.1%) of the fish sampled during the 2000 spill season showed any signs of GBD (Weitkamp 2003a). The mainstem Columbia River in the vicinity of the mid-Columbia Projects contains considerable habitat with depths exceeding 30 feet, which may provide adequate hydrostatic compensation for fish during the short periods when TDG levels exceed 120 percent of saturation. Therefore the adverse effects of spillway operations are likely to be insignificant.

4.5. Predator Control Program

It is anticipated that the activities associated with the avian control program are not likely to adversely affect bull trout, while the northern pikeminnow control program is likely to result in the injury or mortality of adult and juvenile bull trout.

Avian Predator Control Program

Avian control methods consist largely of land based activities that include gull wires installed across the project tailrace and pyrotechnics discharges to discourage predation on juvenile salmonid smolts. The avian control program may include lethal removal of birds each year when necessary. The marginal increase in human activity associated with

control measures on the reservoirs is not likely to adversely affect bull trout. The avian control measures are likely to have a slight beneficial effect on juvenile bull trout by reducing their likelihood for depredation while near the project facilities.

Northern Pikeminnow Control Program

Rocky Reach and Rock Island Projects

Direct effects to individual bull trout from the Chelan PUD pikeminnow predator control program will likely occur through immediate or delayed hooking mortality. Terminal gear in the rod and reel fishery typically consists of a beaded spinner with a #4 single barbed hook. Live bait (worms) and artificial plastics are added to the hook. Terminal gear in the long-line fishery typically consists of size #6 hooks baited with worms. From 1996 through 2003, 7 bull trout have been caught in the combined fishery (both Rocky Reach and Rock Island) in more than 55,000 hours of rod effort. These fish were all released alive. No bull trout have been caught since 1998. No bull trout have ever been caught in Rocky Reach Reservoir on long line gear (Chelan PUD 2003c, 2003d).

Wells Project

The Douglas PUD pikeminnow control program relies exclusively upon the use of long-lines placed on the bottom of the Columbia River immediately below Wells Dam and in Lake Pateros. Gabions attached to the long-lines are tied with short, ultra-light monofilament line baited with small crickets. This particular fishing technique is highly effective at catching pikeminnow while minimizing the incidence of non-target resident and anadromous fish species (Jerald, 2003). Direct effects to individual bull trout from the Douglas PUD funded pikeminnow control program could occur through both immediate or delayed hooking mortality. During the 9 years of the pikeminnow control program at Wells Dam the pikeminnow control program has removed over 64,000 adult pikeminnow and has not captured a single adult or juvenile bull trout (Douglas PUD 2003).

NOAA (NMFS 1998) determined that the pikeminnow removal program resulted in a net benefit to listed anadromous Columbia River salmonids. Continued implementation of the pikeminnow removal programs may also provide some benefit to bull trout populations in the action area by increasing survival of juvenile salmon and thereby increasing a potential prey base for bull trout in the mainstem Columbia and tributaries. Continued removal of pikeminnow may also reduce predation on juvenile adfluvial bull trout as these fish finish their rearing stage in tributaries and enter mainstem Columbia River habitats.

4.6. Tributary Conservation Plan

Some direct and indirect effects on bull trout are likely to occur resulting from implementation of actions funded by the Tributary Conservation Plan. However, any actions authorized by the Tributary Committees that may affect bull trout or proposed bull trout critical habitat will require the FERC, under the proposed action, to complete a separate ESA Section 7(a)(2) consultation and/or conference prior to implementation.

The premise of the Tributary Conservation Plans is protection of existing productive habitat and restoration of high priority habitat by restoring, when practical, natural processes that, over time, will create and maintain suitable habitat conditions without human intervention. The Tributary Conservation Plans will fund third party conservation efforts in the Wenatchee, Entiat, and Methow, and Okanogan river basins. Habitat restoration projects and plans to purchase conservation easement or land in fee will be submitted to the tributary conservation plan committees. Examples of projects to be funded by the Tributary Conservation Plans may include, but are not limited to, 1) providing access to currently blocked stream sections or oxbows, 2) removing dams or other passage barriers on tributary streams, 3) improving or increasing the hiding and resting cover habitat that is essential for anadromous species during their relatively long adult holding period, 4) improving in-stream flow conditions by correcting problematic water diversion or withdrawal structures, or 5) purchasing (or leasing on a long-term basis) conservation easements to protect or restore important aquatic habitat and shoreline areas.

The Tributary Coordinating Committees will decide if the projects meet criteria for funding. Projects will have to be reviewed by state and federal agencies to receive permits for construction projects. Habitat preservation projects will likely benefit bull trout through the protection of proposed critical habitat found within Wenatchee and Methow River bull trout Core Areas (USFWS 2002). Projects that may increase in-stream flow volume in the Methow Basin will benefit all life stages of bull trout by improving access through migration corridors, pool depth, in-stream cover, and preferred water temperatures.

Habitat restoration projects are likely to require a period of construction that may result in short term disturbances such as noise, increased turbidity, and disturbance associated with increased human presence. These projects are expected to result in positive benefits for bull trout if additional aquatic habitat is created by the project or if upstream migration barriers are removed allowing bull trout access back into historically utilized watersheds. Passage barrier removal could potentially introduce brook trout to isolated stream reaches where only resident bull trout exist. Any passage barrier which controls the upstream distribution of migratory bull trout, salmon or steelhead would likely act as a barrier to brook trout. Resident bull trout have been identified in the Chiwawa River, the Icicle River above the Leavenworth Fish Hatchery, and the Little Wenatchee River in the Wenatchee River Subbasin; and in the upper Twisp River, Buttermilk, Goat, and Early Winters Creeks in the Twisp Subbasin (USFWS 2002). No streams have been specifically identified in the action area to contain only resident bull trout above a fish passage barrier (USFWS 2002). Habitat improvement projects that involve removal of fish barriers should verify the presence or absence of resident bull trout and brook trout before any barrier is removed.

Some potential activities (e.g., removal of large stream channel blockages or reconnecting side channels, etc.), are likely to produce short-term unavoidable negative effects (e.g. temporary increases in sediment loads and turbidity, etc.) but result in long-term benefits to bull trout as a result of funding restoration projects in the Wenatchee,

Okanogan, Entiat, or Methow Rivers. Actions proposed under the authority of the Tributary Conservation Plans that have the potential to disturb bull trout or bull trout habitat will be required to complete a separate ESA Section 7(a)(2) consultation prior to implementation.

4.7. Hatchery Compensation Plan

Hatchery propagation programs are likely to provide some benefit to bull trout populations by increasing densities of a historically important prey item (smolts) in tributaries and mainstem habitats. However, potential adverse impacts identified in conjunction with the Hatchery Compensation Plans include impacts from water withdrawal, release of hatchery effluent, and operation of broodstock traps. Hatchery evaluation activities including spawning ground surveys, snorkel surveys and smolt trap operation also may result in the harassment or capture of migratory bull trout. The operation of the broodstock trapping facilities and hatchery evaluation activities (spawning ground surveys, snorkel surveys and smolt trap operation) is conducted by the Washington Department of Fish and Wildlife. These activities have previously undergone consultation and are authorized under an ESA Section 6(c)(1) permit issued by the Service on February 14, 2000 (permit # 6007.2100). Therefore, adverse effects of interest in this consultation are restricted to those associated with water withdrawal and release of hatchery effluent.

Water withdrawal for hatcheries located within the spawning and/or rearing areas can diminish stream flow from points of intake to outflow and, if great enough, can impede migration and affect spawning behavior. Hatchery facilities operating to carry out the proposed programs rely largely on ground water withdrawal. Hatchery operators are required to comply with water right permits administered by Washington Department of Ecology established for each hatchery or acclimation site. This is intended to prevent over-appropriation of surface water needed for natural fish production and migration. Hatchery facilities are also required to maintain all screens associated with water intakes in surface water areas to NOAA Fisheries screening criteria.

Hatchery effluent may transport pathogens (disease) out of the hatchery and infect bull trout. Hatcheries and fish rearing facilities supporting the Hatchery Compensation Plans are all operated in accordance with state and federal water pollution regulations. Each facility operates under a National Pollutant Discharge Elimination System (NPDES) permit which specifies discharge requirements, in accordance with finfish culture specifications. The U.S. EPA has delegated responsibility to administer the NPDES permit program to the state of Washington on the basis of RCW 90.48, which defines the Department of Ecology's authority and obligations in administering the discharge permit program. Washington has issued a general state NPDES permit, renewed in April, 2000, that sets wastewater limits and sampling requirements for use of fish treatment drugs and chemicals. The Service finds that adherence to water right limits, water quality NPDES permits, and NOAA Fisheries intake screening criteria are sufficient measures to protect bull trout within the action area from these effects.

4.8. Effects to Proposed Critical Habitat

The proposed action will have the following effects on the PCEs present in the action area.

PCE 1: Permanent water having low levels of contaminants: Implementation of the proposed action is not expected to affect this element. None of the proposed activities will result in a reduction of the amount of permanent water within the tributary systems nor will they contribute additional contaminants.

PCE 2: Water Temperatures ranging from 2 to 15 degrees C: This element is currently present in some segments of the tributary portions of the action area. Activities associated with the Tributary Conservation Plan may positively affect this element through stream restoration projects and riparian area enhancement.

PCE 3: Complex stream channels features such as large woody debris, side channels, and undercut banks: This element is currently present only in the tributary portions of the action area. Implementation of the proposed action is expected to contribute towards maintenance or enhancement of this element. Activities associated with the Tributary Conservation Plan may positively affect this element through stream restoration projects and riparian area enhancement.

PCE 4: Substrate of sufficient amount, size, and composition: This element is currently present in some segments of the tributary portions of the action area. Implementation of restoration activities under the Tributary Conservation Plan are expected to contribute towards maintenance or enhancement of this element.

PCE 5: A natural hydrograph, including peak, high, low, and base flows within historic ranges: This element is currently present in some segments of the tributary portions of the action area. Implementation of restoration activities under the Tributary Conservation Plan are expected to contribute towards maintenance or enhancement of this element.

PCE 6: Springs, seeps, groundwater sources, and subsurface water connectivity to contribute to water quality and quantity: This element is present in the action area. Implementation of the proposed action is not expected to affect this element.

PCE 7: Migratory corridors with minimal physical, biological, or chemical barriers between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows: Functional migratory corridors are present in both the mainstem and tributary portions of the action area. Within the tributaries, summer high water temperatures and manmade physical barriers may affect the migratory ability of bull trout. Implementation of restoration activities under the Tributary Conservation Plan are expected to contribute towards maintenance of current condition or enhancement of this element. While the mainstem

Columbia River currently functions as a migratory corridor, that function is impaired by the continued operation of the Rocky Reach, Rock Island and Wells Projects. Implementation of the proposed actions is expected to perpetuate the currently degraded condition.

PCE 8: An abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish: An abundant food base is present in the action area. Hatchery propagation programs may benefit bull trout populations by increasing densities of a historically important prey item (smolts) in tributaries and mainstem habitats. Stream restoration and riparian area enhancement projects may enhance the availability of prey items for bull trout in the tributary portions of the action area. Implementation of the proposed action is expected to maintain or enhance the condition of this PCE.

PCE 9: Few or no predatory, interbreeding, or competitive nonnative species present: This element is currently present only in the tributary portions of the action area. Implementation of the proposed action is not expected to affect this element.

5. Cumulative Effects

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The Service is not aware of any specific future actions that are reasonably certain to occur and which are likely to adversely affect bull trout in the Action Area. However, as the human population in the State continues to grow residential growth and demand for dispersed and developed recreation is reasonably certain to occur. This trend is likely to result in increasing habitat degradation from riparian road construction, levee building, bank armoring, and campsite development on private lands. These activities tend to remove riparian vegetation, disconnect rivers from their floodplains, interrupt groundwater-surface water interactions, reduce stream shade (and increase stream temperature), reduce off-channel rearing habitat, and reduce the opportunity for large woody debris recruitment. There has been an increase in conversions of agricultural lands to residential development along the shoreline. The area is also experiencing a 2.7 compound growth rate (FERC 1995). Although the entire shoreline of the Columbia River is designated as a shoreline of statewide significance, the residential portions of the shoreline consist primarily of lawns, retaining walls and boat docks (FERC 1995). There are also two highways routed along the Columbia River (Hwy 2 and 97) and several bridges that span the pools.

As this area experiences growth, we are reasonably certain that there will be increased spills of hazardous chemicals along the transportation corridors, a continuation of farming practices that load sediments and deposit pesticides into the river, and additional

septic systems that will increase nutrient levels within the tributaries and along the Columbia River. Each subsequent action by itself may have only a small incremental effect, but taken together they may have a substantive effect that would further degrade the watershed's environmental baseline and undermine the improvements in habitat conditions necessary for listed species to survive and recover. Watershed assessments and other education programs may reduce these adverse effects by continuing to raise public awareness about the potentially detrimental effects of residential development and recreation on salmonid habitats and by presenting ways in which a growing human population and healthy fish populations can co-exist.

6. Conclusion

After reviewing the current status of the bull trout, the environmental baseline, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Columbia River distinct population segment of the bull trout. After reviewing the current status of proposed bull trout critical habitat, the environmental baseline, the effects of the proposed action, and cumulative effects, it is the Service's conference opinion that the action, as proposed, is not likely to destroy or adversely modify proposed critical habitat. The Service makes these determinations based on the following reasons:

- The effects of the proposed action do not preclude us from meeting the conservation needs of the bull trout.

- There are no direct impacts to spawning habitat. Indirect impacts are not expected to have any measurable effect on bull trout reproduction. Improved passage and survival conditions for anadromous fishes at the Projects, in conjunction with implementation of the Hatchery and Tributary Compensation Plans, should work to improve overall stream productivity relative to baseline conditions, and may eventually express a positive effect on bull trout reproduction and numbers.

- At present, there is no verifiable reduction in bull trout range that can be attributed to continued operation of the Rocky Reach, Rock Island and Wells Projects, although volitional passage is likely to be inhibited.

- The condition of the PCE's of proposed bull trout critical habitat will be maintained or enhanced as a result of implementation of the proposed action.

INCIDENTAL TAKE STATEMENT
For the
Rocky Reach Project

1. Introduction

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by FERC so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. FERC has a continuing duty to regulate the activity covered by this incidental take statement. If FERC (1) fails to assume and implement the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, FERC must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [(50 CFR§402.14(i)(3)].

2. Anticipated Amount or Extent of Take of Bull Trout

The Service anticipates the following amount and types of take, by project element:

2.1 Turbine Operation

As stated in the analysis of project effects, there is currently little information available on the incidence of bull trout mortality attributable to turbine operation at the three dams addressed in the accompanying biological/conference opinion. However, bull trout have been documented passing through the turbines and it is reasonable to deduce that some percentage of those individuals attempting to navigate the turbines will be struck by the turbine structures and killed. It is also likely that bull trout that successfully navigate the turbines may be subject to increased susceptibility to predation caused by disorientation

following turbine passage or increased susceptibility to infection caused by scale loss or non-lethal wounds incurred during turbine passage. Nevertheless, a total of eight adult radio tagged bull trout moved downstream past Rocky Reach Dam during telemetry studies in from 2001 through 2003, and no mortalities were observed (BioAnalysts 2002, 2003).

The Service anticipates incidental take of bull trout will be difficult to quantify or detect for the following reasons: 1) the limited scope, timing, and sampling locations of existing monitoring programs which may detect predation of bull trout, 2) finding dead or impaired specimens is unlikely because of water depth and scavengers, and 3) injuries or trauma caused by attempted predation, which cause reduced survival of bull trout would be virtually undetectable. However, the level of take of this species can be anticipated by the loss of individuals that are monitored through the use of radio-tags (or other similar tracking technology that may be employed in the future) because mortality of these individuals is detectable. Based on survival estimates from anadromous fish passage studies, the Service anticipates that no more than 5 percent of radio-tagged (or other similar tracking technology that may be employed in the future) bull trout passing through turbines will be killed by the turbine operation. The Service anticipates that 100 percent of the bull trout passing through the turbines will be harassed.

2.2 Juvenile Bypass Operation

As stated in the analysis of project effects, operation of the juvenile bypass facilities may result in the entrainment and capture of adult and juvenile bull trout resulting in injury or mortality due to handling or contact with structures within the bypass and the associated juvenile sampling facilities.

The Service anticipates incidental take of bull trout will be difficult to quantify or detect for the following reasons: 1) the limited scope, timing, and sampling locations of existing monitoring programs which may detect predation of bull trout, 2) finding dead or impaired specimens is unlikely because of water depth and scavengers, and 3) injuries or trauma caused by attempted predation or competition, which cause reduced survival of bull trout would be virtually undetectable. However, the level of take of this species can be anticipated by the loss of individuals that are monitored through the use of radio-tags (or other similar tracking technology that may be employed in the future) because mortality of these individuals is detectable. Based on survival estimates from anadromous fish passage studies, the Service anticipates that no more than 2 percent of radio-tagged (or other similar tracking technology that may be employed in the future) bull trout passing through the juvenile bypass facilities will be injured or killed. We expect all bull trout that pass through the facilities will be harassed.

2.3 Adult Fishway Operation

As stated in the analysis of project effects, operation of the adult fishways is likely to result in delays in upstream movement of adult bull trout, impeded upstream passage of juveniles, and injury or mortality of adults due to contact with structures within the

fishways and "fallback". The Service anticipates incidental take of bull trout will be difficult to quantify or detect for the following reasons: 1) the limited scope, timing, and sampling locations of existing monitoring programs which may detect predation of bull trout, 2) finding dead or impaired specimens is unlikely because of water depth and scavengers, and 3) injuries or trauma caused by attempted predation or competition, which cause reduced survival of bull trout would be virtually undetectable. However, the level of take of this species can be anticipated by the loss of individuals that are monitored through the use of radio-tags (or other similar tracking technology that may be employed in the future) because mortality of these individuals is detectable. Based on survival estimates from anadromous fish passage studies, the Service anticipates that no more than 2 percent of radio-tagged (or other similar tracking technology that may be employed in the future) bull trout passing the facilities will be injured or killed as a result of the proposed action.

2.4 Spillway Operation

As stated in the analysis of project effects, operation of the spillways may result in supersaturated levels of total dissolved gasses. Supersaturated gases in fish tissues tend to pass from the dissolved state to the gaseous phase as internal bubbles or blisters. This condition, called gas bubble trauma (GBT) or gas bubble disease (GBD), can be debilitating or even fatal. Injury and mortality of bull trout may also occur as a result of contact with spillway structures. It is also likely that bull trout that successfully pass through the spillway may be subject to increased susceptibility to predation caused by disorientation or increased susceptibility to infection caused by scale loss or non-lethal wounds incurred during spillway passage.

The Service anticipates incidental take of bull trout will be difficult to quantify or detect for the following reasons: 1) the limited scope, timing, and sampling locations of existing monitoring programs which may detect predation of bull trout, 2) finding dead or impaired specimens is unlikely because of water depth and scavengers, and 3) injuries or trauma caused by attempted predation or competition, which cause reduced survival of bull trout would be virtually undetectable. However, the level of take of this species can be anticipated by the loss of individuals that are monitored through the use of radio-tags (or other similar tracking technology that may be employed in the future) because mortality of these individuals is detectable. Based on survival estimates from anadromous fish passage studies, the Service anticipates that no more than 2 percent of radio-tagged (or other similar tracking technology that may be employed in the future) bull trout passing the facilities via the spillways will be injured or killed as a result of the proposed action. We expect all bull trout that pass through the spillways will be harassed.

2.5 Predator Control Program

As stated in the analysis of project effects, the Service anticipates that the activities associated with the northern pikeminnow removal program will result in the mortality of no more than two individual bull trout. Data accumulated over the course of the current pikeminnow control program indicate the likelihood of injury or mortality is extremely small (Chelan PUD 2003c, 2003d; Douglas PUD 2003).

2.6 Tributary Conservation Plan

This project element is the adoption of a plan which does not contain specific information concerning the location, timing, or duration of specific activities. The amount of incidental take of bull trout, if any, is critically dependent upon implementation decisions that have not yet been made. Therefore, the exemption from take prohibitions, allowed under the terms of section 7(o)(2) of the Act, is not provided in this Incidental Take Statement. Actions authorized by the Tributary Committees that may affect bull trout or proposed bull trout critical habitat will require the FERC, under the proposed action, to complete a separate ESA Section 7(a)(2) consultation and/or conference prior to implementation.

2.7 Hatchery Compensation Plan

This project element is the adoption of a plan which does not contain specific information concerning the location, timing, or duration of specific activities. The amount of incidental take of bull trout, if any, is critically dependent upon implementation decisions that have not yet been made. Therefore, the exemption from take prohibitions, allowed under the terms of section 7(o)(2) of the Act, is not provided in this Incidental Take Statement. Actions authorized by the Hatchery Committees that may affect bull trout or proposed bull trout critical habitat will require the FERC, under the proposed action, to complete a separate ESA Section 7(a)(2) consultation and/or conference prior to implementation.

3. Effect of the Take

In the accompanying Biological Opinion, the Service determined that this level of anticipated take is not likely to jeopardize the continued existence of the Columbia River distinct population segment of the bull trout, and is not likely to destroy or adversely modify proposed critical habitat.

4. Reasonable and Prudent Measures

The Service believes that the following reasonable and prudent measures are necessary and appropriate to minimize take of bull trout.

RPM 1. FERC shall require the licensee to develop and implement, in coordination with the Service, appropriate measures to reduce impediments to up and downstream passage of adult and juvenile bull trout at Rocky Reach Dam and its associated reservoir system.

As stated in the analysis of project effects, continued operation of the Project will result in delays in upstream and downstream movement of adult bull trout, impeded upstream passage of juveniles, and injury or mortality of adults and juveniles due to contact with structures within the turbines, juvenile bypass system, spillways, and adult fishways. Implementation of measures to reduce impediments to upstream and downstream passage will minimize the take of bull trout. Should measures to reduce impediments to up- and downstream passage of bull trout warrant consideration of additional modifications to facilities or operations, as determined by the Service in consultation with FERC and the licensee, the Service will work with FERC and the licensee to insure these measures are implemented, as appropriate, or recommend that FERC reinitiate consultation if necessary.

RPM 2. FERC shall require the licensee to design a monitoring program to (1) detect adverse effects resulting from the proposed action, (2) assess the actual level of incidental take in comparison with the anticipated incidental take level documented in the biological opinion, (3) detect when the level of anticipated incidental take is exceeded, and (4) determine the effectiveness of reasonable and prudent measures and their implementing terms and conditions. Specifically, the program shall be designed to monitor the abundance, distribution, and timing of adult and juvenile bull trout utilizing Rocky Reach Dam and its associated reservoir system. Implementation of this monitoring program shall begin no later than May 1, 2005. Due to the scarcity of information regarding the dynamics of bull trout within the action area, the take exemptions addressed previously were based upon current project survival estimates for anadromous fish. Because this surrogate measure was used, establishment of a bull trout monitoring program is essential to ensure that project effects do not exceed anticipated levels. If information from the monitoring efforts warrants consideration of additional modifications to facilities or operations for the minimization of project effects on bull trout, as determined by the Service in consultation with FERC and the licensee, the Service will work with FERC and the licensee to insure these measures are implemented, as appropriate, or recommend that FERC reinitiate consultation if necessary.

5. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the action agency must comply with the following terms and conditions, which implement the reasonable and prudent measures, described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

The Service believes the following terms and conditions are necessary and appropriate to minimize the take of listed bull trout:

1. To implement RPM 1, FERC shall require the licensee to develop, in coordination with the Service, a prioritized list of monitoring efforts necessary to evaluate the effects of the Project on the up- and downstream passage needs of bull trout at Rocky Reach Dam by February 28, 2005. Based on that prioritized list, the licensee shall then be required to

initiate studies to evaluate the up- and downstream passage needs for bull trout at Rocky Reach Dam and to assess the Project impacts on those passage needs. If the information from these studies warrants consideration of modifications to facilities or operations to reduce the take of bull trout, as determined by the Service in consultation with FERC and the licensee, then the Service will work with FERC and the licensee to ensure that these measures are implemented, as appropriate, or recommend that FERC reinitiate consultation if necessary.

2. To implement RPM 1, FERC shall require the licensee to, in coordination with the Service, develop a prioritized list of monitoring efforts necessary to determine the extent of bull trout entrainment through the turbines at Rocky Reach Dam by February 28, 2005. If the studies contained in the prioritized list are determined by the Service, in consultation with FERC and the licensee, to be feasible, the licensee shall be required to assess the extent of bull trout entrainment through the turbines at Rocky Reach Dam. If entrainment is determined to be significant, the licensee will be required to explore techniques to minimize bull trout entrainment through the turbines.

3. To implement RPM 2, FERC shall require the licensee to, in coordination with the Service, develop and implement a comprehensive bull trout monitoring program, that includes the presence of a sufficient number of radio-tagged (or other appropriate tracking technology) bull trout, to enable monitoring of bull trout utilizing Rocky Reach Dam and its associated reservoir system and tracking of the incidental take exemptions stated above.

4. During the interim period between FERC's issuance of the license amendment and the implementation of the monitoring plan called for in RPM 2, the licensee shall be required to implement the action items agreed to during a February 19, 2004 meeting between the licensee and the Service. Specifically, these items are:

1. Continue assessment of the Rocky Reach juvenile bypass system on migratory bull trout and juvenile bull trout where feasible.
2. Extend fish ladder monitoring period to assess adult bull trout utilization of existing fishways outside the traditional migratory timeframes.
3. Continue coordinated telemetry monitoring of radio-tagged bull trout.
4. Compile project operational data linked to timeframes when adult migratory bull trout pass project powerhouses and/or spill gates.
5. Cost share funding with the Service for analysis of genetic samples from fluvial bull trout sampled during the first year of the Mid-Columbia Bull Trout Study.
6. Participate in a coordinated effort with the Service to increase the informational database for adult bull trout that utilize the Methow/Twisp river system.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of

consultation and review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

6. Reporting Requirements

In order to monitor the impacts of implementation of the reasonable and prudent measures, FERC shall prepare annual reports describing the progress of the proposed Projects, including implementation of the associated terms and conditions, and impacts to bull trout (50 CFR § 402.14(I)(3)). The report, which shall be submitted to the Central Washington Field Office shall list and describe the adverse effects resulting from Project activities including the number and life stages of individuals affected.

Upon locating a dead, injured, or sick endangered or threatened species specimen, initial notification must be made to the Central Washington Field Office (Wenatchee, Washington; telephone 509-664-0658) within 48 hours. The Service, in conjunction with the licensee, shall determine if the mortality is attributable to Project effects. Care should be taken in handling sick or injured specimens to ensure effective treatment and care or the handling of dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered species or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by the Service to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. The Service recommends that in the development of the monitoring plans called for in the terms and conditions of this incidental take statement, the licensee engage in a collaborative process with the Service, NOAA Fisheries, Washington Department of Fish and Wildlife, relevant tribes, or any other entities they deem appropriate.

2. The Service recommends that the licensee continue to participate in development and implementation (when completed) of the bull trout recovery plan.

3. The Service recommends that the licensee continue monitoring TDG levels, and invest in facility improvements to keep TDG levels at or below 110% (or other applicable state water quality standards).

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects, or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

RE-INITIATION NOTICE

This concludes formal consultation and conference on the actions outlined in the request. As provided in 50 CFR §402.16, reinitiating of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

You may ask the Service to confirm the conference opinion as a biological opinion issued through formal consultation if final critical habitat for bull trout is designated. The request must be in writing. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the conference opinion as the biological opinion on the project and no further section 7 consultation will be necessary.

After designation of critical habitat for bull trout and any subsequent adoption of this conference opinion, the Federal agency shall request reinitiation of consultation if: (1) the amount of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect the species or critical habitat in a manner or to an extent not considered in this conference opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the species or critical habitat that was not considered in this conference opinion; (4) a new species is listed or critical habitat is designated that may be affected by the action.

INCIDENTAL TAKE STATEMENT
For the
Rock Island Project

1. Introduction

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by FERC so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. FERC has a continuing duty to regulate the activity covered by this incidental take statement. If FERC (1) fails to assume and implement the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, FERC must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [(50 CFR§402.14(i)(3)].

2. Anticipated Amount or Extent of Take of Bull Trout

The Service anticipates the following amount and types of take, by project element:

2.1 Turbine Operation

As stated in the analysis of project effects, there is currently little information available on the incidence of bull trout mortality attributable to turbine operation at the three dams addressed in the accompanying biological/conference opinion. However, bull trout have been documented passing through the turbines and it is reasonable to deduce that some percentage of those individuals attempting to navigate the turbines will be struck by the turbine structures and killed. It is also likely that bull trout that successfully navigate the turbines may be

subject to increased susceptibility to predation caused by disorientation following turbine passage or increased susceptibility to infection caused by scale loss or non-lethal wounds incurred during turbine passage.

The Service anticipates incidental take of bull trout will be difficult to quantify or detect for the following reasons: 1) the limited scope, timing, and sampling locations of existing monitoring programs which may detect predation of bull trout, 2) finding dead or impaired specimens is unlikely because of water depth and scavengers, and 3) injuries or trauma caused by attempted predation, which cause reduced survival of bull trout would be virtually undetectable. However, the level of take of this species can be anticipated by the loss of individuals that are monitored through the use of radio-tags (or other similar tracking technology that may be employed in the future) because mortality of these individuals is detectable. Based on survival estimates from anadromous fish passage studies, the Service anticipates that no more than 5 percent of radio-tagged (or other similar tracking technology that may be employed in the future) bull trout passing through turbines will be killed by the turbine operation. The Service anticipates that 100 percent of the bull trout passing through the turbines will be harassed.

2.2 Juvenile Bypass Operation

As stated in the analysis of project effects, operation of the juvenile bypass facilities may result in the entrainment and capture of adult and juvenile bull trout resulting in injury or mortality due to handling or contact with structures within the bypass and the associated juvenile sampling facilities.

The Service anticipates incidental take of bull trout will be difficult to quantify or detect for the following reasons: 1) the limited scope, timing, and sampling locations of existing monitoring programs which may detect predation of bull trout, 2) finding dead or impaired specimens is unlikely because of water depth and scavengers, and 3) injuries or trauma caused by attempted predation or competition, which cause reduced survival of bull trout would be virtually undetectable. However, the level of take of this species can be anticipated by the loss of individuals that are monitored through the use of radio-tags (or other similar tracking technology that may be employed in the future) because mortality of these individuals is detectable. Based on survival estimates from anadromous fish passage studies, the Service anticipates that no more than 2 percent of radio-tagged (or other similar tracking technology that may be employed in the future) bull trout passing through the juvenile bypass facilities will be injured or killed. We expect all bull trout that pass through the facilities will be harassed.

2.3 Adult Fishway Operation

As stated in the analysis of project effects, operation of the adult fishways is likely to result in delays in upstream movement of adult bull trout, impeded upstream passage of juveniles, and injury or mortality of adults due to contact with structures within the fishways and "fallback".

The Service anticipates incidental take of bull trout will be difficult to quantify or detect for the following reasons: 1) the limited scope, timing, and sampling locations of existing monitoring programs which may detect predation of bull trout, 2) finding dead or impaired specimens is unlikely because of water depth and scavengers, and 3) injuries or trauma caused by attempted predation or competition, which cause reduced survival of bull trout would be virtually undetectable. However, the level of take of this species can be anticipated by the loss of individuals that are monitored through the use of radio-tags (or other similar tracking technology that may be employed in the future) because mortality of these individuals is detectable. Based on survival estimates from anadromous fish passage studies, the Service anticipates that no more than 2 percent of radio-tagged (or other similar tracking technology that may be employed in the future) bull trout passing the facilities will be injured or killed as a result of the proposed action.

2.4 Spillway Operation

As stated in the analysis of project effects, operation of the spillways may result in supersaturated levels of total dissolved gasses. Supersaturated gases in fish tissues tend to pass from the dissolved state to the gaseous phase as internal bubbles or blisters. This condition, called gas bubble trauma (GBT) or gas bubble disease (GBD), can be debilitating or even fatal. Injury and mortality of bull trout may also occur as a result of contact with spillway structures. It is also likely that bull trout that successfully pass through the spillway may be subject to increased susceptibility to predation caused by disorientation or increased susceptibility to infection caused by scale loss or non-lethal wounds incurred during spillway passage.

The Service anticipates incidental take of bull trout will be difficult to quantify or detect for the following reasons: 1) the limited scope, timing, and sampling locations of existing monitoring programs which may detect predation of bull trout, 2) finding dead or impaired specimens is unlikely because of water depth and scavengers, and 3) injuries or trauma caused by attempted predation or competition, which cause reduced survival of bull trout would be virtually undetectable. However, the level of take of this species can be anticipated by the loss of individuals that are monitored through the use of radio-tags (or other similar tracking technology that may be employed in the future) because mortality of these individuals is detectable. Based on survival estimates from anadromous fish passage studies, the Service anticipates that no more than 2 percent of radio-tagged (or other similar tracking technology that may be employed in the future) bull trout passing the facilities via the spillways will be injured or killed as a result of the proposed action. We expect all bull trout that pass through the spillways will be harassed.

2.5 Predator Control Program

As stated in the analysis of project effects, the Service anticipates that the activities associated with the northern pikeminnow removal program will result in the mortality of no more than two individual bull trout. Data accumulated over the course of the current pikeminnow control program indicate the likelihood of injury or mortality is extremely small (Chelan PUD 2003c, 2003d; Douglas PUD 2003).

2.6 Tributary Conservation Plan

This project element is the adoption of a plan which does not contain specific information concerning the location, timing, or duration of specific activities. The amount of incidental take of bull trout, if any, is critically dependent upon implementation decisions that have not yet been made. Therefore, the exemption from take prohibitions, allowed under the terms of section 7(o)(2) of the Act, is not provided in this Incidental Take Statement. Actions authorized by the Tributary Committee that may affect bull trout or proposed bull trout critical habitat will require the FERC, under the proposed action, to complete a separate ESA Section 7(a)(2) consultation and/or conference prior to implementation.

2.7 Hatchery Compensation Plan

This project element is the adoption of a plan which does not contain specific information concerning the location, timing, or duration of specific activities. The amount of incidental take of bull trout, if any, is critically dependent upon implementation decisions that have not yet been made. Therefore, the exemption from take prohibitions, allowed under the terms of section 7(o)(2) of the Act, is not provided in this Incidental Take Statement. Actions authorized by the Hatchery Committee that may affect bull trout or proposed bull trout critical habitat will require the FERC, under the proposed action, to complete a separate ESA Section 7(a)(2) consultation and/or conference prior to implementation.

3. Effect of the Take

In the accompanying Biological Opinion, the Service determined that this level of anticipated take is not likely to jeopardize the continued existence of the Columbia River distinct population segment of the bull trout, and is not likely to destroy or adversely modify proposed critical habitat.

4. Reasonable and Prudent Measures

The Service believes that the following reasonable and prudent measures are necessary and appropriate to minimize take of bull trout.

RPM 1. FERC shall require the licensee to develop and implement, in coordination with the Service, appropriate measures to reduce impediments to up and downstream passage of adult and juvenile bull trout at Rock Island Dam and its associated reservoir system. As stated in the analysis of project effects, continued operation of the Project will result in delays in upstream and downstream movement of adult bull trout, impeded upstream passage of juveniles, and injury or mortality of adults and juveniles due to contact with structures within the turbines, juvenile bypass system, spillways, and adult fishways. Implementation of measures to reduce impediments to upstream and downstream passage will minimize the take of bull trout. Should measures to reduce impediments to up- and downstream passage of bull trout warrant consideration of additional modifications to facilities or operations, as determined by the Service in consultation with FERC and the

licensee, the Service will work with FERC and the licensee to insure these measures are implemented, as appropriate, or recommend that FERC reinitiate consultation if necessary.

RPM 2. FERC shall require the licensee to develop a monitoring program to (1) detect adverse effects resulting from the proposed action, (2) assess the actual level of incidental take in comparison with the anticipated incidental take level documented in the biological opinion, (3) detect when the level of anticipated incidental take is exceeded, and (4) determine the effectiveness of reasonable and prudent measures and their implanting terms and conditions. Specifically, the program shall be designed to monitor the abundance, distribution, and timing of adult and juvenile bull trout utilizing Rock Island Dam and its associated reservoir system. Implementation of this monitoring program shall begin no later than May 1, 2005. Due to the scarcity of information regarding the dynamics of bull trout within the action area, the take exemptions addressed previously were based upon current project survival estimates for anadromous fish. Because this surrogate measure was used, establishment of a bull trout monitoring program is essential to ensure that project effects do not exceed anticipated levels. If information from the monitoring efforts warrants consideration of additional modifications to facilities or operations for the minimization of project effects on bull trout, as determined by the Service in consultation with FERC and the licensee, the Service will work with FERC and the licensee to insure these measures are implemented, as appropriate, or recommend that FERC reinitiate consultation if necessary.

5. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the action agency must comply with the following terms and conditions, which implement the reasonable and prudent measures, described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

The Service believes the following terms and conditions are necessary and appropriate to minimize the take of listed bull trout:

1. To implement RPM 1, FERC shall require the licensee to develop, in coordination with the Service, a prioritized list of monitoring efforts necessary to evaluate the effects of the Project on the up- and downstream passage needs of bull trout at Rock Island Dam by February 28, 2005. Based on that prioritized list, the licensee shall then be required to initiate studies to evaluate the up- and downstream passage needs for bull trout at Rock Island Dam and to assess the Project impacts on those passage needs. If the information from these studies warrants consideration of modifications to facilities or operations to reduce the take of bull trout, as determined by the Service in consultation with FERC and the licensee, then the Service will work with FERC and the licensee to ensure that these measures are implemented, as appropriate, or recommend that FERC reinitiate consultation if necessary.

2. To implement RPM 1, FERC shall require the licensee to, in coordination with the Service, develop a prioritized list of monitoring efforts necessary to determine the extent of bull trout entrainment through the turbines at Rock Island Dam by February 28, 2005. If the studies contained in the prioritized list are determined by the Service, in consultation with FERC and the licensee, to be feasible, the licensee shall be required to assess the extent of bull trout entrainment through the turbines at Rock Island Dam. If entrainment is determined to be significant, the licensee will be required to explore techniques to minimize bull trout entrainment through the turbines.

3. To implement RPM 2, FERC shall require the licensee to, in coordination with the Service, develop and implement a comprehensive bull trout monitoring program, that includes the presence of a sufficient number of radio-tagged (or other appropriate tracking technology) bull trout, to enable monitoring of bull trout utilizing Rock Island Dam and its associated reservoir system and tracking of the incidental take exemptions stated above.

4. During the interim period between FERC's issuance of the license amendment and the implementation of the monitoring plan called for in RPM 2, the licensee shall be required to implement the action items agreed to during a February 19, 2004 meeting between the licensee and the Service. Specifically, these items are:

1. Extend fish ladder monitoring period to assess adult bull trout utilization of existing fishways outside the traditional migratory timeframes.
2. Continue coordinated telemetry monitoring of radio-tagged bull trout.
3. Compile project operational data linked to timeframes when adult migratory bull trout pass project powerhouses and/or spill gates.
4. Cost share funding with the Service for analysis of genetic samples from fluvial bull trout sampled during the first year of the Mid-Columbia Bull Trout Study.
5. Participate in a coordinated effort with the Service to increase the informational database for adult bull trout that utilize the Methow/Twisp river system.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

6. Reporting Requirements

In order to monitor the impacts of implementation of the reasonable and prudent measures, FERC shall prepare annual reports describing the progress of the proposed Projects, including implementation of the associated terms and conditions, and impacts to

bull trout (50 CFR § 402.14(I)(3)). The report, which shall be submitted to the Central Washington Field Office shall list and describe the adverse effects resulting from Project activities including the number and life stages of individuals affected.

Upon locating a dead, injured, or sick endangered or threatened species specimen, initial notification must be made to the Central Washington Field Office (Wenatchee, Washington; telephone 509-664-0658) within 48 hours. The Service, in conjunction with the licensee, shall determine if the mortality is attributable to Project effects. Care should be taken in handling sick or injured specimens to ensure effective treatment and care or the handling of dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered species or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by the Service to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

4. The Service recommends that in the development of the monitoring plans called for in the terms and conditions of this incidental take statement, the licensee engage in a collaborative process with the Service, NOAA Fisheries, Washington Department of Fish and Wildlife, relevant tribes, or any other entities they deem appropriate.

5. The Service recommends that the licensee continue to participate in development and implementation (when completed) of the bull trout recovery plan.

6. The Service recommends that the licensee continue monitoring TDG levels, and invest in facility improvements to keep TDG levels at or below 110% (or other applicable state water quality standards).

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects, or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

RE-INITIATION NOTICE

This concludes formal consultation and conference on the actions outlined in the request. As provided in 50 CFR §402.16, reinitiating of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

You may ask the Service to confirm the conference opinion as a biological opinion issued through formal consultation if final critical habitat for bull trout is designated. The request must be in writing. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the conference opinion as the biological opinion on the project and no further section 7 consultation will be necessary.

After designation of critical habitat for bull trout and any subsequent adoption of this conference opinion, the Federal agency shall request reinitiation of consultation if: (1) the amount of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect the species or critical habitat in a manner or to an extent not considered in this conference opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the species or critical habitat that was not considered in this conference opinion; (4) a new species is listed or critical habitat is designated that may be affected by the action.

INCIDENTAL TAKE STATEMENT
For the
Wells Project

1. Introduction

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by FERC so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. FERC has a continuing duty to regulate the activity covered by this incidental take statement. If FERC (1) fails to assume and implement the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, FERC must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [(50 CFR§402.14(i)(3)].

2. Anticipated Amount or Extent of Take of Bull Trout

The Service anticipates the following amount and types of take, by project element:

2.1 Turbine Operation

As stated in the analysis of project effects, there is currently little information available on the incidence of bull trout mortality attributable to turbine operation at the three dams addressed in the accompanying biological/conference opinion. However, bull trout have been documented passing through the turbines and it is reasonable to deduce that some percentage of those individuals attempting to navigate the turbines will be struck by the turbine structures and killed. It is also likely that bull trout that successfully navigate the turbines may be

subject to increased susceptibility to predation caused by disorientation following turbine passage or increased susceptibility to infection caused by scale loss or non-lethal wounds incurred during turbine passage.

The Service anticipates incidental take of bull trout will be difficult to quantify or detect for the following reasons: 1) the limited scope, timing, and sampling locations of existing monitoring programs which may detect predation of bull trout, 2) finding dead or impaired specimens is unlikely because of water depth and scavengers, and 3) injuries or trauma caused by attempted predation, which cause reduced survival of bull trout would be virtually undetectable. However, the level of take of this species can be anticipated by the loss of individuals that are monitored through the use of radio-tags (or other similar tracking technology that may be employed in the future) because mortality of these individuals is detectable. Based on survival estimates from anadromous fish passage studies, the Service anticipates that no more than 5 percent of radio-tagged (or other similar tracking technology that may be employed in the future) bull trout passing through turbines will be killed by the turbine operation. The Service anticipates that 100 percent of the bull trout passing through the turbines will be harassed.

2.2 Juvenile Bypass Operation

As stated in the analysis of project effects, operation of the juvenile bypass facilities may result in the entrainment and capture of adult and juvenile bull trout resulting in injury or mortality due to contact with structures within the bypass.

The Service anticipates incidental take of bull trout will be difficult to quantify or detect for the following reasons: 1) the limited scope, timing, and sampling locations of existing monitoring programs which may detect predation of bull trout, 2) finding dead or impaired specimens is unlikely because of water depth and scavengers, and 3) injuries or trauma caused by attempted predation or competition, which cause reduced survival of bull trout would be virtually undetectable. However, the level of take of this species can be anticipated by the loss of individuals that are monitored through the use of radio-tags (or other similar tracking technology that may be employed in the future) because mortality of these individuals is detectable. Based on survival estimates from anadromous fish passage studies, the Service anticipates that no more than 2 percent of radio-tagged (or other similar tracking technology that may be employed in the future) bull trout passing through the juvenile bypass facilities will be injured or killed. We expect all bull trout that pass through the facilities will be harassed.

2.3 Adult Fishway Operation

As stated in the analysis of project effects, operation of the adult fishways is likely to result in delays in upstream movement of adult bull trout, impeded upstream passage of juveniles, and injury or mortality of adults due to contact with structures within the fishways and "fallback".

The Service anticipates incidental take of bull trout will be difficult to quantify or detect for the following reasons: 1) the limited scope, timing, and sampling locations of existing monitoring programs which may detect predation of bull trout, 2) finding dead or impaired specimens is unlikely because of water depth and scavengers, and 3) injuries or trauma caused by attempted predation or competition, which cause reduced survival of bull trout would be virtually undetectable. However, the level of take of this species can be anticipated by the loss of individuals that are monitored through the use of radio-tags (or other similar tracking technology that may be employed in the future) because mortality of these individuals is detectable. Based on survival estimates from anadromous fish passage studies, the Service anticipates that no more than 2 percent of radio-tagged (or other similar tracking technology that may be employed in the future) bull trout passing the facilities will be injured or killed as a result of the proposed action.

2.4 Spillway Operation

As stated in the analysis of project effects, operation of the spillways may result in supersaturated levels of total dissolved gasses. Supersaturated gases in fish tissues tend to pass from the dissolved state to the gaseous phase as internal bubbles or blisters. This condition, called gas bubble trauma (GBT) or gas bubble disease (GBD), can be debilitating or even fatal. Injury and mortality of bull trout may also occur as a result of contact with spillway structures. It is also likely that bull trout that successfully pass through the spillway may be subject to increased susceptibility to predation caused by disorientation or increased susceptibility to infection caused by scale loss or non-lethal wounds incurred during spillway passage.

The Service anticipates incidental take of bull trout will be difficult to quantify or detect for the following reasons: 1) the limited scope, timing, and sampling locations of existing monitoring programs which may detect predation of bull trout, 2) finding dead or impaired specimens is unlikely because of water depth and scavengers, and 3) injuries or trauma caused by attempted predation or competition, which cause reduced survival of bull trout would be virtually undetectable. However, the level of take of this species can be anticipated by the loss of individuals that are monitored through the use of radio-tags (or other similar tracking technology that may be employed in the future) because mortality of these individuals is detectable. Based on survival estimates from anadromous fish passage studies, the Service anticipates that no more than 2 percent of radio-tagged (or other similar tracking technology that may be employed in the future) bull trout passing the facilities via the spillways will be injured or killed as a result of the proposed action. We expect all bull trout that pass through the spillways will be harassed.

2.5 Predator Control Program

As stated in the analysis of project effects, the Service anticipates that the activities associated with the northern pikeminnow removal program will result in the mortality of no more than two individual bull trout. Data accumulated over the course of the current pikeminnow control program indicate the likelihood of injury or mortality is extremely small (Chelan PUD 2003c, 2003d; Douglas PUD 2003).

2.6 Tributary Conservation Plan

This project element is the adoption of a plan which does not contain specific information concerning the location, timing, or duration of specific activities. The amount of incidental take of bull trout, if any, is critically dependent upon implementation decisions that have not yet been made. Therefore, the exemption from take prohibitions, allowed under the terms of section 7(o)(2) of the Act, is not provided in this Incidental Take Statement. Actions authorized by the Tributary Committee that may affect bull trout or proposed bull trout critical habitat will require the FERC, under the proposed action, to complete a separate ESA Section 7(a)(2) consultation and/or conference prior to implementation.

2.7 Hatchery Compensation Plan

This project element is the adoption of a plan which does not contain specific information concerning the location, timing, or duration of specific activities. The amount of incidental take of bull trout, if any, is critically dependent upon implementation decisions that have not yet been made. Therefore, the exemption from take prohibitions, allowed under the terms of section 7(o)(2) of the Act, is not provided in this Incidental Take Statement. Actions authorized by the Hatchery Committee that may affect bull trout or proposed bull trout critical habitat will require the FERC, under the proposed action, to complete a separate ESA Section 7(a)(2) consultation and/or conference prior to implementation.

3. Effect of the Take

In the accompanying Biological Opinion, the Service determined that this level of anticipated take is not likely to jeopardize the continued existence of the Columbia River distinct population segment of the bull trout, and is not likely to destroy or adversely modify proposed critical habitat.

4. Reasonable and Prudent Measures

The Service believes that the following reasonable and prudent measures are necessary and appropriate to minimize take of bull trout.

RPM 1. FERC shall require the licensee to develop and implement, in coordination with the Service, appropriate measures to ensure to reduce impediments to up and downstream passage of adult and juvenile bull trout at Wells Dam and its associated reservoir system. As stated in the analysis of project effects, continued operation of the Project will result in delays in upstream and downstream movement of adult bull trout, impeded upstream passage of juveniles, and injury or mortality of adults and juveniles due to contact with structures within the turbines, juvenile bypass system, spillways, and adult fishways. Implementation of measures to reduce impediments to upstream and downstream passage will minimize the take of bull trout. Should measures to reduce impediments to up- and downstream passage of bull trout warrant consideration of additional modifications to facilities or operations, as determined by the Service in consultation with FERC and the

licensee, the Service will work with FERC and the licensee to insure these measures are implemented, as appropriate, or recommend that FERC reinitiate consultation if necessary.

RPM 2. FERC shall require the licensee to develop a monitoring program to (1) detect adverse effects resulting from the proposed action, (2) assess the actual level of incidental take in comparison with the anticipated incidental take level documented in the biological opinion, (3) detect when the level of anticipated incidental take is exceeded, and (4) determine the effectiveness of reasonable and prudent measures and their implanting terms and conditions. Specifically, the program shall be designed to monitor the abundance, distribution, and timing of adult and juvenile bull trout utilizing Wells Dam and its associated reservoir system. Implementation of this monitoring program shall begin no later than May 1, 2005. Due to the scarcity of information regarding the dynamics of bull trout within the action area, the take exemptions addressed previously were based upon current project survival estimates for anadromous fish. Because this surrogate measure was used, establishment of a bull trout monitoring program is essential to ensure that project effects do not exceed anticipated levels. If information from the monitoring efforts warrants consideration of additional modifications to facilities or operations for the minimization of project effects on bull trout, as determined by the Service in consultation with FERC and the licensee, the Service will work with FERC and the licensee to insure these measures are implemented, as appropriate, or recommend that FERC reinitiate consultation if necessary.

5. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the action agency must comply with the following terms and conditions, which implement the reasonable and prudent measures, described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

The Service believes the following terms and conditions are necessary and appropriate to minimize the take of listed bull trout:

1. To implement RPM 1, FERC shall require the licensee to develop, in coordination with the Service, a prioritized list of monitoring efforts necessary to evaluate the effects of the Project on the up- and downstream passage needs of bull trout at Wells Dam by February 28, 2005. Based on that prioritized list, the licensee shall then be required to initiate studies to evaluate the up- and downstream passage needs for bull trout at Wells Dam and to assess the Project impacts on those passage needs. If the information from these studies warrants consideration of modifications to facilities or operations to reduce the take of bull trout, as determined by the Service in consultation with FERC and the licensee, then the Service will work with FERC and the licensee to ensure that these measures are implemented, as appropriate, or recommend that FERC reinitiate consultation if necessary.

2. To implement RPM 1, FERC shall require the licensee to, in coordination with the Service, develop a prioritized list of monitoring efforts necessary to determine the extent of bull trout entrainment through the turbines at Wells Dam by February 28, 2005. If the studies contained in the prioritized list are determined by the Service, in consultation with FERC and the licensee, to be feasible, the licensee shall be required to assess the extent of bull trout entrainment through the turbines at Wells Dam. If entrainment is determined to be significant, the licensee will be required to explore techniques to minimize bull trout entrainment through the turbines.

3. To implement RPM 2, FERC shall require the licensee to, in coordination with the Service, develop and implement a comprehensive bull trout monitoring program, that includes the presence of a sufficient number of radio-tagged (or other appropriate tracking technology) bull trout, to enable monitoring of bull trout utilizing Wells Dam and its associated reservoir system and tracking of the incidental take exemptions stated above.

4. During the interim period between FERC's issuance of the license amendment and the implementation of the monitoring plan called for in RPM 2, the licensee shall be required to implement the action items agreed to during a February 19, 2004 meeting between the licensee and the Service. Specifically, these items are:

1. Extend fish ladder monitoring period to assess adult bull trout utilization of existing fishways outside the traditional migratory timeframes.
2. Continue coordinated telemetry monitoring of radio-tagged bull trout.
3. Compile project operational data linked to timeframes when adult migratory bull trout pass project powerhouses and/or spill gates.
4. Cost share funding with the Service for analysis of genetic samples from fluvial bull trout sampled during the first year of the Mid-Columbia Bull Trout Study.
5. Participate in a coordinated effort with the Service to increase the informational database for adult bull trout that utilize the Methow/Twisp river system.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

6. Reporting Requirements

In order to monitor the impacts of implementation of the reasonable and prudent measures, FERC shall prepare annual reports describing the progress of the proposed Projects, including implementation of the associated terms and conditions, and impacts to

bull trout (50 CFR § 402.14(I)(3)). The report, which shall be submitted to the Central Washington Field Office shall list and describe the adverse effects resulting from Project activities including the number and life stages of individuals affected.

Upon locating a dead, injured, or sick endangered or threatened species specimen, initial notification must be made to the Central Washington Field Office (Wenatchee, Washington; telephone 509-664-0658) within 48 hours. The Service, in conjunction with the licensee, shall determine if the mortality is attributable to Project effects. Care should be taken in handling sick or injured specimens to ensure effective treatment and care or the handling of dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered species or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by the Service to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

7. The Service recommends that in the development of the monitoring plans called for in the terms and conditions of this incidental take statement, the licensee engage in a collaborative process with the Service, NOAA Fisheries, Washington Department of Fish and Wildlife, relevant tribes, or any other entities they deem appropriate.

8. The Service recommends that the licensee continue to participate in development and implementation (when completed) of the bull trout recovery plan.

9. The Service recommends that the licensee continue monitoring TDG levels, and invest in facility improvements to keep TDG levels at or below 110% (or other applicable state water quality standards).

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects, or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

RE-INITIATION NOTICE

This concludes formal consultation and conference on the actions outlined in the request. As provided in 50 CFR §402.16, reinitiating of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

You may ask the Service to confirm the conference opinion as a biological opinion issued through formal consultation if final critical habitat for bull trout is designated. The request must be in writing. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the conference opinion as the biological opinion on the project and no further section 7 consultation will be necessary.

After designation of critical habitat for bull trout and any subsequent adoption of this conference opinion, the Federal agency shall request reinitiation of consultation if: (1) the amount of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect the species or critical habitat in a manner or to an extent not considered in this conference opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the species or critical habitat that was not considered in this conference opinion; (4) a new species is listed or critical habitat is designated that may be affected by the action.

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