United States Department of the Interior

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AUG 22 2016

Dr. Craig Busack, Senior Fish Biologist
Sustainable Fisheries Division
NOAA Fisheries
West Coast Regional Office
1201 NE Lloyd Blvd., Suite 1100
Portland, OR 97232

Subject: NOAA Fisheries issuance of section 10(a)(1)(A) permits for the continued operation and maintenance of the Northeast Oregon and Southeast Washington Spring/Summer Chinook, Steelhead, and Rainbow trout Programs funded under the Lower Snake River Compensation Plan and the Northwest Power Act (*FWS reference* 01EOFW00-2015-F-0154)

Dear Dr. Busack:

This document transmits the U. S. Fish and Wildlife Service's (Service) Biological Opinion (Opinion) for the National Oceanic and Atmospheric Administration, National Marine Fisheries Service's (NOAA's) issuance of section 10(a)(1)(A) permits for the continued operation and maintenance of the Northeast Oregon and Southeast Washington Spring/Summer Chinook, Steelhead and Rainbow Trout Hatchery Programs funded by the Service's Lower Snake River Compensation Plan (LSRCP) Office and the Bonneville Power Administration (BPA), and its effects on bull trout (*Salvelinus confluentus*) and designated critical habitat in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. §§ 1531 *et seq.*).

The three action agencies jointly prepared and submitted a Biological Assessment (Assessment), dated April 18, 2014; the request for formal consultation was received by our office on April 22, 2014. The Service requested additional information that was provided by LSRCP and BPA on May 13, 2014. The Service sent an email back to LSRCP and BPA initiating consultation on May 21, 2014. Additional information and clarifications regarding the proposed action and potential effects continued to be provided through April, 2016. The agencies determined, and the Service agrees, that the impacts associated with the Hatchery Programs ***are likely to adversely affect*** bull trout and bull trout critical habitat.

This Opinion is based on information provided in the April 18, 2014 Assessment, the requested clarifications provided on May 13, 2014, an additional piece of the proposed action provided on April 12, 2016, Hatchery Genetic Management Plans for the 12 programs covered, correspondence with project staff at the BPA and the LSRCP office, and other sources of information. A complete administrative record for this consultation is on file at the Service's La Grande Field Office in La Grande, Oregon.

We appreciate your concern for listed species. If you have any questions on this Opinion, or require more information regarding this consultation, please contact Gretchen Sausen (for Oregon Facilities) at 541-962-8584, or Erin BrittonKuttel (for Washington Facilities) at 509-893-8029.

Sincerely,

Gary S. Mill

Gary S. Miller
Field Supervisor

cc:
Katey Grange, Bonneville Power Administration, Portland, Oregon
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BIOLOGICAL OPINION
For
NOAA's Issuance of Section 10(a)(1)(A) Permits for the Continued Operation and Maintenance of the Northeast Oregon and Southeast Washington Spring/Summer Chinook, Steelhead, and Rainbow Trout Hatchery Programs funded under the Lower Snake River Compensation Plan and the Northwest Power Act

Action Agencies: NOAA Fisheries Salmon Management Division, Portland, Oregon

U.S. Fish and Wildlife Service, Lower Snake River Compensation Plan Office, Boise, Idaho

And

Bonneville Power Administration, Portland, Oregon

Consultation Conducted by:
U.S. Fish and Wildlife Service
Washington Fish and Wildlife Office
Eastern Washington Field Office
Spokane, Washington

And

U.S. Fish and Wildlife Service
La Grande Field Office
La Grande, Oregon

Date Issued: AUG 22 2016

Issued by: Gary S. Miller
Gary S. Miller
Field Supervisor, La Grande Field Office

File No. : 01EOFW00-2015-F-0154

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ACRONYMS

AFS	American Fisheries Society
BA	Biological Assessment
BLM	Bureau of Land Management
BPA	Bonneville Power Administration
BT	Bull Trout
CFR	Code of Federal Regulations
CHU	Critical Habitat Unit
Corps	Army Corps of Engineers
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
CWA	Clean Water Act
DNA	Deoxyribonucleic acid
DPS	Distinct Population Segment
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FDA	Food and Drug Administration
FH	Fish Hatchery
FMO	Foraging, Migrating, and Overwintering
FR	Federal Register
HCP	Habitat Conservation Plan
IDFG	Idaho Department of Fish and Game
IGDO	inter-gravel dissolved oxygen
IHNV	Infectious Hematopoietic Necrosis Virus
IHOT	Integrated Hatchery Operations Team
IMW	Intensively Monitored Watershed
IPCC	Intergovernmental Panel on Climate Change
IPNV	Infectious Pancreatic Necrosis Virus
LSRCP	Lower Snake River Compensation Program
M&E	Monitoring and Evaluation
mg/L	milligrams per liter
MHHW	Mean Higher High Water
MLLW	Mean Lower Low Water
NE	Northeast
NOAA	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NPT	Nez Perce Tribe
O&M	Operations and Maintenance
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
OHW	Ordinary High Water
Opinion	Biological Opinion
OR	Oregon
PBF	Physical or Biological Features
PCE	Primary Constituent Element
PIT	Passive Integrated Transponder

PNFHPC	Pacific Northwest Fish Health Protection Committee
Rkm	River kilometer
SE	Southeast
SR	Spawning and Rearing
SRSRB	Snake River Salmon Recovery Board
USFS	US Forest Service
USFWS	US Fish and Wildlife Service
VHSV	Viral Hemorrhagic Septicemia Virus
WA	Washington
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WDOE	Washington Department of Ecology

INTRODUCTION

This document represents the U. S. Fish and Wildlife Service's (Service) Biological Opinion (Opinion) for the National Oceanic and Atmospheric Administration, National Marine Fisheries Service's (NOAA's) issuance of section 10(a)(1)(A) permits for the continued operation and maintenance of the Northeast Oregon and Southeast Washington Spring/Summer Chinook, Steelhead and Rainbow Trout Hatchery Programs funded by the Service's Lower Snake River Compensation Plan (LSRCP) Office and the Bonneville Power Administration (BPA), and its effects on bull trout (*Salvelinus confluentus*) and designated critical habitat in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. §§ 1531 *et seq.*).

The three action agencies jointly prepared and submitted a Biological Assessment (Assessment), dated April 18, 2014; the request for formal consultation was received by our office on April 22, 2014. The Service requested additional information that was provided by LSRCP and BPA on May 13, 2014. The Service sent an email back to LSRCP and BPA initiating consultation on May 21, 2014. Additional information and clarifications regarding the proposed action and potential effects continued to be provided through April, 2016.

This Opinion is based on information provided in the April 18, 2014 Assessment, the requested clarifications provided on May 13, 2014, an additional piece of the proposed action provided on April 12, 2016, Hatchery Genetic Management Plans for the 12 programs covered, correspondence with project staff at the BPA and the LSRCP office, and other sources of information. A complete record of this consultation is on file at the Service's La Grande Field Office in La Grande, Oregon.

CONSULTATION HISTORY

- The LSRCP Office initiated consultation on May 19, 1998 with the Service's Snake River Basin Office for all LSRCP Programs under a programmatic Assessment. The Service issued an Opinion on Operation of the LSRCP Program (File # 1024.0000, 1-4-99-F-2) on April 8, 1999. Work at BPA-funded facilities is conducted under Section 10 permits that have been issued to the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) (permit TE844468-10) and the Columbia River Intertribal Fish Commission (permit TEOO1598-5).
- LSRCP requested the Service review a draft Assessment on May 6, 2013.
- The Service provided comments to the draft Assessment on July 30 and August 12, 2013.
- The Service, BPA, LSRCP, and National Marine Fisheries Service (NOAA) had a conference call to discuss Service comments on the draft Assessment and combining BPA and LSRCP funded programs into a single Assessment on September 20, 2013.
- BPA and LSRCP requested a review of the combined draft Assessment on January 8, 2014.
- The Service provided comments to the January 8, 2014 draft Assessment on January 29, 2014.
- The Service, NOAA, BPA, and LSRCP had a conference call to discuss multiple hatchery consultations on February 11, 2014.

- There was a follow-up meeting on March 21, 2014, in which the draft Assessment at that date was deemed by all parties to be complete.
- The Service received a request from NOAA for consultation on the project and final Assessment on April 22, 2014.
- The Service requested additional information that was provided by LSRCP and BPA on May 13, 2014.
- The Service sent an email back to NOAA (and LSRCP and BPA) initiating consultation on May 21, 2014.
- The Service sent a draft Opinion to NOAA, BPA, and LSRCP for review on July 7, 2015.
- The Service received comments on the July 7, 2015 draft Opinion on July 22 and August 5, 2015 from NOAA, BPA, and LSRCP.
- The Service, NOAA, BPA, and LSRCP had a conference call to discuss the July 7, 2015 draft Opinion and agency comments on August 27, 2015. BPA, NOAA, and LSRCP were tasked with further review of the draft Opinion.
- BPA sent the Service consolidated comments on the draft Opinion on December 11, 2015.
- The Service, NOAA, BPA, and LSRCP had a conference call to discuss incidental take for the project on March 3, 2016.
- The Service, NOAA, BPA, and LSRCP had a conference call to discuss this opinion and future hatchery consultations on April 12, 2016. Hatchery outplanting of chinook was discussed to include as part of the proposed action, and BPA stated that this information would be sent to the Service to incorporate into the Opinion.
- BPA sent the Service information on Hatchery outplanting of chinook to include in the Opinion on April 12, 2016.
- BPA sent the Service additional incidental take data to include in the Opinion on April 22, 2016.

BIOLOGICAL OPINION

1. Description of the Proposed Action

The National Marine Fisheries Service (NOAA) is issuing ESA Section 10(a)(1)(A) research/enhancement permits for intentional take of listed Chinook and steelhead for the continued operation and maintenance of hatchery facilities that comprise twelve Northeast Oregon and Southeast Washington Spring/Summer Chinook, Steelhead, and Rainbow Trout Programs. NOAA is thus the lead federal action agency for purposes of this consultation as per 50 CFR 402.07. The issued Section 10(a)(1)(A) permits will be valid for 10 years after issuance. This consultation also covers the funding action of the Service's Lower Snake River Compensation Plan (LSRCP) program and the Bonneville Power Administration (BPA; for more detail, see below and refer to Table 1 of the Assessment)

Several operators of the Northeast Oregon and Southeast Washington hatchery programs currently hold Section 10(a)(1)(A) permits or Section 6 cooperative agreements from the Service intended for the recovery of bull trout in the action area, where recovery activities may also result in take of bull trout. This Opinion, however, focuses on the operation and maintenance effects of the Northeast Oregon and Southeast Washington hatchery programs on bull trout and its designated critical habitat, and is thus a separate purpose. As such, this Opinion replaces the previous consultations associated with these hatchery programs that affect bull trout and bull trout critical habitat, except as follows:

- Construction, operation and maintenance of the proposed Northeast Oregon Hatchery Project, which would include a new Lostine Hatchery, is covered by a ten-year ESA Section 7 consultation completed in 2004 (USFWS 2004g) and revised in 2006 (USFWS 2006).

- Research, monitoring, and evaluation (RM&E or M&E) activities that may result in take of bull trout (e.g., spawning surveys and population monitoring, see below in Section 1.6 for more detail) will remain covered under existing Section 10(a)(1)(A) permits until the permits expire, are renewed, or are amended, though there may be some overlap with the coverage provided by this Opinion until those permits expire (most are set to expire within three years from the date of this Opinion). Non-federal entities conducting activities intended for the recovery of bull trout may need to obtain or maintain a separate Section 10(a)(1)(A) permit or Section 6 cooperative agreement.

The LSRCP Program was authorized by the Water Resources Development Act of 1976, (Public Law 94-587, Section 102, 94th Congress) to mitigate losses caused by the construction and operation of the four lower Snake River dams and navigation lock projects. LSRCP Program adult return goals associated with Northeast Oregon and Southeast Washington programs are 1,152 spring Chinook (*Oncorhynchus tshawytscha*) and 4,656 steelhead (*Oncorhynchus mykiss*) to Washington; 9,072 spring Chinook and 11,184 steelhead to Oregon; and the release of 86,000 pounds of rainbow trout. The LSRCP Office funds, under a direct funding agreement with BPA, and administers operation and maintenance and monitoring and evaluation (M&E) of the spring Chinook, steelhead and rainbow trout programs in Washington and Oregon including activities occurring at the Lyons Ferry Fish Hatchery, Tucannon River Fish Hatchery and Adult Collection Facility, Curl Lake Juvenile Acclimation Facility, Cottonwood Acclimation Facility, and Cottonwood Adult Collection Facility.

Under the Pacific Northwest Electric Power Planning and Conservation Act of 1980, 16 U.S.C. §§ 839 *et seq.* (Northwest Power Act), BPA must protect, mitigate, and enhance fish and wildlife affected by the development, operation, and management of federal hydroelectric facilities on the Columbia River and its tributaries in a manner consistent with the purposes of the Northwest Power Act and the fish and wildlife program adopted by the Northwest Power and Conservation Council. BPA issues fish and wildlife contracts to fund parts of the spring Chinook programs in Oregon, including the operation and maintenance of the Upper Grande Ronde River Adult Trap and Juvenile Acclimation Facilities, Catherine Creek Adult Trap and Juvenile Acclimation Facilities, the Lostine River Adult Trap and Juvenile Acclimation Facilities, and spawning and rearing activities at Lookingglass Fish Hatchery. BPA recently funded a safety net program (and may again in the future should the program be needed) for the Upper Grande Ronde population and various M&E programs within the Grande Ronde River Basin. BPA's hatchery adult return goal is 4,220 spring Chinook.

The twelve hatchery programs under this consultation are supported by 20 facilities within the Snake River and Columbia River mainstem, and the Grande Ronde, Imnaha, and Tucannon river subbasins and operated by the Washington State Department of Fish and Wildlife (WDFW), Oregon Department of Fish and Wildlife (ODFW), Nez Perce Tribe (NPT), and Confederated Tribes of the Umatilla Indian Reservation (CTUIR). There are seven general activities or actions associated with the proposed programs: Adult Broodstock Collection, Water Diversions, Effluent, Routine Facility Operations and Maintenance, Non-Routine Facility Operations and Maintenance, Acclimation and Release, Chinook Adults Outplanting, and Monitoring and Evaluation.

A summary of facilities and location, funding source, operators, and programs for the Southeast Washington component of the proposed action is included in Table 1, and location generally shown in Figure 1. The same for the Northeast Oregon component of the proposed action is included in Table 2 and Figure 2. A summary of all facilities and programs, and general area of location, is included in Table 3. Detailed descriptions of the facility locations are discussed later in the Environmental Baseline.

Table 1. Facilities associated with each Southeast Washington Program.

Facility	Funding Source	Operator(s)	County	Rkm	Waterbody	Tucannon Chinook	Tucannon Steelhead	Snake River (Lyons Ferry) Wallowa Steelhead	Grande Ronde (Cotton- wood) Wallowa Steelhead	Rainbow Trout
Lyons Ferry Fish Hatchery	LSRCP	WDFW	Franklin	Rkm 95.0	Snake River	x	x	X	x	x
Tucannon River Fish Hatchery	LSRCP	WDFW	Columbia	Rkm 58.0	Tucannon River	x	x			x
Tucannon River Adult Collection Facility	LSRCP	WDFW	Columbia	Rkm 59.0	Tucannon River	x	x			
Curl Lake Juvenile Acclimation Facility	LSRCP	WDFW	Columbia	Rkm 66.0	Tucannon River	x	x			x
Cottonwood Adult Collection Facility	LSRCP	WDFW	Asotin	Rkm 46.7	Grande Ronde River				x	
Cottonwood Juvenile Acclimation Facility	LSRCP	WDFW	Asotin	Rkm 0.2	Cottonwood Creek				x	

Rkm = river kilometer
LSRCP = Lower Snake River Compensation Plan
WDFW = Washington State Department of Fish and Wildlife

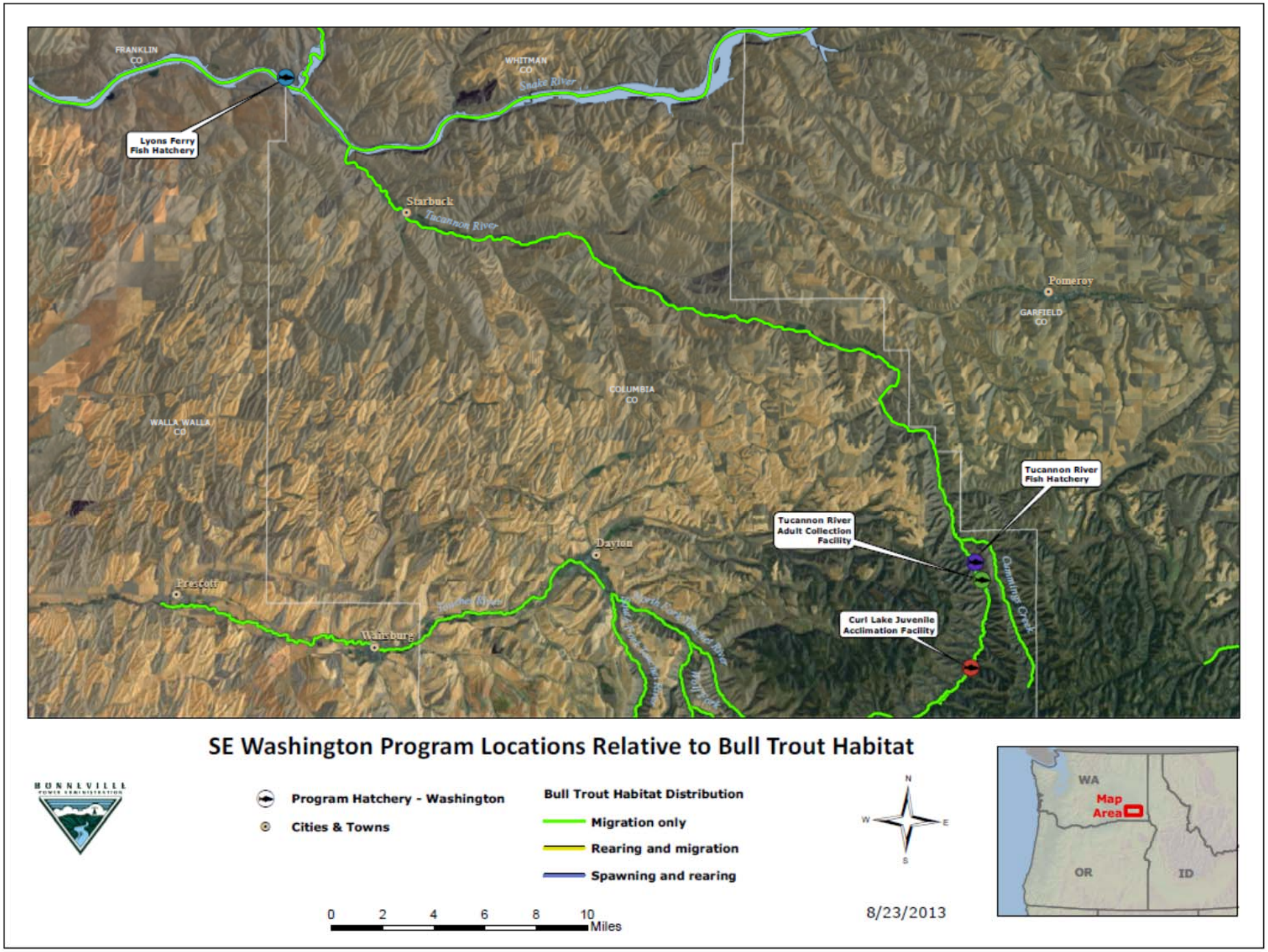

Figure 1. SE Washington Facility Locations.

Table 2. Facilities Associated with each Northeast Oregon Program.

Facility	Funding Source	Operator	County	Rkm	Waterbody	UGRR Chinook	Catherine Chinook	Lostine Chinook	Lookingglass Chinook	Imnaha Chinook	GR Wallowa Steelhead	Imnaha Steelhead
Lookingglass Fish Hatchery	LSRCP/ BPA	ODFW/ NPT/ CTUIR	Union	Rkm 3.5	Lookingglass Creek	X	x	X	x	x		
UGRR Adult Collection Facility	LSRCP/ BPA	ODFW/ NPT/ CTUIR	Union	Rkm 247.0	Upper Grande Ronde River	X						
UGRR Juvenile Acclimation Facility	LSRCP/ BPA	ODFW/ NPT/ CTUIR	Union	Rkm 274.4	Upper Grande Ronde River	X						
Catherine Creek Adult Collection Facility	LSRCP/ BPA	ODFW/ NPT/ CTUIR	Union	Rkm 70.0	Catherine Creek		x		x			
Catherine Creek Juvenile Acclimation Facility	LSRCP/ BPA	ODFW/ NPT/ CTUIR	Union	Rkm 84.5	Catherine Creek		x					
Lostine River Adult Collection Facility	LSRCP/ BPA	ODFW/ NPT/ CTUIR	Wallowa	Rkm 1.6	Lostine River			X				
Lostine River Juvenile Acclimation Facility	LSRCP/ BPA	ODFW/ NPT/ CTUIR	Wallowa	Rkm 16.1	Lostine River			X				
Irrigon Fish Hatchery	LSRCP/ BPA	ODFW/ NPT/ CTUIR	Morrow	Rkm 449.0	Columbia River				x		x	x
Wallowa Fish Hatchery	LSRCP	ODFW	Wallowa	Rkm 1.0	Spring Creek						x	x
Big Canyon Adult Collection Facility	LSRCP	ODFW	Wallowa	Rkm 0.0	Deer Creek						x	
Big Canyon Juvenile Acclimation Facility	LSRCP	ODFW	Wallowa	Rkm 0.0	Deer Creek						x	

Facility	Funding Source	Operator	County	Rkm	Waterbody	UGRR Chinook	Catherine Chinook	Lostine Chinook	Lookingglass Chinook	Imnaha Chinook	GR Wallowa Steelhead	Imnaha Steelhead
Imnaha River Adult Collection Facility	LSRCP	ODFW/ NPT	Wallowa	Rkm 73.2	Imnaha River					X		
Imnaha River Juvenile Acclimation Facility	LSRCP	ODFW/ NPT	Wallowa	Rkm 73.2	Imnaha River					X		
Little Sheep Adult Collection Facility	LSRCP	ODFW/ NPT	Wallowa	Rkm 8.4	Little Sheep Creek							X
Little Sheep Juvenile Acclimation Facility	LSRCP	ODFW/ NPT	Wallowa	Rkm 8.4	Little Sheep Creek							X

Rkm = river kilometer
LSRCP = Lower Snake River Compensation Plan
BPA = Bonneville Power Administration
ODFW = Oregon Department of Fish and Wildlife
NPT = Nez Perce Tribe
CTUIR = Confederated Tribes of the Umatilla Indian Reservation

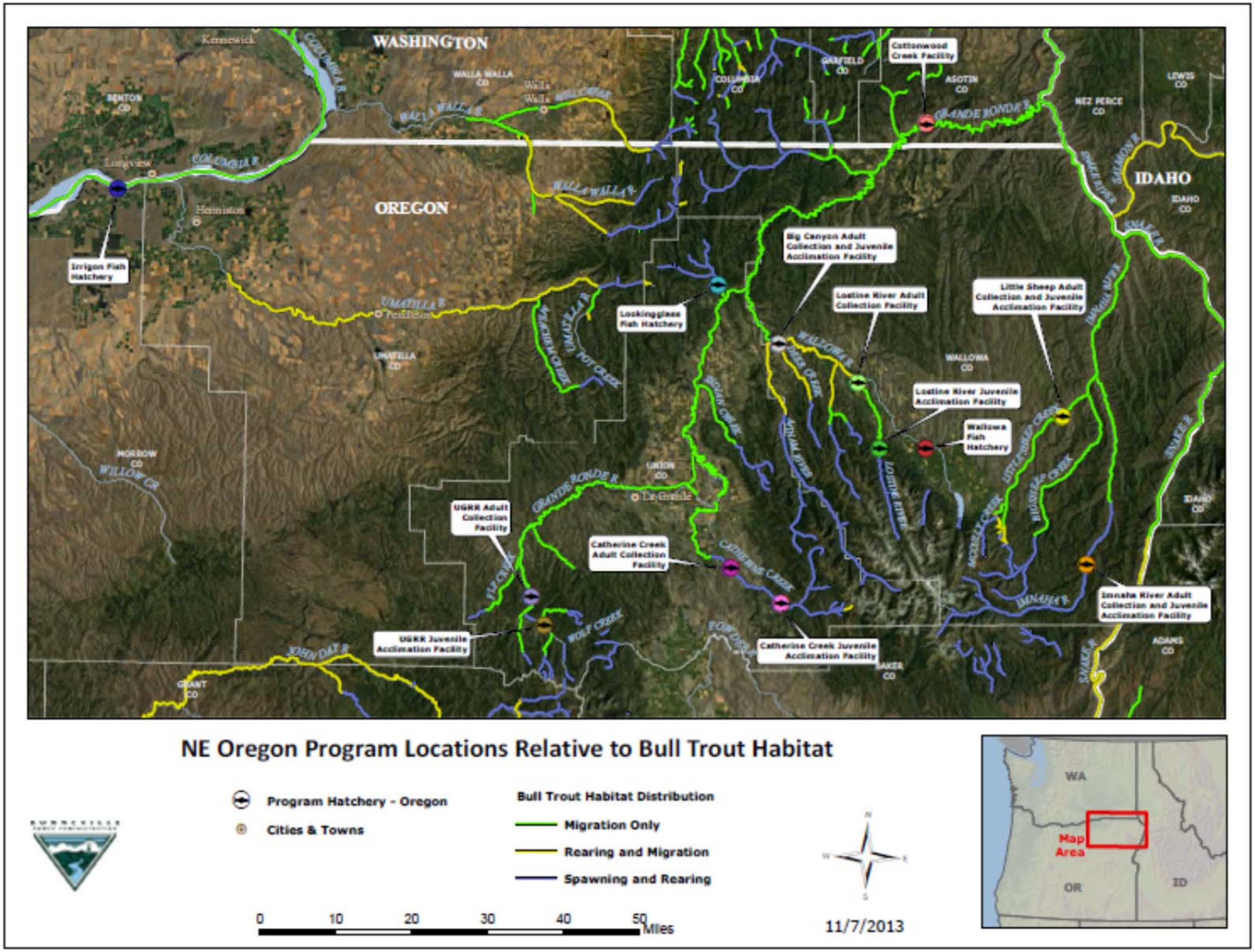

Figure 2. NE Oregon Facility Locations.

Table 3. All Facilities, Activities, and Location Summary.

	Facility	Adult Collection	Juvenile Acclimation & Release	Water Diversion	Water Effluent & Fish Health	O&M
SE WA	Lyons Ferry Fish Hatchery	X	X	x	x	x
	Tucannon River Fish Hatchery		X	x	x	x
	Tucannon River Adult Collection Facility	X		x		x
	Curl Lake Juvenile Acclimation Facility		X	x	x	x
NE OR	Cottonwood Creek Juvenile Acclimation Facility		X	x	x	x
	Cottonwood Creek Adult Collection Facility	X		X		x
	Lookingglass Fish Hatchery	X	X	x	x	x
	UGRR Adult Collection Facility	X				x
	UGRR Juvenile Acclimation Facility		X	x	x	x
	Catherine Creek Adult Collection Facility	X*				x
	Catherine Creek Juvenile Acclimation Facility		X	x	x	x
	Lostine River Adult Collection Facility	X*				x
	Lostine River Juvenile Acclimation Facility		X	x	x	x
	Irrigon Fish Hatchery				x	x
	Wallowa Fish Hatchery	X	X	x	x	x
	Big Canyon Adult Collection Facility	X				x
	Big Canyon Juvenile Acclimation Facility		X	x	x	x
	Imnaha River Adult Collection Facility	X*				x
	Imnaha River Juvenile Acclimation Facility		X	x	x	x
	Little Sheep Adult Collection Facility	X				x
	Little Sheep Juvenile Acclimation Facility		X	x	x	x

Footnote *: Designates locations that include chinook adult outplanting (BPA email to Service on April 12, 2016). Catherine Creek Program includes outplanting to Indian Creek and Lookingglass Creek. The Lostine Program includes outplanitng to Bear Creek, Wallowa River and Hurricane Creek. The Imnaha Program includes outplanting to Big Sheep and Lick Creeks.

1.1 Adult Collection

Broodstock collection (the collection of returning adult salmon for spawning in the hatcheries) can be accomplished in several ways, but in most hatchery operations it occurs by entrance into an adult ladder or trapping. The proposed hatchery programs use either a weir (picket or panel) with an associated trap or a water intake dam with a trap attached to a fish passage structure. Both the weirs and the dams block the entire stream, either on a temporary or permanent basis. Fish too large to fit through the weir or are blocked by the dam are channeled through the trap and are retained in the trap box. Staff regularly check the trap box to capture broodstock and release non-target fish. Broodstock collection occurs at the Lyons Ferry Fish Hatchery, Tucannon River Adult Collection Facility, Cottonwood Creek Adult Collection Facility, Lookingglass Fish Hatchery, Upper Grande Ronde River Adult Collection Facility, Catherine Creek Adult Collection Facility, Lostine River Adult Collection Facility, Wallowa Fish Hatchery, Big Canyon Adult Collection Facility, Imnaha River Adult Collection Facility, and Little Sheep Adult Collection Facility (Figures 1 and 2). Hook and line may also be used when needed to supplement broodstock collections for the Tucannon River steelhead program. No other programs use hook and line broodstock collection.

1.2 Outplanting of Chinook Adults

Adult outplanting of excess hatchery origin spring chinook salmon for the Catherine Creek Program includes outplanting to Indian Creek and Lookingglass Creek downstream of Lookingglass hatchery. The Lostine Program includes outplanting to Bear Creek, Wallowa River and Hurricane Creek. The Imnaha program includes outplanting to Big Sheep and Lick Creeks. The primary goal for outplanting in lower Lookingglass Creek is to support tribal and sport fisheries (harvest augmentation). For the other locations, outplanting adults in empty or underseeded habitat provides an opportunity to increase natural production of the population and provide important nutrient enhancement.

Outplanting of hatchery origin chinook salmon is typically an annual occurrence. Outplant dates vary by system, Catherine Creek is typically June, the Lostine weir captured fish are outplanted in July through September, and the Imnaha weir captured fish are outplanted in August through September. Maximum numbers of fish realeased in Indian Creek is limited to 50 pairs or 100 fish per year. There is no maximum number for Lookingglass Creek. In Big Sheep and Lick Creek, the maximum number of outplants annually is 300 adults. For the Wallowa system there are several factors that determine the numbers of outplants. These include run size of both hatchery and wild fish, and harvest, tribal distribution and food bank. No maximum numbers were provided for the Wallowa system, although data provided showed a high of 477 spring chinook outplants on Bear Creek in 2014 and a high of 208 spring chinook outplants on the Wallowa River in the same year.

1.3 Water Diversions

Water supply is the most important aspect of fish hatchery operations. Water supplies for most hatchery facilities come from either surface water diversions, ground water sources (wells and springs), or a combination of both. Ground water is extracted using onsite wells. Surface water intakes, which draw from stream and river sources, typically have diversion structures associated with them to efficiently withdraw the required water volume to operate the hatchery facility. Juvenile acclimation facilities only need water for part of the year, while hatchery spawning and rearing facilities require water year round. Surface water diversions are made via permanent fixed or temporary mobile pumps, depending on the facility and the nature of the water needs. Water intakes are screened to reduce impingement and entrainment. Some, but not all, of the subject facilities have pumps with fish screens that are compliant with NOAA's 2011 fish passage criteria (NOAA 2011). All facilities except the Adult Collection Facilities have water intake and diversions (Table 3; Figures 1 and 2), with the exception of the Tucannon River Adult Collection Facility.

1.4 Effluent

Hatchery operations discharge waste water from normal operations. This water is typically discharged (returned) into the stream it was first withdrawn from and is typically returned downstream of the facility and withdrawal diversion point. Groundwater extracted in support of hatchery operations is also returned to surface waters adjacent to hatchery facilities. The effluent water has typically been used throughout the facility, for all aspects of hatchery operations, including: adult broodstock trapping and holding, egg incubation, juvenile rearing, fish health treatments, and pond cleaning. All facilities except the Adult Collection Facilities release effluent (Table 3; Figures 1 and 2).

The Federal Water Pollution Control Act, 33 U.S.C. §§ 1251 et. seq, otherwise referred to as the Clean Water Act (CWA), regulates discharges of dredged or fill material into waters of the United States. The purpose of the CWA is to restore the physical, biological, and chemical integrity of the waters of the United States using two basic mechanisms: (1) direct regulation of discharges pursuant to permits issued under the National Pollution Discharge Elimination System (NPDES) and Section 404 (discharge of dredge or fill materials); and (2) the Title III water quality program. The states of Washington and Oregon are responsible for issuing and reporting on NPDES permits. The threshold applied for fish hatchery operations under the CWA is that any facility that rears 20,000 pounds of fish or more and discharges effluent into navigable waters must obtain a permit. This includes the Lyons Ferry Fish Hatchery, the Tucannon River Fish Hatchery, Curl Lake Acclimation Facility, Cottonwood Creek Acclimation Facility, Lookingglass Fish Hatchery, Irrigon Fish Hatchery, Wallowa Fish Hatchery, Big Canyon Acclimation Facility, Imnaha Acclimation facility, and Little Sheep Acclimation Facility. The Upper Grande Ronde, Lostine, and Catherine Creek facilities are not subject to CWA NPDES discharge permit requirements as the facilities produce less than 20,000 pounds of fish.

1.5 Routine and Semi-Routine Facility Operation and Maintenance

Normal and preventative maintenance of hatchery facility structures and equipment is necessary for proper functionality. Normal maintenance activities include: pond cleaning, pump maintenance, debris removal from intake and outfall structures, building maintenance, and grounds maintenance. Hatchery maintenance that occurs directly in watered structures, such as pond maintenance, pump maintenance and removal of minor amounts of debris from intake or outfall structures, weirs, ladders, and traps occur on a regular basis to ensure proper facility operation.

Semi-routine maintenance at program facilities do not occur annually and are undertaken on an as needed basis. Examples of semi-routine maintenance include in-stream work such as clearing gravel blockages from water intakes, outfalls, or traps after larger flow events, bridge repair, replacement of failed equipment, or weir or ladder maintenance. All facilities are expected to have some element of routine and semi-routine maintenance (Table 3; Figures 1 and 2). Major new in-river hatchery structures, such as new hatchery outfall structures or weirs, are not included in this consultation and would require a separate consultation with the Service. Also not included are actions that would replace or modify infrastructure or operations due to a catastrophic event of nature (Table 3; Figures 1 and 2).

1.6 Acclimation and Release

Acclimation is conducted in existing raceways or large earthen rearing ponds. Some acclimation sites are located at hatchery facilities, while others are located offsite further up in the watershed. During operations, each site requires regular, daily human presence for the entire acclimation period. Acclimation typically occurs over a period of 2 to 3 months for 1 to 2 smolt acclimation groups, depending on facility. Smolts are released through volitional release practices so that the fish migrate quickly seaward, limiting the duration of smolt presence at and downstream of the release site. Acclimation and release sites are located at the Lyons Ferry Hatchery, Tucannon River Fish Hatchery, Curl Lake Juvenile Acclimation Facility, Cottonwood Creek Juvenile Acclimation Facility, Lookingglass Fish Hatchery, Upper Grande Ronde River Juvenile Acclimation Facility, Catherine Creek Juvenile Acclimation Facility, Lostine River Juvenile Acclimation Facility, Wallowa Fish Hatchery, Big Canyon Juvenile Acclimation Facility, Imnaha Juvenile Acclimation Facility, and Little Sheep Juvenile Acclimation Facility (Table 3; Figures 1 and 2).

1.7 Monitoring and Evaluation

Numerous M&E programs occur as part of the action under a variety of funding sources to evaluate hatchery origin spring/summer Chinook and steelhead. The M&E work described in this subsection is in support of multiple Northeast Oregon and Southeast Washington hatchery programs.

1.7.1 In-Hatchery M&E

The in-hatchery M&E is primarily focused on the performance of the fish in the hatchery facilities, from growth-rate and mortality rates at the various life stages, to marking and tagging rates and retention estimates. While all of the aspects of in-hatchery M&E are vital to the continued operation and success of the program, none of these in-hatchery activities have an effect to species outside of the captive holding facilities.

1.7.2 Off-Station M&E

The off-station M&E activities associated with the programs take place throughout the Action Area. These activities are focused in two major areas of concern—adult spawner and juvenile production estimates for spring/summer Chinook and steelhead. These M&E projects have been in place since the 1990s and are formalized and funded through BPA and the LSRCP. Adult Chinook are marked at the adult collection traps during M&E sampling outside of hatchery facilities (e.g, spawning ground surveys). Current project numbers, operators and funding sources are listed in Table 4. Table 5 includes the dates and locations of the various M&E activities.

Table 4. Current M&E Projects Associated with Hatchery Programs

Project Name	Operator(s)	Funded by	Current USFWS ESA Coverage
Grande Ronde Supplementation M&E on Catherine Cr./Upper Grande Ronde R.	CTUIR	BPA	Section 10 permit (TE844468-10)
Grande Ronde Supplementation Operations and Maintenance (O&M) and M&E on Lostine R.	NPT	BPA	Section 10 permit (TE001598-5)
Grande Ronde Early Life History of Spring Chinook and Steelhead	ODFW	BPA	Section 6 Cooperative Agreement
Chinook spawning ground surveys in the Upper Grande Ronde R., Lostine R., Catherine Cr., Lookingglass Cr., Imnaha R., Tucannon R., and Asotin Cr.	ODFW, NPT, CTUIR, WDFW	LSRCP/BPA	LSRCP Section 7 (File # 1024.0000, 1-4-99-F-2) , Section 10 permit (TE001598-5), Section 10 permit (TE844468-10)
Snorkel surveys (seining and dip nets), electrofishing, and hook and line sampling in Lookingglass Cr., Grande Ronde R., Catherine Cr., Imnaha R., and Tucannon R.	ODFW, CTUIR, WDFW	LSRCP	LSRCP Section 7 (File # 1024.0000, 1-4-99-F-2)
Smolt trapping in Lookingglass Cr., Imnaha R., and Tucannon R.	CTUIR, NPT, ODFW, WDFW	LSRCP/BPA	LSRCP Section 7 (File # 1024.0000, 1-4-99-F-2) , Section 10 permit (TE001598-5), Section 10 permit (TE844468-10)
Steelhead spawning ground surveys in Deer Cr, Tucannon River, Asotin Creek	ODFW WDFW	LSRCP	LSRCP Section 7 (File # 1024.0000, 1-4-99-F-2)

Table 5. Dates and locations of Off-Station M & E Activities.

Off-station RM&E Activity	Timing of Activities	Locations of Activities
Spawning Ground Surveys	August – September	Lostine River [2,5] Catherine Creek [3, 5] Upper Grande Ronde River [3, 4, 5] Lookingglass Creek [5] Imnaha River Basin [4, 5]
	August – October or March-June	Tucannon River [5] Asotin Creek [5]
	March - June	Deer Creek (above the Big Canyon weir) [5]
Steelhead Monitoring Adult Trapping	February - July	Cow Creek Lightening Creek Horse Creek
Snorkel Survey	June - September	Catherine Creek [4,5] Upper Grande Ronde River[4,5] Lostine River[4] Imnaha River [4, 5] Minam River [4] Lookingglass Creek [5]

Off-station RM&E Activity	Timing of Activities	Locations of Activities
	December - January	Catherine Creek [4] Upper Grande Ronde River[4] Lostine River [4] Imnaha River [4]
	Terminated	Tucannon River [5]
Electrofishing Sampling	June - September	Little Sheep Creek [5] Imnaha River [5]
	July-October	Tucannon River [5]
Mark-Recapture (three-pass, low-voltage electrofishing to herd fish into a seine or dip net)	June - October	Rock Creek (RM 0.4 to 3.7) [3] Upper Grande Ronde (RM 174.2 to 175.2) [3]
Smolt Trapping (floating screw-type)	September-June[1]	Catherine Creek (RM 19.9)[4] Upper Grande Ronde River (RM 185.8) [4] Lookingglass Creek (RM 2.5)[3,5]
	September – May[1]	Lostine River (RM 1.9) [4] Minam River (RM 0.2) [4]
	October - July	Tucannon River (RM 1.9)[5]
	March- June[1]	Grande Ronde River (RM 100.6) [4]
	March – May[1]	Minam River (RM 1.9) [4]
	Year round	Lookingglass Creek (RM 2.5) [5]
	Year round	Lower Imnaha River (RM 4.1)[2, 5]

1 Based on 2012 sampling season
2 Section 10 permit TE001598-5
3 Section 10 permit TE844468-10
4 Section 6 Cooperative Agreement with ODFW
5 LSRCP Section 7 consultation (File # 1024.0000, 1-4-99-F-2) Boise ES Office, April 8, 1999.

Spawner Surveys

Ground-based (by foot) surveys of Chinook spawning grounds in the Grande Ronde, Lostine River, Catherine Creek, Imnaha River, Tucannon River, and Asotin Creek, in support of hatchery programs, take place from August to October. Reaches are walked (waded) and examined for new redd deposition in survey areas. Active spawning, courting, or guarding behavior is also observed and recorded. Additionally, carcasses of Chinook salmon are sampled for marks, tags, breeding effort and can also be tissue sampled. ODFW conducts steelhead spawning ground surveys in Deer Creek from March through June to monitor spawning of natural steelhead above the weir at Big Canyon.

Sample Survey (Snorkel, Electrofishing, Seining, etc.)

Single or multiple pass snorkel survey estimates fish presence, population estimates, and densities in relation to key environmental factors of channel units. Snorkel data collected includes visual daytime snorkel counts in sample reaches and by channel unit type (riffles/pools). Counts and length classes of salmonids are estimated by species on a unit area basis. Presence/absence of all other species is also recorded. Some fish are captured for PIT tagging with seine nets during summer snorkel surveys and with hand held dip nets during winter sampling. In the past, bull trout have been observed in the snorkel survey area during non-capture snorkel surveys and juvenile and adult bull trout have been captured during summer seining. Snorkel surveys occur in most action area water bodies (Table 4).

ODFW conducts electrofishing in Little Sheep Creek and ODFW and NPT conducts electrofishing in the Imnaha River to support the NOAA Fisheries study of natural production of hatchery and natural steelhead above the weir on Little Sheep Creek and Imnaha River. ODFW and/or NPT electro-fish representative sample reaches to collect steelhead parr and resident rainbow trout adults to obtain tissue (DNA samples) taken from fin clips. Electrofishing typically occurs from May through October. Protocols employed during electrofishing are designed to minimize impacts of electrofishing, capture time, handling, and stress on bull trout prior to release back into the river. WDFW has conducted electrofishing activities in the Tucannon River in the past and may again in the future.

CTUIR and ODFW conduct snorkel surveys, which are often accompanied by seining or dip net use in; Lookingglass Creek, Grande Ronde River, and Catherine Creek to assess outmigration of natural-origin juvenile spring Chinook salmon in order to describe life history and production characteristics of the reintroduced stocks. CTUIR collects fifty spring Chinook parr from several standard sites in Lookingglass Creek using snorkel/seines to help determine seasonal growth and condition. Sampling is conducted once a month in June, July, August, September, and October. ODFW conducts snorkel surveys in the summer and winter to capture juvenile spring Chinook for PIT-tagging. Summer snorkel surveys are accompanied by juvenile collection via seine nets while the winter tagging is conducted using dip nets. Snorkel surveys used to be conducted by WDFW to monitor distribution and abundance of juvenile spring Chinook between July and September in the Tucannon River, but has not been done since 2006. Snorkel surveys might be re-instated in the future.

CTUIR assesses life history strategies and survival of juvenile spring Chinook salmon in Lookingglass Creek by conducting snorkeling surveys between June and September to help evaluate supplementation success. Snorkel and electrofishing surveys have been terminated in recent years in the Tucannon River because of concerns about the degree of bias in the estimates that result. However, these surveys may be initiated again if methods to reduce bias are found or a specific need for the juvenile data is described. Surveys occur between July and October.

Smolt Trapping

Rotary screw traps are used at several locations to trap out-migrating Chinook and steelhead (natural and hatchery-origin). Juvenile trapping enables ODFW, WDFW, NPT, and CTUIR to determine critical habitat, abundance, migration patterns, survival, hatchery/wild Chinook interactions (with microsatellite genetic analysis), and alternate life history strategies for Chinook and steelhead. Some of the natural and hatchery-origin fish captured are measured, weighed, and released. Small groups of captured steelhead and Chinook receive PIT or radio tags and some also have scales collected. Most fish are counted and released immediately back to the stream to continue their migration.

Mark-Recapture

Sampling consists of a three-pass, mark-recapture method with low-voltage electrofishing to herd fish into a seine or dip net. Block nets are placed at the upstream and downstream ends of the habitat units to prevent immigration and emigration of fish during the removal events.

Following initial marking, recapture events will occur in one or more methods: (1) repeat electrofishing/seine or dip net surveys, (2) PIT tag antenna arrays, or (3) smolt traps. The method of choice will be based on site conditions.

Non-Broodstock Adult Trapping

NPT conducts a selective sampling approach to monitor one or two key tributaries on a four year rotational basis to obtain the demographic stock status information assessment for the total escapement of adult steelhead to the mouth of the Imnaha River. This includes specific data on the metapopulation structure for specific spawning aggregates in Cow, Lightening and Horse Creeks (lower Imnaha River tributaries). NPT installs and operates a flat-panel floating weir to evaluate adult steelhead spawner escapement, demographics, and hatchery/natural composition from late-February through mid-June. The trap is checked daily for fish and debris maintenance. WDFW also operates non-broodstock collection steelhead traps in the Asotin Creek steelhead population (Asotin, George, Alpowa, Ten Mile, and Couse creeks, and on a rotating basis trap in Snake River tributaries that are considered part of the Tucannon River steelhead population - Almota Creek, Penewawa Creek, Alkali Flat Creek, Deadman Creek, and Pataha Creek [tributary to the Tucannon River]).

1.8 Conservation Measures

Conservation measures are actions that will be applied by the action agencies to minimize project effects to listed bull trout and their habitat.

1.8.1 Adult Collection

Measures applied to minimize potential effects during broodstock collection activities include:

- Operate programs in accordance with the policies and procedures developed by the Integrated Hatchery Operations Team (IHOT 1995) for Columbia Basin anadromous salmonid hatcheries.
- Operate adult collection traps only when temperatures are less than 68^{o} F (19^{o}C), though special handling conditions may be developed and agreed to by operators and the services when temperatures exceed 68^{o} F (19^{o}C).
- Direct and coordinate all program adult collection activities through annual planning meetings between the NPT, CTUIR, WDFW, ODFW, LSRCP, BPA, and NOAA that results in the development of an Annual Operating Plan.
- Operate all traps in accordance with their design standards to minimize risk to all fish in general and non-target species in particular.
- Check the adult traps at least every 24 hours, unless an agreement with the Services has been obtained, and more often during peak Chinook and steelhead returns. Remove fish quickly from the trap and return all non-target fish to the stream immediately with minimal handling.
- Ensure that the fish ladders and traps receive sufficient flow in all seasons to attract and effectively pass fish of all life stages. Catalog and prioritize those ladders and traps that do not meet Anadromous Salmonid Passage Facility Design (NOAA 2011) for upgrades as funding becomes available.

1.8.2 Water Diversion

Measures applied to minimize potential effects of water withdrawals include:

- Operate facilities within their water right with respect to maximum withdrawal from surface and/or ground water sources , while complying with any minimum instream flow requirements.
- Site, design, and operate all withdrawal structures to prevent barriers to fish passage.
- LSRCP will catalog and prioritize those intakes and traps that do not meet Anadromous Salmonid Passage Facility Design (NOAA 2011) for upgrades as funding becomes available.

1.8.3 Effluent

General measures applied to minimize potential effects of hatchery effluent include:

- Operate all qualifying hatchery facilities (i.e., rearing >20,000 lbs per year) under an applicable CWA NPDES permit, which includes periodic water quality sampling for compliance.
- Ensure proper feeding volume and application to reduce non-utilized feed.
- Use pollution abatement structures for all pond cleaning activities (rearing >20,000 lbs per year) to reduce the suspended sediment from these activities.
- Perform all hatchery maintenance on "watered" or "in-water" facilities to minimize potential effects to hatchery effluent (i.e., sediment disturbance, water temperature, and chemical composition).

Specific measures applied to minimize disease risk from effluent:

- Operate programs in accordance with the policies and procedures developed by the IHOT for Columbia Basin anadromous salmonid hatcheries.
- Follow the measures outlined in the PNFHPC Model Comprehensive Fish Health Protection Program.
- Test pre-release and broodstock to ensure that released fish meet existing fish health standards. Conduct testing in accordance to protocols in the most recent edition of the American Fisheries Society (AFS) Fish Health Section Blue Book and OIE standards.
- Administer therapeutic drugs and chemicals to fish and eggs reared at program facilities only when necessary to effectively prevent, control, or treat disease conditions.
- Administer all treatments according to label directions in compliance with the Food and Drug Administration (FDA) and the Environmental Protection Agency (EPA) regulations for the use of aquatic animal drugs and chemicals. EPA and FDA consider the environmental effects acceptable when the therapeutic compounds are used according to the label.
- Notify program fish health staff at least six weeks prior to a release or transfer of fish from the hatchery. Collect tissue samples on 60 fish of the stock being transferred or released. The pathogens screened for include: infectious hematopoietic necrosis virus (IHNV); infectious pancreatic necrosis virus (IPNV); viral hemorrhagic septicemia virus (VHSV); *R. salmoninarum*; *Aeromonas salmonicida*; *Yersinia ruckeri*; and under certain circumstances other pathogens such as *Myxobolus cerebralis* and *Ceratomyxa shasta*.

1.8.4 Facility Operation and Maintenance

None beyond those identified for effluent and/or semi-routine operation and maintenance.

Semi-Routine Facility Operation and Maintenance

Measures applied to minimize potential effects of semi-routine hatchery facility maintenance:

- Catalog and prioritize those structures that do not meet Anadromous Salmonid Passage Facility Design (NOAA 2011) for upgrades as funding becomes available.
- Complete all work during the allowable in-water work times established for each location, unless otherwise approved in writing by the appropriate state and federal agency (WDFW or ODFW), NOAA Fisheries, and the Service.
- Prepare and implement a pollution and erosion control plan to prevent pollution related to O&M activities. The plan will be made available for inspection on request by BPA, NOAA Fisheries and the Service. Pollution and erosion control plan will address equipment and materials storage sites, fueling operations, staging areas, cement mortars and bonding agents, hazardous materials, spill containment and notification, and debris management.
- Select equipment that will have the least adverse effects on the environment (e.g., minimally-sized rubber tires, etc.) when heavy equipment must be used.
- Have the proper approved oils /lubricants when working below the Ordinary High Water (OHW) mark.
- Operate all equipment above the OHW or in the dry whenever possible to reduce impacts.
- Make absorbent material available on site to collect any lubricants in case of a pressurized line failure. Dispose of all used materials in the proper manner.
- Stage and fuel all equipment in appropriate areas above the OHW mark.
- Cease operations if, at any time, fish are observed in distress as a result of the action activities.
- Clean all equipment to ensure it is free of vegetation, external oil, grease, dirt, and mud before equipment is brought to the site and prior to removal from the project area.
- Involve local habitat entities with the maintenance actions and notify local habitat entities prior and following the activities completion.
- Ensure that all work meets state and federal fish passage requirements.
- Minimize impacts to riparian vegetation at the work sites and upon completion of the work. Grade and replant disturbed areas to match the landscape and existing vegetation at the site.
- Install silt barriers at the site during work to prevent/reduce sediment from entering the river.
- Dispose of all discharge water created by O&M tasks (e.g. debris removal operations, vehicle wash water) at an adjacent upland location. No discharge water will be allowed to return to the adjacent waterbodies unless specifically approved by NOAA Fisheries and the Service.
- Obtain all appropriate state and Federal permits before work is initiated.
- Clean all materials used prior to placement below the OHW.
- Install straw bales and or geo-textile filtration traps to outlet channel when dredging to catch any sediment exiting the subject waterbody.
- Filter pumped water through straw bale sediment traps to remove any sediment prior to re-entering state waterbodies.

1.8.5 Acclimation and Release

Measures applied to minimize potential competition/predation effects during juvenile release activities include:

- Operate programs in accordance with the policies and procedures developed by the IHOT (1995) for Columbia Basin anadromous salmonid hatcheries.
- Release hatchery smolts that are physiologically ready to migrate to minimize the potential for competition with naturally produced juvenile fish in freshwater.
- Operate hatcheries such that hatchery fish are reared to sufficient size that smoltification occurs in nearly the entire population.
- Release all hatchery fish as actively migrating smolts through volitional release practices so that the fish migrate quickly seaward, limiting the duration of interaction with any co-occurring natural-origin fish downstream of the release site.

1.8.6 Monitoring and Evaluation

Measures applied to minimize potential effects of M&E include:

- Conduct all in-river spawner surveys in known target species spawning reaches.
- During spawning activities, conduct surveys to minimize disturbance of live fish, such as follow standard fish handling and anesthetization procedures to minimize the effects on all fish handled for M&E activities.
- Follow fish trapping, trap maintenance, fish handling, fish anesthesia, and fish marking protocols explicitly and train all staff in their use and application before working under field conditions.
- Do not use non-target species for smolt trap efficiency tests.
- Handle listed fish with extreme care and keep them in cold water to the maximum extent possible during sampling and processing procedures. When fish are transferred or held, a healthy environment must be provided; e.g., the holding units will contain adequate amounts of well-circulated water. When using gear that captures a mix of species, process listed fish first, whenever possible, to minimize handling stress.
- Check smolt trap and live box components regularly to ensure that traps are not causing fish impingement or descaling and that fine debris is removed from the traps.
- Monitor water temperatures and stream discharge regularly to ensure safe capture and handling of all fish. At water temperatures of 70–72°F, sampling will be permitted for up to four days per week from 0600-1030 hours. All sampling will cease when temperatures reach 72°F. No sampling may resume until daily average water temperatures drop to ≤ 71.9°F.

1.9 Action Area

The action area is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). In delineating the action area, we evaluated the farthest reaching physical, chemical, and biotic effects of the action on the environment. The action area for the NE Oregon/SE Washington hatchery programs includes the mainstem Columbia River between one mile downstream of the Umatilla River confluence and the Tri-Cities, the mainstem Snake River from the Columbia River confluence to the confluence with the Hells Canyon Dam, all portions of the Imnaha River, the Grande Ronde River, the Tucannon River, and Asotin Creek subbasins (Figure 3). It is recognized that fish released from the programs will also inhabit lower portions of the Columbia River downstream of John Day Dam and the Pacific Ocean. Considering the small proportion of fish from the proposed programs in comparison with the total numbers of fish in the Columbia River basin and the Pacific Ocean, it is not possible to meaningfully measure, detect, or evaluate the effects of those juvenile interactions (NOAA 2012).

Figure 3. Action area for the NE Oregon/SE Washington Chinook and Steelhead Hatchery Programs.

2. Analytical Framework for the Jeopardy and Adverse Modification Determinations

2.1 Jeopardy Determination

In accordance with policy and regulation, the jeopardy analysis in this Opinion relies on four components: (1) the *Status of the Species*, which evaluates the range-wide condition of the bull trout, the factors responsible for that condition, and the species' survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the bull trout in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the bull trout; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the bull trout; and (4) *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the bull trout.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the species' current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the species in the wild.

The jeopardy analysis in this Opinion emphasizes consideration of the range-wide survival and recovery needs of the bull trout and the role of the action area in its survival and recovery. It is within this context that we evaluate the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

2.2 Adverse Modification Determination

This Opinion applies the new regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02 (81 FR 7214, published February 11, 2016). The designation of critical habitat for bull trout used the term primary constituent element (PCE). The new critical habitat regulations (81 FR 7214) replace this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a ''destruction or adverse modification'' analysis, which is the same regardless of whether the original designation identified primary constituent elements, physical or biological features, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

In accordance with policy and regulation, the adverse modification analysis in this Opinion relies on four components: 1) the *Status of Critical Habitat*, which evaluates the range-wide condition of designated critical habitat for the bull trout in terms of PBF (see Conservation Role and Description of Critical Habitat), the factors responsible for that condition, and the intended recovery function of the critical habitat overall; 2) the *Environmental Baseline*, which evaluates the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area; 3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the PBF and how that will influence the recovery role of affected critical habitat units; and 4) *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the PBF and how that will influence the recovery role of affected critical habitat units.

For purposes of the adverse modification determination, the effects of the proposed Federal action on bull trout critical habitat are evaluated in the context of the range-wide condition of the critical habitat, taking into account any cumulative effects, to determine if the critical habitat range-wide would remain functional (or would retain the current ability for the PBF to be functionally established in areas of currently unsuitable but capable habitat) to serve its intended recovery role for the bull trout.

The analysis in this Opinion places an emphasis on using the intended range-wide recovery function of bull trout critical habitat and the role of the action area relative to that intended function as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the adverse modification determination.

3. Status of the Species/Critical Habitat

3.1 Listing Status

The coterminous United States population of the bull trout (*Salvelinus confluentus*) was listed as threatened on November 1, 1999 (64 FR 58910). The bull trout generally occurs in the Klamath River Basin of south-central Oregon; the Jarbidge River in Nevada; the Willamette River Basin in Oregon; Pacific Coast drainages of Washington, including Puget Sound; major rivers in Idaho, Oregon, Washington, and Montana, within the Columbia River Basin; and the St. Mary-Belly River, east of the Continental Divide in northwestern Montana (Bond 1992, p. 2; Brewin and Brewin 1997, p. 215; Cavender 1978, pp. 165-166; Leary and Allendorf 1997, pp. 716-719).

Throughout its range, bull trout are threatened by the combined effects of habitat degradation, fragmentation, and alterations associated with dewatering, road construction and maintenance, mining, grazing, the blockage of migratory corridors by dams or other diversion structures, poor water quality, entrainment (a process by which aquatic organisms are pulled through a diversion or other device) into diversion channels, and introduced non-native species (64 FR 58910). Although all salmonids are likely to be affected by climate change, bull trout are especially vulnerable given that spawning and rearing are constrained by their location in upper watersheds and the requirement for cold water temperatures (Battin *et al.* 2007, pp. 6672-6673; Rieman *et al.* 2007, p. 1552). Poaching and incidental mortality of bull trout during other targeted fisheries are additional threats.

The bull trout was initially listed as three separate Distinct Population Segments (DPSs) (63 FR 31647; 64 FR 17110). The preamble to the final listing rule for the United States coterminous population of the bull trout discusses the consolidation of these DPSs with the Columbia and Klamath population segments into one listed taxon and the application of the jeopardy standard under section 7 of the Endangered Species Act (Act) relative to this species (64 FR 58910):

> *Although this rule consolidates the five bull trout DPSs into one listed taxon, based on conformance with the DPS policy for purposes of consultation under section 7 of the Act, we intend to retain recognition of each DPS in light of available scientific information relating to their uniqueness and significance. Under this approach, these DPSs will be treated as interim recovery units with respect to application of the jeopardy standard until an approved*

> *recovery plan is developed. Formal establishment of bull trout recovery units will occur during the recovery planning process.*

Since the publication of this final listing rule, the Service published the Recovery Plan for the Coterminous United States Population of Bull Trout (Recovery Plan)(USFWS 2015a), which recognized all bull trout as one DPS, but retained the previous six separate DPS as individual recovery units, comprised of 109 core areas. This project area is contained within the Mid-Columbia Recovery Unit (MCRU).

Thus, as discussed above under the *Analytical Framework for the Jeopardy and Adverse Modification Determinations*, the Service's jeopardy analysis for the proposed Project will involve consideration of how the Project is likely to affect the MCRU for the bull trout based on its uniqueness and significance as described in the DPS final listing rule cited above, the Recovery Plan, and the MCRU Implementation Plan for Bull Trout (USFWS 2015b) which are herein incorporated by reference. However, in accordance with Service national policy, the jeopardy determination is made at the scale of the listed species. In this case, that is the coterminous U.S. population of the bull trout.

Recovery Planning

Between 2002 and 2004, three separate draft bull trout recovery plans were completed. In 2002, a draft recovery plan that addressed bull trout populations within the Columbia, Saint Mary- Belly, and Klamath River basins (USFWS 2002a, b, c, d) was completed and included individual chapters for 24 separate recovery units. In 2004, draft recovery plans were developed for the Coastal-Puget Sound drainages in western Washington, including two recovery unit chapters, and for the Jarbidge River in Nevada (USFWS 2004a, b). None of these draft recovery plans were finalized, but they have served to identify recovery actions across the range of the species and to provide a framework for implementing numerous recovery actions by our partner agencies, local working groups, and others with an interest in bull trout conservation.

The Service released a revised draft bull trout recovery plan in August 2014 (USFWS 2014a) and a final recovery plan in September 2015 (USFWS 2015a). The final recovery plan: 1) incorporates and builds upon new information found in numerous reports and studies regarding bull trout life history, ecology, etc., including a variety of implemented conservation actions, since the draft 2002 and 2004 recovery planning period; and (2) revises recovery criteria proposed in the 2002 and 2004 draft recovery plans to focus on effective management of threats to bull trout at the core area level, and de-emphasize achieving targeted point estimates of abundance of adult bull trout (demographics) in each core area.

The 2002 and 2004 draft recovery plans provide the general life history information, habitat characteristics, diet, reasons for decline, and distribution and abundance of the different core areas. The 2014 revised draft recovery plan and the final 2015 recovery plan integrate new information collected since the 1999 listing regarding bull trout life history, distribution, demographics, conservation successes, etc., and update previous bull trout recovery planning efforts across the range of the single DPS currently listed under the Act. While the 2015 final recovery plan supersedes and replaces the previous draft recovery plans, the 2002 and 2004 draft recovery plans still provide important information on bull trout status and life history.

The 2015 final recovery plan establishes three recovery actions for each of the six Recovery Units (RUs):

1) Protect, restore, and maintain suitable habitat conditions for bull trout that promote diverse life history strategies and conserve genetic diversity**.**

2) Prevent and reduce negative effects of non-native fishes and other non-native taxa on bull trout.

3) Work with partners to conduct research and monitoring to implement and evaluate bull trout recovery activities, consistent with an adaptive management approach using feedback from implemented, site-specific recovery actions.

3.1.1 Current Status and Conservation Needs

Bull trout recovery is based on a geographical hierarchical approach. Bull trout are listed as a single DPS within the five-state area of the coterminous United States. The single DPS is subdivided into six biologically-based recovery units: (1) Coastal Recovery Unit; (2) Klamath Recovery Unit; (3) Mid-Columbia Recovery Unit; (4) Upper Snake Recovery Unit; (5) Columbia Headwaters Recovery Unit; and (6) Saint Mary Recovery Unit (USFWS 2014a, p. 32). A viable recovery unit should demonstrate that the three primary principles of biodiversity have been met: representation (conserving the genetic makeup of the species); resiliency (ensuring that each population is sufficiently large to withstand stochastic events); and redundancy (ensuring a sufficient number of populations to withstand catastrophic events) (USFWS 2014a).

Each of the six recovery units contain multiple bull trout core areas, 118 total, which are non-overlapping watershed-based polygons, and each core area includes one or more local populations. Currently there are 110 occupied core areas, which comprise 600 or more local populations. There are also six core areas where bull trout historically occurred but are now extirpated, and two research needs areas where bull trout were known to occur historically, but their current presence and use of the area are uncertain.

Core areas can be further described as complex or simple. Complex core areas contain multiple local bull trout populations, are found in large watersheds, have multiple life history forms, and have migratory connectivity between spawning and rearing habitat and foraging, migration, and overwintering habitats (FMO). Simple core areas are those that contain one bull trout local population. Simple core areas are small in scope, isolated from other core areas by natural barriers, and may contain unique genetic or life history adaptations.

A local population is a group of bull trout that spawn within a particular stream or portion of a stream system. A local population is considered 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. Gene flow may occur between local populations (*e.g.*, those within a core population), but is assumed to be infrequent compared with that among individuals within a local population.

The habitat requirements of bull trout are often generally expressed as the four “Cs”: cold, clean, complex, and connected habitat. Cold stream temperatures, clean water quality that is relatively free of sediment and contaminants, complex channel characteristics (including abundant large wood and undercut banks), and large patches of such habitat that are well connected by unobstructed migratory pathways are all needed to promote conservation of bull trout throughout all hierarchical levels.

Recovery Units

The following is a summary of the description and current status of the bull trout within the six recovery units (RUs). A comprehensive discussion is found in the Service's 2015 recovery plan for the bull trout (USFWS 2014a, pp. 113-126, USFWS 2015a) and the 2015 Implementation Plans.

Coastal Recovery Unit

The Coastal RU is located within western Oregon and Washington. The Coastal RU is divided into three regions: Puget Sound, Olympic Peninsula, and the Lower Columbia River Regions. This RU contains 21 core areas and 85 local populations, including the Clackamas River core area where bull trout had been extirpated and were reintroduced in 2011, and identified four historically occupied core areas that could be re-established. Core areas within Puget Sound and the Olympic Peninsula currently support the only anadromous local populations of bull trout. This RU also contains ten shared FMO habitats which are outside core areas and allows for the continued natural population dynamics in which the core areas have evolved. There are four core areas within the Coastal RU that have been identified as current population strongholds: Lower Skagit, Upper Skagit, Quinault River, and Lower Deschutes River. These are the most stable and abundant bull trout populations in the RU. The current condition of the bull trout in this RU is attributed to the adverse effects of climate change, loss of functioning estuarine and nearshore marine habitats, development and related impacts (e.g., flood control, floodplain disconnection, bank armoring, channel straightening, loss of instream habitat complexity), agriculture (e.g., diking, water control structures, draining of wetlands, channelization, and the removal of riparian vegetation, livestock grazing), fish passage (e.g., dams, culverts, instream flows) residential development, urbanization, forest management practices (e.g., timber harvest and associated road building activities), connectivity impairment, mining, and the introduction of non-native species. Conservation measures or recovery actions implemented include relicensing of major hydropower facilities that have provided upstream and downstream fish passage or complete removal of dams, land acquisition to conserve bull trout habitat, floodplain restoration, culvert removal, riparian re-vegetation, levee setbacks, road removal, and projects to protect and restore important nearshore marine habitats.

Klamath Recovery Unit

The Klamath RU is located in southern Oregon and northwestern California. The Klamath RU is the most significantly imperiled recovery unit, having experienced considerable extirpation and geographic contraction of local populations and declining demographic condition, and natural re-colonization is constrained by dispersal barriers and presence of nonnative brook trout (USFWS 2014a, p.38). This RU currently contains three core areas and eight local populations. Nine historic local populations of bull trout have become extirpated, and restoring additional local populations will be necessary to achieve recovery (USFWS Klamath RU, p. B-7). All three core areas have been isolated from other bull trout populations for the past 10,000 years. The current condition of the bull trout in this RU is attributed to the adverse effects of climate change, habitat degradation and fragmentation, past and present land use practices, agricultural water diversions, nonnative species, and past fisheries management practices. Conservation measures or recovery actions implemented include removal of nonnative fish (e.g., brook trout, brown trout, and hybrids), acquiring water rights for instream flows, replacing diversion structures, installing fish screens, constructing bypass channels, installing riparian fencing, culvert replacement, and habitat restoration.

Mid-Columbia Recovery Unit

The Mid-Columbia RU is located within eastern Washington, eastern Oregon, and portions of central Idaho. The Mid-Columbia RU is divided into four geographic regions: Lower Mid-Columbia, Upper Mid-Columbia, Lower Snake, and Mid-Snake Geographic Regions. This RU contains 25 occupied core areas, two historically occupied core areas; one research needs area, and seven FMO habitats. The current condition of the bull trout in this RU is attributed to the adverse effects of climate change, agricultural practices (e.g. irrigation, water withdrawals, livestock grazing), fish passage (e.g. dams, culverts), nonnative species, forest management practices, and mining. Conservation measures or recovery actions implemented include road removal, channel restoration, mine reclamation, improved grazing management, removal of fish barriers, and instream flow requirements.

Upper Snake Recovery Unit

The Upper Snake RU is located in central Idaho, northern Nevada, and eastern Oregon. The Upper Snake RU is divided into seven geographic regions: Salmon River, Boise River, Payette River, Little Lost River, Malheur River, Jarbidge River, and Weiser River. This RU contains 22 core areas and 206 local populations, with almost 60 percent being present in the Salmon River Region. The current condition of the bull trout in this RU is attributed to the adverse effects of climate change, dams, mining, forest management practices, nonnative species, and agriculture (e.g., water diversions, grazing). Conservation measures or recovery actions implemented include instream habitat restoration, instream flow requirements, screening of irrigation diversions, and riparian restoration.

Columbia Headwaters Recovery Unit

The Columbia Headwaters RU is located in western Montana, northern Idaho, and the northeastern corner of Washington. The Columbia Headwaters RU is divided into five geographic regions: Upper Clark Fork, Lower Clark Fork, Flathead, Kootenai, and Coeur d'Alene Geographic Regions. This RU contains 35 bull trout core areas; 15 of which are complex core areas as they represent larger interconnected habitats and 20 simple core areas as they are isolated headwater lakes with single local populations. The 20 small core areas are each represented by a single local population, many of which may have persisted for thousands of years despite small populations and isolated existence (USFWS Columbia RU p. D-1). Fish passage improvements within the IRU have reconnected previously fragmented habitats. The current condition of the bull trout in this RU is attributed to the adverse effects of climate change, mining and contamination by heavy metals, nonnative species, modified instream flows, migratory barriers (e.g., dams), habitat fragmentation, forest practices (e.g., logging, roads), agriculture practices (e.g. irrigation, livestock grazing), and residential development. Conservation measures or recovery actions implemented include habitat improvement, fish passage, and removal of nonnative species. Unlike the other RUs, the Columbia Headwaters RU does not have any anadromous fish overlap. Therefore, bull trout within the Columbia Headwaters RU do not benefit from the recovery actions for salmon (USFWS Columbia RU p. D-41).

<u>Saint Mary Recovery Unit</u>

The Saint Mary RU is located in Montana but is heavily linked to downstream resources in southern Alberta, Canada. Most of the watershed in this RU is located in Canada. The United States portion includes headwater spawning and rearing habitat and the upper reaches of FMO habitat. This RU contains four core areas, and eight local populations. The current condition of the bull trout in this RU is attributed to the adverse effects of climate change, the Saint Mary Diversion operated by the Bureau of Reclamation (e.g., entrainment, fish passage, instream flows), and nonnative species. The primary issue precluding bull trout recovery in this RU relates to impacts of water diversions, specifically at the Bureau of Reclamation's Milk River Project.

3.1.2 Life History

Bull trout exhibit both resident and migratory life history strategies. Both resident and migratory forms may be found together, and either form may produce offspring exhibiting either resident or migratory behavior (Rieman and McIntyre 1993, pp. 1-18). Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. The resident form tends to be smaller than the migratory form at maturity and also produces fewer eggs (Fraley and Shepard 1989, p. 1; Goetz 1989, pp. 15-16). Migratory bull trout spawn in tributary streams where juvenile fish rear 1 to 4 years before migrating to either a lake (adfluvial form), river (fluvial form) (Fraley and Shepard 1989, pp. 135-137; Goetz 1989, pp. 22-25), or saltwater (anadromous form) to rear as subadults and to live as adults (Cavender 1978, pp. 139, 165-68; McPhail and Baxter 1996, p. 14; WDFW *et al.* 1997, pp. 17-18, 22-26). Bull trout normally reach sexual maturity in 4 to 7 years and may live longer than 12 years. They are iteroparous (they spawn more than once in a lifetime). Repeat- and alternate-year spawning has been reported, although repeat-spawning frequency and post-spawning mortality are not well documented (Fraley and Shepard 1989, pp. 135-137; Leathe and Graham 1982, p. 95; Pratt 1992, p. 6; Rieman and McIntyre 1996, p. 133).

The iteroparous reproductive strategy of bull trout has important repercussions for the management of this species. Bull trout require passage both upstream and downstream, not only for repeat spawning but also for foraging. Most fish ladders, however, were designed specifically for anadromous semelparous salmonids (fishes that spawn once and then die, and require only one-way passage upstream). Therefore, even dams or other barriers with fish passage facilities may be a factor in isolating bull trout populations if they do not provide a downstream passage route. Additionally, in some core areas, bull trout that migrate to marine waters must pass both upstream and downstream through areas with net fisheries at river mouths. This can increase the likelihood of mortality to bull trout during these spawning and foraging migrations.

Growth varies depending upon life-history strategy. Resident adults range from 6 to 12 inches total length, and migratory adults commonly reach 24 inches or more (Goetz 1989, pp. 29-32; Pratt 1984, p. 13). The largest verified bull trout is a 32-pound specimen caught in Lake Pend Oreille, Idaho, in 1949 (Simpson and Wallace 1982).

3.1.3 Habitat Characteristics

Bull trout have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993, p. 7). Habitat components that influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrate, and migratory corridors (Fraley and Shepard 1989, pp. 137, 141; Goetz 1989, pp. 19-26; Bond in Hoelscher and Bjornn 1989, p. 57; Howell and Buchanan 1992, p. 1; Pratt 1992, p. 6; Rich 1996, pp. 35-38; Rieman and McIntyre 1993, pp. 4-7; Rieman and McIntyre 1995, pp. 293-294; Sedell and Everest 1991, p. 1; Watson and Hillman 1997, pp. 246-250). Watson and Hillman (1997, pp. 247-249) 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, p. 7), bull trout should not be expected to simultaneously occupy all available habitats (Rieman *et al.* 2007, p. 1560).

Migratory corridors link seasonal habitats for all bull trout life histories. The ability to migrate is important to the persistence of bull trout (Gilpin, *in litt.* 1997, pp. 4-5; Rieman and McIntyre 1993, p. 7; Rieman *et al.* 1997, p. 1114). Migrations facilitate gene flow among local populations when individuals from different local populations interbreed or stray to nonnatal streams. Local populations that are extirpated by catastrophic events may also become reestablished by bull trout migrants. However, it is important to note that the genetic structuring of bull trout indicates there is limited gene flow among bull trout populations, which may encourage local adaptation within individual populations, and that reestablishment of extirpated populations may take a long time (Rieman and McIntyre 1993, p. 7; Spruell *et al.* 1999, pp. 118-120). Migration also allows bull trout to access more abundant or larger prey, which facilitates growth and reproduction. Additional benefits of migration and its relationship to foraging are discussed below under “Diet.”

Cold water temperatures play an important role in determining bull trout habitat quality, as these fish are primarily found in colder streams (below 15 °C or 59 °F), and spawning habitats are generally characterized by temperatures that drop below 9 °C (48 °F) in the fall (Fraley and Shepard 1989, p. 133; Pratt 1992, p. 6; Rieman and McIntyre 1993, p. 7).

Thermal requirements for bull trout appear to differ at different life stages. Spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Baxter *et al.* 1997, pp. 426-427; Pratt 1992, p. 6; Rieman and McIntyre 1993, p. 7; Rieman *et al.* 1997, p. 1117). Optimum incubation temperatures for bull trout eggs range from 2 °C to 6 °C (35 °F to 39 °F) whereas optimum water temperatures for rearing range from about 6 °C to 10 °C (46 °F to 50 °F) (Buchanan and Gregory 1997, pp. 121-122; Goetz 1989, pp. 22-24; McPhail and Murray 1979, pp. 41, 50, 53, 55). In Granite Creek, Idaho, Bonneau and Scarnecchia (1996) observed that juvenile bull trout selected the coldest water available in a plunge pool, 8 °C to 9 °C (46 °F to 48 °F), within a temperature gradient of 8 °C to 15 °C (4 °F to 60 °F). In a landscape study relating bull trout distribution to maximum water temperatures, Dunham *et al.* (2003) found that the probability of juvenile bull trout occurrence does not become high (i.e., greater than 0.75) until maximum temperatures decline to 11 °C to 12 °C (52 °F to 54 °F).

Although bull trout are found primarily in cold streams, occasionally these fish are found in larger, warmer river systems throughout the Columbia River basin (Buchanan and Gregory 1997, pp. 121-122; Fraley and Shepard 1989, pp. 135-137; Rieman and McIntyre 1993, p. 2; Rieman and McIntyre 1995, p. 288; Rieman *et al.* 1997, p. 1114). Availability and proximity of cold water patches and food productivity can influence bull trout ability to survive in warmer rivers (Myrick *et al.* 2002). For example, in a study in the Little Lost River of Idaho where bull trout were found at temperatures ranging from 8 °C to 20 °C (46 °F to 68 °F), most sites that had high densities of bull trout were in areas where primary productivity in streams had increased following a fire (Gamett, pers. comm. 2002).

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, pp. 135-137; Goetz 1989, pp. 22-25; Hoelscher and Bjornn 1989, p. 54; Pratt 1992, p. 6; Rich 1996, pp. 35-38; Sedell and Everest 1991, p. 1; Sexauer and James 1997, pp. 367-369; Thomas 1992, pp. 4-5; Watson and Hillman 1997, pp. 247-249). Maintaining bull trout habitat requires stability of stream channels and maintenance of natural flow patterns (Rieman and McIntyre 1993, p. 7). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997, pp. 367-369). 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, pp. 135-137; Pratt 1992, p. 6; Pratt and Huston 1993, pp. 70-72). Pratt (1992, p. 6) indicated that increases in fine sediment reduce egg survival and emergence.

Bull trout typically spawn from August through November during periods of increasing flows and decreasing water temperatures. Preferred spawning habitat consists of low-gradient stream reaches with loose, clean gravel (Fraley and Shepard 1989, p. 135). Redds are often constructed in stream reaches fed by springs or near other sources of cold groundwater (Goetz 1989, p. 15; Pratt 1992, p. 8; Rieman and McIntyre 1996, p. 133). Depending on water temperature, incubation is normally 100 to 145 days (Pratt 1992, p. 8). After hatching, fry remain in the substrate, and time from egg deposition to emergence may surpass 200 days. Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows (Ratliff and Howell 1992 in Howell and Buchanan 1992, pp. 10, 15; Pratt 1992, pp. 5-6).

Early life stages of fish, specifically the developing embryo, require the highest inter-gravel dissolved oxygen (IGDO) levels, and are the most sensitive life stage to reduced oxygen levels. The oxygen demand of embryos depends on temperature and on stage of development, with the greatest IGDO required just prior to hatching.

A literature review conducted by the Washington Department of Ecology (WDOE 2002) indicates that adverse effects of lower oxygen concentrations on embryo survival are magnified as temperatures increase above optimal (for incubation). In a laboratory study conducted in Canada, researchers found that low oxygen levels retarded embryonic development in bull trout (Giles and Van der Zweep 1996, pp. 54-55). Normal oxygen levels seen in rivers used by bull trout during spawning ranged from 8 to 12 mg/L (in the gravel), with corresponding instream levels of 10 to 11.5 mg/L (Stewart *et al.* 2007). In addition, IGDO concentrations, water velocities in the water column, and especially the intergravel flow rate, are interrelated variables that affect the survival of incubating embryos (ODEQ 1995). Due to a long incubation period of 220+ days, bull trout are particularly sensitive to adequate IGDO levels. An IGDO level below 8 mg/L is likely to result in mortality of eggs, embryos, and fry.

Migratory forms of bull trout may develop when habitat conditions allow movement between spawning and rearing streams and larger rivers, lakes or nearshore marine habitat where foraging opportunities may be enhanced (Brenkman and Corbett 2005, pp. 1073, 1079-1080; Frissell 1993, p. 350; Goetz *et al.* 2004, pp. 45, 55, 60, 68, 77, 113-114, 123, 125-126). 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 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, lakes, and marine waters; 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 1999, pp. 15-16; Rieman and McIntyre 1993, pp. 18-19; MBTSG 1998, pp. iv, 48-50; USFWS 2004a, Vol. 2, p. 63). In the absence of the migratory bull trout life form, isolated populations cannot be replenished when disturbances make local habitats temporarily unsuitable. Therefore, the range of the species is diminished, and the potential for a greater reproductive contribution from larger fish with higher fecundity is lost (Rieman and McIntyre 1993, pp. 1-18).

3.1.4 Diet

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy. A single optimal foraging strategy is not necessarily a consistent feature in the life of a fish, because this strategy can change as the fish progresses from one life stage to another (i.e., juvenile to subadult). Fish growth depends on the quantity and quality of food that is eaten (Gerking 1994), and as fish grow, their foraging strategy changes as their food changes, in quantity, size, or other characteristics. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, and small fish (Boag 1987, p. 58; Donald and Alger 1993, pp. 239-243; Goetz 1989, pp. 33-34). Subadult and adult migratory bull trout feed on various fish species (Brown 1994, p. 21; Donald and Alger 1993, p. 242; Fraley and Shepard 1989, p. 135; Leathe and Graham 1982, p. 95). Bull trout of all sizes other than fry have been found to eat fish up to half their length (Beauchamp and VanTassell 2001). In nearshore marine areas of western Washington, bull trout feed on Pacific herring (*Clupea pallasi*), Pacific sand lance (*Ammodytes hexapterus*), and surf smelt (*Hypomesus pretiosus*) (Goetz *et al.* 2004, p. 114; WDFW *et al.* 1997, p. 23).

Bull trout migration and life history strategies are closely related to their feeding and foraging strategies. Migration allows bull trout to access optimal foraging areas and exploit a wider variety of prey resources. Optimal foraging theory can be used to describe strategies fish use to choose between alternative sources of food by weighing the benefits and costs of capturing one source of food over another. For example, prey often occur in concentrated patches of abundance ("patch model") (Gerking 1994). As the predator feeds in one patch, the prey population is reduced, and it becomes more profitable for the predator to seek a new patch rather than continue feeding on the original one. This can be explained in terms of balancing energy acquired versus energy expended. For example, in the Skagit River system, anadromous bull trout make migrations as long as 121 miles between marine foraging areas in Puget Sound and headwater spawning grounds, foraging on salmon eggs and juvenile salmon along their migration route (WDFW *et al.* 1997). Anadromous bull trout also use marine waters as migration corridors to reach seasonal habitats in non-natal watersheds to forage and possibly overwinter (Brenkman and Corbett 2005, p. 1079; Goetz *et al.* 2004, pp. 36, 60).

3.1.5 Effects of Climate Change on Bull Trout

The Service's analyses include consideration of ongoing and projected changes in climate. The terms "climate" and "climate change" are defined by the Intergovernmental Panel on Climate Change (IPCC). "Climate" refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007, p. 78). The term "climate change" thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007, p. 78). Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2007, pp. 8–14, 18–19). In our analyses, we use our expert judgment to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change.

Climate change is likely to play an increasingly important role in determining the abundance of ESA-listed species and the conservation value of designated critical habitats in the Pacific Northwest. These changes will not be spatially homogeneous across the Pacific Northwest. Areas with elevations high enough to maintain temperatures well below freezing for most of the winter and early spring will be less affected. Low-elevation areas are likely to be more affected. During the last century, average regional air temperatures increased by 1.5°F, with increases as much as 4°F in isolated areas (USGCRP 2009). Average regional temperatures are likely to increase an additional 3°F to 10°F over the next century (USGCRP 2009). Overall, about one- third of the current cold-water fish habitat in the Pacific Northwest is likely to exceed key water temperature thresholds by the end of this century (USGCRP 2009).

Precipitation trends during the next century are less certain than for temperature, but more precipitation is likely to occur during October through March, less may occur during summer months, and more winter precipitation is likely to fall as rain rather than snow (ISAB 2007, USGCRP 2009). Significant reductions in both total snow pack and low-elevation snow pack in the Pacific Northwest is predicted over the next 50 years (Mote and Salathé 2010) – changes that will shrink the extent of the snowmelt-dominated habitat available to salmonids. Where snow occurs, a warmer climate will cause earlier runoff, which will increase flows in early spring but will likely reduce flows and increase water temperature in late spring, summer, and fall (ISAB 2007, USGCRP 2009).

As the snow pack diminishes and seasonal hydrology shifts to more frequent and severe early large storms, stream flow timing and increased peak river flows may limit salmonid survival (Mantua *et al.* 2010). Lower stream flows and warmer water temperatures during summer will degrade summer rearing conditions, in part by increasing the prevalence and virulence of fish diseases and parasites (USGCRP 2009). To avoid waters above summer maximum temperatures, juvenile rearing may be increasingly found only in the confluence of colder tributaries or other areas of cold water refugia (Mantua *et al.* 2010). Other adverse effects are likely to include altered migration patterns, accelerated embryo development, premature emergence of fry, variation in quality and quantity of tributary rearing habitat, and increased competition and predation risk from warm-water, non-native species (ISAB 2007).

The earth's oceans are also warming, with considerable interannual and inter-decadal variability superimposed on the longer-term trend (Bindoff *et al.* 2007). Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmonids, while cooler ocean periods have coincided with relatively high abundances (Scheuerell and Williams 2005; Zabel *et al.* 2006; USGCRP 2009). Ocean conditions adverse to salmonids may be more likely under a warming climate (Zabel *et al.* 2006).

Ocean acidification resulting from the uptake of carbon dioxide by ocean waters threatens corals, shellfish, and other living things that form their shells and skeletons from calcium carbonate (Orr *et al.* 2005; Feely *et al.* 2012). Such ocean acidification is essentially irreversible over a time scale of centuries (Royal Society 2005). Increasing carbon dioxide concentrations are reducing ocean pH and dissolved carbonate ion concentrations, and thus levels of calcium carbonate saturation. Over the past several centuries, ocean pH has decreased by about 0.1 (an approximately 30 percent increase in acidity) and is projected to decline by another 0.3 to 0.4 pH units (approximately 100 to 150 percent increase in acidity) by the end of this century (Orr *et al.* 2005; Feely *et al.* 2012). As aqueous carbon dioxide concentrations increase, carbonate ion concentrations decrease, making it more difficult for marine calcifying organisms to form biogenic calcium carbonate needed for shell and skeleton formation. The reduction in pH also affects photosynthesis, growth, and reproduction of marine organisms. The upwelling of deeper ocean water deficient in carbonate, and thus potentially detrimental to the food chains supporting juvenile salmonids, has recently been observed along the U.S. west coast (Feely *et al.* 2008).

Climate change is expected to make recovery targets for ESA-listed species more difficult to achieve. Actions improving freshwater and estuarine habitats can offset some of the adverse impacts of climate change. Examples include restoring connections to historical floodplains and estuarine habitats, protecting and restoring riparian vegetation, purchasing or applying easements to lands that provide important cold water or refuge habitat, and leasing or buying water rights to improve summer flows (Battin *et al.* 2007; ISAB 2007).

3.2 Bull Trout Critical Habitat

3.2.1 Legal Status

The Service published a final rule designating critical habitat for the coterminous United States population of the bull trout on October 18, 2010 (75 FR 63898); the rule became effective on November 17, 2010. A justification document was also developed to support the rule and is available on our website (http://www.fws.gov/pacific/bulltrout). The scope of the rule included consideration of the following six draft recovery units: Mid-Columbia, Saint Mary, Columbia

Headwaters, Coastal, Klamath, and Upper Snake (75 FR 63927).

Range-wide, the Service designated numerous miles of streams/shorelines and acres of reservoirs/lakes as bull trout critical habitat (Table 6). These totals include approximately 823 miles of streams/shorelines and 16,701 acres of lakes/reservoirs that are currently considered unoccupied by bull trout. These unoccupied areas were determined by the Service to be essential for restoring functioning migratory bull trout populations based on currently available scientific information. These unoccupied areas often include lower main stem river environments that could provide seasonally important migration habitat for bull trout. This type of habitat is essential where reestablishing bull trout in currently unoccupied areas is considered necessary to achieve recovery. Designated critical habitat is of two types based on its potential use by bull trout, which are: 1) spawning and rearing habitats; and 2) foraging, migration, and over-wintering habitats. Approximately 9,495 miles (48 percent) of the stream and marine shoreline reaches are used as spawning and rearing habitats, with the remainder (including all reservoirs and lakes) used as foraging, migration, and over-wintering habitats.

Table 6. Stream/shoreline distance and reservoir/lake area designated as bull trout critical habitat by state.

State	Stream/Shoreline Miles	Stream/Shoreline Kilometers	Reservoir/ Lake Acres	Reservoir/Lake Hectares
Idaho	8,771.6	14,116.5	170,217.5	68,884.9
Montana	3,056.5	4,918.9	221,470.7	89,626.4
Nevada	71.8	115.6	-	-
Oregon	2,835.9	4,563.9	30,255.5	12,244.0
Oregon/Idaho	107.7	173.3	-	-
Washington	3,793.3	6,104.8	66,308.1	26,834.0
Washington (marine)	753.8	1,213.2	-	-
Washington/ Idaho	37.2	59.9	-	-
Washington/ Oregon	301.3	484.8	-	-
Total	19,729.0	31,750.8	488,251.7	197,589.2

The final rule continues to exclude some areas as critical habitat based on a careful balancing of the benefits of inclusion versus the benefits of exclusion. Critical habitat does not include: 1) waters adjacent to non-federal lands covered by legally operative incidental take permits for HCPs issued under section 10(a)(1)(B) of the Act in which bull trout is a covered species on or before publication of the final rule; 2) waters within or adjacent to Tribal lands subject to certain commitments to conserve bull trout or a conservation program that provides aquatic resource protection and restoration through collaborative efforts, and where the Tribes indicated that inclusion would impair their relationship with the Service; or 3) waters where impacts to national security have been identified. Excluded area totals amount to approximately 10 percent of the stream/shoreline miles and 4 percent of the lake/reservoir acreage totals of designated critical habitat. Each excluded area is identified in the relevant text of the final rule, as identified in paragraphs (e)(8) through (e)(41). Tables 7 and 8 provide a general list of the excluded areas and their associated amount of stream/shoreline miles and reservoir/lake acreage, respectively. It is important to note that the exclusion of waterbodies from designated critical habitat does not negate or diminish their importance for bull trout conservation. Because exclusions reflect the often complex pattern of land ownership, designated critical habitat is often fragmented and interspersed with excluded segments of a given waterbody.

3.2.2 Conservation Role and Description of Critical Habitat

The conservation role of bull trout critical habitat is to support viable core area populations (75 FR 63943). The core areas reflect the metapopulation structure of bull trout and are the closest approximation of a biologically functioning unit for the purposes of recovery planning and risk analyses. CHUs generally encompass one or more core areas and may include foraging, migration, and over-wintering habitats outside of core areas that are considered important to the survival and recovery of bull trout.

Table 7. Stream/shoreline distance excluded from bull trout critical habitat based on tribal ownership or other plan.

Ownership and/or Plan	Kilometers	Miles
Lewis River Hydro Conservation Easements	7.0	4.3
DOD – Dabob Bay Naval	23.9	14.8
HCP – Cedar River (City of Seattle)	25.8	16.0
HCP – Washington Forest Practices Lands	1,608.30	999.4
HCP – Green Diamond (Simpson)	104.2	64.7
HCP – Plum Creek Central Cascades (WA)	15.8	9.8
HCP – Plum Creek Native Fish (MT)	181.6	112.8
HCP–Stimson	7.7	4.8
HCP – WDNR Lands	230.9	149.5
Tribal – Blackfeet	82.1	51.0
Tribal – Hoh	4.0	2.5
Tribal – Jamestown S'Klallam	2.0	1.2
Tribal – Lower Elwha	4.6	2.8
Tribal – Lummi	56.7	35.3
Tribal – Muckleshoot	9.3	5.8
Tribal – Nooksack	8.3	5.1
Tribal – Puyallup	33.0	20.5
Tribal – Quileute	4.0	2.5
Tribal – Quinault	153.7	95.5
Tribal – Skokomish	26.2	16.3
Tribal – Stillaguamish	1.8	1.1
Tribal – Swinomish	45.2	28.1
Tribal – Tulalip	27.8	17.3
Tribal – Umatilla	62.6	38.9
Tribal – Warm Springs	260.5	161.9
Tribal – Yakama	107.9	67.1
Total	3,094.9	1,923.1

Table 8. Lake/Reservoir area excluded from bull trout critical habitat based on tribal ownership or other plan.

Ownership and/or Plan	Hectares	Acres
HCP – Cedar River (City of Seattle)	796.5	1,968.2
HCP – Washington Forest Practices Lands	5,689.1	14,058.1
HCP – Plum Creek Native Fish	32.2	79.7
Tribal – Blackfeet	886.1	2,189.5
Tribal – Warm Springs	445.3	1,100.4
Total	7,849.3	19,395.8

Thirty-two CHUs within the geographical area occupied by the species at the time of listing are designated under the final rule. Twenty-nine of the CHUs contain all of the physical and biological features identified in the final rule that are considered necessary to support the multiple life-history requirements of bull trout. Three mainstem river units in the Columbia and Snake River Basins contain all of the physical and biological features necessary to support foraging, migratory, and over-wintering bull trout (i.e., other than those physical and biological features associated with spawning and rearing habitats). The Olympic Peninsula and Puget Sound CHUs are essential to the conservation of anadromous bull trout, which are unique to the Coastal-Puget Sound population segment. These CHUs contain marine nearshore and freshwater habitats outside of core areas that are used by bull trout from one or more core areas. These habitats contain PBFs that are critical to adult and subadult bull trout for foraging, migration, and overwintering.

The primary function of individual CHUs is to maintain and support core areas, which 1) contain bull trout populations with the demographic characteristics needed to ensure their persistence and contain the habitat needed to sustain those characteristics (Rieman and McIntyre 1993, p. 19), 2) provide for persistence of strong local populations, in part by providing habitat conditions that encourage movement of migratory fish (Rieman and McIntyre 1993, pp. 22-23; MBTSG 1998, pp. 48-49), 3) are large enough to incorporate genetic and phenotypic diversity, but small enough to ensure connectivity between populations (Hard 1995, pp. 314-315; Healey and Prince 1995, p. 182; Rieman and McIntyre 1993, pp. 22-23; MBTSG 1998, pp. 48-49), and 4) are distributed throughout the historic range of the species to preserve both genetic and phenotypic potential adaptations (Hard 1995, pp. 321-322; Rieman and McIntyre 1993, p. 23; Rieman and Allendorf 2001, p. 763; MBTSG 1998, pp. 13-16).

3.2.3 Physical and Biological Features (PBF) for Bull Trout

Within the designated critical habitat areas, the PBFs for bull trout are those habitat components that are essential for the primary biological needs of foraging, reproducing, rearing of young, dispersal, genetic exchange, or sheltering. Based on our current knowledge of the life history, biology, and ecology of this species and the characteristics of the habitats necessary to sustain its essential life-history functions, we have determined that the following PBFs are essential for the conservation of bull trout.

1. Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) that contribute to water quality and quantity and provide thermal refugia.

2. Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.

3. An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

4. Complex river, stream, lake, reservoir, and marine shoreline aquatic environments, and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks, and unembedded substrates to provide a variety of depths, gradients, velocities, and structure.

5. Water temperatures ranging from 36 °F to 59 °F, with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form, geography, elevation, diurnal and seasonal variation, shading (e.g., provided by riparian habitat), streamflow, and local groundwater influence.

6. In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates is characteristic of these conditions. The size and amount of fine sediment suitable to bull trout will likely vary from system to system.

7. A natural hydrograph, including peak, high, low, and base flows, within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph.

8. Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.

9. Sufficiently low levels of occurrence of non-native predatory (e.g., lake trout [*Salvelinus namaycush*], walleye [*Stizostideon vitreum*], northern pike [*Esox lucius*], smallmouth bass [*Micropterus dolomieu*]), interbreeding (e.g., brook trout [*Salvelinus fontinalis*]), or competing (e.g., brown trout [*Salmo trutta*]) species that, if present, are adequately temporally and spatially isolated from bull trout.

These revised PBFs are similar to those previously in effect under the 2005 critical habitat designation (70 FR 56212). The most significant modification is the addition of PBF 9 to address the presence of non-native predatory, interbreeding, or competitive fish species. Although this PBF applies to both freshwater and marine environments, currently no non-native fish species are of concern in the marine environment.

Note that only PBFs 2, 3, 4, 5, and 8 apply to marine nearshore waters identified as critical habitat. Also, lakes and reservoirs within the CHUs also contain most of the physical or biological features necessary to support bull trout, with the exception of those associated with PBFs 1 and 6. Additionally, all except PBF 6 apply to foraging, migration, and over-wintering habitats designated as critical habitat.

Critical habitat includes the stream channels within the designated reaches and has a lateral extent as defined by the bankfull elevation on one bank to the bankfull elevation on the opposite bank. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain and is reached at a discharge that generally has a recurrence interval of 1 to 2 years on the annual flood series. If bankfull elevation is not evident on either bank, the ordinary high-water line must be used to determine the lateral extent of critical habitat. The lateral extent of designated reservoirs/lakes is defined by the perimeter of the waterbody as mapped on standard 1:24,000 scale topographic maps. The Service assumes in many cases that this is the full-pool level of the waterbody. In areas where only one side of the waterbody is designated (i.e., where only one side is excluded), the mid-line of the waterbody represents the lateral extent of critical habitat.

In marine nearshore areas, the inshore extent of critical habitat is the mean higher high-water (MHHW) line, including the uppermost reach of the saltwater wedge within tidally influenced freshwater heads of estuaries. The MHHW line refers to the average of all the higher high-water heights of the two daily tidal levels. Marine critical habitat extends offshore to the depth of 10 meters (33 feet) relative to the mean lower low-water (MLLW) line (zero tidal level or average of all the lower low-water heights of the two daily tidal levels). This area between the MHHW line and 10 meters (33 feet) below the MLLW line (which represents the average extent of the photic zone) is considered the habitat most consistently used by bull trout in marine waters based on known use, forage fish availability, and ongoing migration studies, and captures geological and ecological processes important to maintaining these habitats. This area contains essential foraging habitat and migration corridors such as estuaries, bays, inlets, shallow subtidal areas, and intertidal flats.

Adjacent shoreline riparian areas, bluffs, and uplands are not designated as critical habitat. However, it should be recognized that the quality of freshwater and marine habitats is intrinsically related to the character of these features adjacent to streams, lakes, and shorelines, and that human activities that occur outside of designated critical habitat can have major effects on the physical and biological features of these aquatic environments.

Activities that cause adverse effects to critical habitat are evaluated to determine if they are likely to “destroy or adversely modify” the critical habitat by causing it to no longer serve its intended conservation role for the species or to lose those PBFs that relate to its ability to at least periodically support the species. Activities that may destroy or adversely modify critical habitat are those that alter the PBFs to such an extent that the conservation value of the critical habitat is appreciably reduced (75 FR 63898:63943; USFWS 2004a, Vol. 1. pp. 140-193, Vol. 2, pp. 69-114). The Service’s evaluation must be conducted at the scale of the entire critical habitat area designated, unless otherwise stated in a final critical habitat rule (USFWS and NOAA 1998, pp. 4-39). Thus, adverse modification of bull trout critical habitat is evaluated at the scale of the final designation, which includes critical habitat designated for the Coastal, Klamath, Mid-Columbia, Upper Snake, Columbia Headwaters, and Saint Mary draft recovery units (USFWS 2010a, pp. 4-7). However, we consider all 32 CHUs to contain features or areas essential to the conservation of the bull trout (75 FR 63898:63901, 63944). Therefore, if a proposed action would alter the physical or biological features of critical habitat to an extent that it appreciably reduces the conservation function of one or more CHUs for bull trout, a finding of adverse modification of the entire designated critical habitat area may be warranted (75 FR 63898:63943).

3.2.4 Current Critical Habitat Condition Range-wide

The condition of bull trout critical habitat varies from poor to good across the species' range. Although bull trout are still relatively widely distributed across their historic range, they occur in low numbers in many areas and many local populations are considered depressed or declining (67 FR 71240). This condition reflects the condition of bull trout critical habitat. The decline of bull trout is primarily due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices, impoundments, dams, water diversions, and the introduction of non-native species (63 FR 31647, June 10 1998; 64 FR 17112, April 8, 1999).

There is widespread agreement in the scientific literature that many factors related to human activities have impacted bull trout and their habitat, and continue to do so. Among the many factors that contribute to degraded PBFs, those which appear to be particularly significant are as follows: 1) fragmentation and isolation of local populations due to the proliferation of dams and water diversions that have eliminated habitat, altered water flow and temperature regimes, and impeded migratory movements (Dunham and Rieman 1999, p. 652; Rieman and McIntyre 1993, p. 7); 2) degradation of spawning and rearing habitats and upper watershed areas, particularly alterations in sedimentation rates and water temperatures, resulting from forest and rangeland practices and intensive development of roads (Fraley and Shepard 1989, p. 141; MBTSG 1998, pp. ii - v, 20-45); 3) the introduction and spread of non-native fish species as a result of fish stocking and degraded habitat conditions, particularly brook trout and lake trout that compete for limited resources or hybridize (in the case of brook trout) with bull trout (Leary *et al.* 1993, p. 857; Rieman *et al.* 2006, pp. 73-76); 4) in the Coastal-Puget Sound region where anadromous bull trout occur, degradation of mainstem river foraging, migration, and over-wintering habitat and the degradation and loss of marine nearshore foraging and migration habitat due to urban and residential development; and 5) degradation of foraging, migration, and over-wintering habitat resulting from reductions in prey base, road construction, agriculture practices, development, and dams.

3.2.5 Effects of Climate Change on Bull Trout Critical Habitat

Our analyses under the Act include consideration of ongoing and projected changes in climate. The terms "climate" and "climate change" are defined by the Intergovernmental Panel on Climate Change (IPCC). "Climate" refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007, p. 78). The term "climate change" thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007, p. 78). Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2007, pp. 8–14, 18–19). In our analyses, we use our expert judgment to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change.

One objective of the final rule was to identify and designate those habitats that provide for potential resiliency of bull trout populations in the face of climate change. Over a period of decades, climate change may directly threaten the integrity of the essential physical or biological features described by PBFs 1, 2, 3, 5, 7, 8, and 9. Protecting bull trout strongholds and cold water refugia from disturbance and ensuring connectivity among populations were important considerations in addressing this potential impact. Additionally, climate change may exacerbate habitat degradation impacts both physically (e.g., decreased base flows, increased water temperatures) and biologically (e.g., increased competition with non-native fishes).

3.2.6 Consultations on Effects to Critical Habitat

Pursuant to section 7 of the Act, the Service has consulted on the effects of various projects to bull trout critical habitat throughout the species' range. Many of these section 7 consultations include actions that potentially degrade the environmental baseline. However, long-term restoration efforts have also been implemented that provide improvements in the function of designated critical habitat within some of the CHUs.

4. Environmental Baseline

The preamble to the implementing regulations for section 7 (51 FR 19932; third paragraph, left column) contemplates that the evaluation of "…the present environment in which the species or critical habitat exists, as well as the environment that will exist when the action is completed, in terms of the totality of factors affecting the species or critical habitat…will serve as the baseline for determining the effects of the action on the species or critical habitat." The regulations at 50 CFR 402.02 define the environmental baseline to include "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." The analyses presented in this section supplement the above *Status of the Species* and *Status of Critical Habitat* evaluations by focusing on the current condition of the bull trout and its critical habitat in the action area, the factors responsible for that condition (inclusive of the factors cited above in the regulatory definition of environmental baseline), and the role the action area plays in the survival and recovery of the bull trout and in the recovery support function of designated critical habitat. Relevant factors on lands surrounding the action area that are influencing the condition of the bull trout and its critical habitat were also considered in completing the status and baseline evaluations herein.

4.1 Status of the Bull Trout in the Action Area

The Action Area encompasses over 1,000 miles of foraging, migrating, overwintering (FMO) and spawning and rearing (SR) habitats in the Lower Snake River and Mid-Columbia River Basins. Several tributaries to the Lower Snake River are also part of the action area, including all of the Grande Ronde, Imnaha, and Tucannon Rivers, and Asotin Creek (Figure 3). Each of the action area tributaries contains an identified core area and subsequently one to several individual local populations of bull trout. While the mainstem Columbia and Snake Rivers are not included within identified bull trout core areas, the corridors provide shared FMO for bull trout from tributaries throughout the action area. In addition, individuals from several other core areas are likely to enter the action area in the mainstem Columbia and Snake Rivers, in small numbers, during migratory and foraging activities, or as a result of entrainment over dams. Bull trout originating outside of the action area likely originate from core areas in the Clearwater, Walla Walla, and Umatilla Rivers. There are no barriers to bull trout movement into the action area from core areas in the Salmon River. However, there is little data or known documentation of use of the Snake River by Salmon River populations. Therefore, these populations were not included in the assessment. The status of bull trout within the mainstem Snake and Columbia Rivers and each of the core areas identified within the action area (Imnaha River, Grande Ronde River, Asotin Creek, and Tucannon River) are addressed separately, below. Brief status descriptions are also provided for the Clearwater, Walla Walla, and Umatilla Rivers where bull trout often enter into and utilize the action area for FMO.

4.1.1 Mainstems of the Lower Snake and Columbia Rivers

Historically, the lower Snake and Mid-Columbia Rivers were used as; foraging areas, migration corridors, and over-wintering habitats by fluvial bull trout that originated in tributary streams throughout the broader region. Presently, different portions of the mainstems are used to varying degrees by bull trout, depending on the status of the local populations within the tributaries, and the condition of migration corridors that connect the tributaries to the Snake and Columbia Rivers. Currently, foraging, migrating, and over-wintering bull trout could occur in the lower Snake River and Mid-Columbia River reservoirs, at any time of year, depending on the availability of suitable water temperatures, but are most likely present from November through May. Bull trout would primarily occur in areas of abundant food resources, and cold water refugia while in the mainstems of the rivers. They would likely avoid areas of slack water, limited cover, or where predation by larger fish is possible, such as; near docks and riprap-armored banks.

The Army Corps of Engineers (Corps) maintains fish counts at passage facilities on all four of the lower Snake River dams, and McNary Dam on the Columbia River to monitor various salmonid populations. The Corps' salmonid monitoring program does not specifically address bull trout and does not continue throughout the year, notably excluding December through February when over-wintering bull trout would be expected to occur in the mainstem. Between 2006 and 2013, approximately 579 bull trout were observed in adult fish ladders in the Lower Snake River and two bull trout were observed at the McNary Dam fish ladder (D. Wills *in litt.* 2014). While the collection of these data was relatively consistent and can be considered comparable among the Dams, they should be viewed with some caution as individual fish were not marked and may have been counted more than once. At McNary, Lower Monumental, Little Goose, and Lower Granite Dams out-migrating salmon smolts are monitored, sampled, and transported. Bull trout are occasionally collected in the smolt facilities along the Lower Snake River. Between 1998 and 2013, fourteen bull trout were also opportunistically documented in juvenile bypass structures during anadromous smolt monitoring activities at the Lower Monumental, Little Goose, and Lower Granite Dams, respectively (D. Wills *in litt*. 2014). Finally, the Service has also monitored individual bull trout in the lower Snake River that were marked using passive integrated transponder (PIT) tags (D. Wills *in litt*. 2014). Between 2006 and 2011, a total of eight PIT-tagged bull trout were detected on nineteen separate occasions, including the detection of the same two fish at the Ice Harbor and Lower Monumental Dams, five individuals at Little Goose Dam, and three at Lower Granite Dam (including two in common with the Little Goose Dam detections). Another three tagged bull trout were observed at McNary Dam on multiple occasions in 2008 and 2011 (D. Wills *in litt*. 2014).

Studies have also documented bull trout originating from local populations throughout the region entering the mainstem Snake and Columbia Rivers. Habitat in larger rivers, lakes, and reservoirs likely provides greater opportunities for growth and reproductive success via food resources and space (Mogen and Kaeding 2005, p. 850). Bull trout from the upper Clearwater River watershed have migrated downstream as far as Lewiston, Idaho (USFWS 2008a, p. 33). Telemetry studies in the Walla Walla River documented tagged bull trout entering the Columbia River between November and February (Barrows *et al*. 2012, p. 2; Barrows *et al.* 2014, p. 1). Some tagged Walla Walla bull trout were tracked upstream to the Snake River (Barrows *et al.* 2014, p. 46). Other studies have observed bull trout from the Walla Walla River migrating into the Columbia River and arriving in upstream facilities in the Umatilla River (Anglin *et al*. 2012, p. 2). Bull trout from the Tucannon River drainage were documented in the Lower Snake River in late fall and winter (Faler *et al.* 2008, p. 21). Starcevich *et al*. (2010) tracked bull trout movements from populations in the Grande Ronde, Imnaha, Walla Walla, Umatilla, and John Day Rivers. Each resulted in migrations into mainstem rivers during overwintering (Starcevich *et al*. 2010, p. 264). Fall and spring distributions of bull trout in the Imnaha River include the lower Imnaha and Snake Rivers. Faler *et al*. (2003) documented bull trout from the Tucannon River overwinter in the Lower Snake River between October and February. Based on the frequency of use by tributary populations, the mainstem Columbia and Snake Rivers provide important connectivity, foraging, and overwintering areas for bull trout. Migratory corridors such as these also provide bull trout in the broader region with possible access to; unoccupied but suitable habitats, enhanced foraging areas, and refuge from disturbances in other watersheds (Saunders *et al.* 1991).

4.1.2 Grande Ronde River

The Grande Ronde River Core area, within the Columbia River Interim Recovery Unit, was subdivided into three smaller core areas in 2011. This was based on; the distribution patterns determined from telemetry studies of fish tagged from the Wenaha, Lostine River, and Lookingglass Creek, differences in the environmental characteristics among the subdivisions, and the likelihood for genetic exchange and demographic linkage given the size of the Grande Ronde subbasin (USFWS 2011a). For example, bull trout from the upper Grande Ronde would not likely interbreed with fish from the Wenaha River or the Wallowa River. This subdivision is also consistent with the core area designations in the neighboring John Day system. The Little Minam core area was included in the 2002/2004 draft recovery plans due to it being a healthy population isolated above a barrier with essential physical habitat features. The Little Minam River is included in this summary as the 4th core area in the Grande Ronde basin.

The core areas in the Grande Ronde River basin include; 1) Upper Grande Ronde River/Catherine Creek/Indian Creek; 2) Lookingglass Creek/Wenaha River; 3) Wallowa River/Minam River; and 4) Little Minam River. The Grande Ronde River between these locations is identified as FMO habitat.

Little Minam River Core Area

The Little Minam River Core Area is located in northeast Oregon within the Grande Ronde Basin within the Little Minam watershed. The Little Minam Core Area is located entirely within the Eagle Cap Wilderness on the western edge of the Wallowa subbasin, in both Union and Wallowa Counties.

The Little Minam Core area includes the Little Minam River, a tributary to the Minam River. This core area encompasses the Little Minam River and tributaries containing one local population located above a barrier falls at approximately km 9 (mi 5.6). (The Little Minam River below the barrier to the confluence with the Minam River is not included in this population but is included in the Minam River population as 5.6 miles of FMO habitat). Bull trout above the barrier falls occupy 9.4 miles of the Little Minam River (spawning/rearing), 0.4 miles of Boulder Creek (spawning/rearing), ≤0.5 miles of Horseshoe Creek (spawning/rearing) (A. Miller, USFS pers. comm. 2011) and 3.2 miles of Dobbin Creek (spawning/rearing).

The entire occupied area of the Little Minam Core area is essential to the recovery unit because it is a resident bull trout stronghold within the Mid-Columbia Recovery Unit and within the state of Oregon. The Little Minam Core area contains one healthy resident population (an average of 306 redds from 1997 to 2004, or 27 redds/mile). This bull trout stronghold has resident bull trout that are distributed throughout the habitat and habitat conditions are excellent (located within the Eagle Cap wilderness). The Little Minam resident population is stable with a low risk of extinction.

There are no major threats to this core area as it is a bull trout stronghold within the Columbia Basin and within the state of Oregon. Although, catastrophic fire and other stochastic events are concerns as this resident population is isolated above a barrier and is therefore, vulnerable to these events.

Upper Grande Ronde/Catherine/Indian Core Area

This core area is located in northeast Oregon in Union County near the city of La Grande and includes the mainstem Grande Ronde River from the headwaters and tributaries; Catherine Creek and tributaries, and Indian Creek and tributaries, and the mainstem Grande Ronde River from FMO headwaters to downstream Indian confluence.

Bull trout populations in this core area include; 1) the Upper Grande Ronde River; 2) Limber Jim Creek; 3) Chicken and Indiana Creek; 4) Clear Creek; 5) Catherine Creek; and 6) Indian Creek.

The entire occupied area of the Upper Grande Ronde/Catherine/Indian Core Area is essential to the conservation of bull trout in the Mid-Columbia RU. The six populations in this core area are spread over a large geographical area with multiple age classes, containing both resident and fluvial fish. Distribution for this core area includes a total of approximately 231.4 stream miles. (53.6 occupied stream miles in Catherine Creek, 2.7 miles in M.F. Catherine Creek, 8.7 miles in NF Catherine Creek, 6.7 in S.F. Catherine, 20.3 miles in Indian Creek, 0.7 miles in Camp Creek, 1.7 miles in EF Indian Creek, 0.9 miles in NF Indian Creek, 77 miles in the mainstem Grande Ronde River (FMO Indian to headwaters), 11. 5 miles in the Upper Grande Ronde River, 8.1 miles in Limber Jim, 5.3 miles in Chicken Creek, 2.1 miles in Indiana Creek, and 10.2 in Clear Creek (including unnamed tributary), 9.4 miles in Fly Creek, 2.4 miles in Pole Creek, 1.8 miles in Sand Pass creek, 1.9 miles in Collins Creek, and 2.1 miles in Marion Creek). This core area of bull trout also has an anadromous prey base; connectivity with the Grande Ronde River; general distribution of bull trout throughout the habitat; and varying habitat conditions. There is a high level of uncertainty in the status of the populations in this core area. The NF Catherine Creek is the only location that has some trend data (total redds for 1.3 miles of survey ranged 2-33 redds from 1998-2006, and 2008, and 2009, average number redds was 14, or 10.8 redds/mile). This population to date is estimated to be stable (with a downward trend in recent years). Ratliff and Howell 1992 estimated the Upper Grande Ronde, Catherine and Indian Creek populations as being at moderate risk of extinction.

Significant threats in this core area include; 1) poor water quality (stream temperature, sediment, nutrients, bacteria, and chemicals); 2) passage barriers and lack of fish screens; 3) seasonal low flows; and 4) non-native fish interactions with bull trout.

Lookingglass/Wenaha Core Area

The Wenaha watershed area and the Lookingglass watersheds are included in this core area. The Lookingglass portion of this core area is located in Union and Wallowa counties in NE Oregon, and the Wenaha portion of this core area is located in Columbia, Garfield, and Asotin counties in SE WA, and in Wallowa county, OR. Lookingglass is near the town of Elgin, OR and the Wenaha is near the town of Troy, OR. The Wenaha-Tucannon Wilderness is located in the Umatilla National Forest, encompasses 177,465 acres and includes most of the Wenaha River drainage. The Wenaha River is designated as a Federal Wild and Scenic River. The Wenaha is recovering from legacy effects associated with past logging; and domestic sheep and cattle grazing. Lookingglass Creek is located on both national forest (almost entirely within a designated roadless area) and private lands and is a spring fed drainage that maintains cool water temperatures.

Bull trout populations in this core area include; 1) NF Wenaha River; 2) SF Wenaha River (including the Wenaha River); 3) Butte Creek and WF Butte Creek; and 4) Lookingglass Creek.

The entire occupied area of the Lookingglass/Wenaha Core Area is essential to the conservation of bull trout in the Mid-Columbia RU. The four populations in this core area are spread over a large geographical area with multiple age classes, containing both resident and fluvial fish. Distribution for this core area includes a total of approximately 15.0 bull trout occupied stream miles in Lookingglass drainage (2.8 miles of spawning/rearing in Lookingglass Creek, and 12.2 miles of FMO in Lookingglass. The Wenaha system has approximately 51.3 miles of occupied bull trout habitat. Bull trout distribution in the Wenaha River includes; 1) mainstem Wenaha River 21.7 total miles, 10 miles of FMO in the lower river and 11.7 miles of spawning/rearing; 2) NF Wenaha River includes 11.7 miles spawning/rearing; 3) SF Wenaha River has 8.1 miles spawning/rearing; 4) and WF and EF Butte Creeks have 2.6 miles spawning/rearing; and 5) Butte Creek has 7.2 miles of spawning/rearing. The Wenaha River bull trout have been included in the SF Wenaha River population but this assumption will need to be validated. This core area of bull trout also has an anadromous prey base; connectivity with the Grande Ronde River; general distribution of bull trout throughout the habitat; and excellent habitat conditions. There is a concern regarding the presence of brook trout in the Lookingglass system and the level of interaction between bull trout and brook trout in Lookingglass Creek is unknown. In general, there is a high level of uncertainty about the trend of the populations, especially for the populations within the Wenaha. The Lookingglass Creek redd counts have had a range of 15-69 (average of 44.5) redds for approximately 4 miles of survey from 1994-2010. Lookingglass population is estimated to be stable based on the trend of redd counts. Lookingglass Creek was rated as moderate risk of extinction (by Buchanan *et al.* 1997).

There are insufficient data available to make inferences about abundance of bull trout and to conclude population stability or trend in the entire Wenaha River system (G. Mendel, WDFW, pers. comm., 2008; and B. Knox, ODFW, pers. comm. 2011). Information is available regarding the relative abundance of bull trout in northern tributaries of the Wenaha River within Washington State (Mendel *et al.* 2006, 2008). The North Fork Wenaha River within Washington has bull trout redd counts of 82 and 86 (both partial counts) in 2006 and 2007 respectively, and 153 redds in 2005, and 112 in 2010 (G. Mendel, WDFW, pers. comm. 2011). Butte Creek and the West Fork of Butte Creek also have bull trout redd counts (of 31 and 32 redds, respectively) in 2005 and 2006, although the survey areas were not exactly the same during the two years. One pass electrofishing surveys are available that provide relative densities (#/100 meters square) of bull trout juveniles from the main-stem and tributaries of the North Fork Wenaha River, and Butte Creek. Other tributaries of the Wenaha River within Washington, including portions of Crooked Creek in 2008 and 2010, as well as Menatchee Creek (lower Grande Ronde tributary) were sampled with one pass electrofishing, but no bull trout were documented (Mendel *et al*. 2006, 2008; G. Mendel pers. comm. 2011). Ratliff and Howell (1992) listed the Wenaha River as having a low risk of extinction based upon protection within wilderness.

Significant threats to portions of this core area include: 1) Lack of connectivity in Lookingglass Creek between spawning/rearing and FMO habitat due to passage, the Lookingglass Hatchery weir is a bull trout passage barrier.

<u>Grande Ronde River FMO Habitat (River Mile (RM) 0- RM 100.5)</u>

The Grande Ronde River FMO habitat (not associated with a core area in the Grande Ronde Basin) is from the confluence with the Snake River upstream to the confluence with Indian Creek (River Mile 0-100.5). The Grande Ronde River FMO habitat is located in northeast Oregon in Union and Wallowa Counties; and in southeast Washington in Asotin County. It passes through the towns of Elgin and Troy in OR and joins the Snake River near Rogersburg, WA. Major streams flowing into the Grande Ronde River FMO are Lookingglass Creek, the Wallowa River, Wenaha River, and Joseph Creek.

The Grande Ronde FMO habitat provides connectivity to populations in the three nearby core areas; the Upper Grande Ronde/Catherine/Indian; Lookingglass/Wenaha; and Wallowa/Minam as well connectivity to the Snake River and nearby bull trout populations. Major barriers to bull trout movement (seasonally) within this FMO habitat include water quality problems associated with high stream temperatures (in the late summer and early fall), low flows (in the late summer and early fall) and high sediment (ODEQ 2010, ODEQ 1998). Bull trout interactions with non-native fish in this FMO habitat may affect abundance and distribution of bull trout within the Grande Ronde River and in nearby core areas. The eight dams downstream of the Grande Ronde FMO habitat; closest dam being Lower Granite dam, and the Hells Canyon complex of dams upstream, may affect connectivity between this FMO habitat and portions of the Snake River.

Significant threats in this FMO habitat include; 1) Passage barriers and FMO habitat associated with poor water quality (high stream temperature and sediment and low flows).

Wallowa/Minam Core Area

The Wallowa/Minam Core area is located in the Grande Ronde River subbasin in northeast Oregon, in Wallowa and Union counties near the cities of Wallowa, Lostine, Enterprise, and Joseph. This core area includes the Wallowa River, Hurricane Creek, Lostine River, Bear Creek, Deer Creek, and the Minam River drainages. The Eagle Cap Wilderness is located in the Wallowa-Whitman National Forest, and includes most of the Minam River and the upper most reaches of the Wallowa and Lostine River drainages as well as Bear, Deer, and Hurricane Creeks. Federal Wild and Scenic River status is designated for the Lostine (16 miles from the headwaters to USFS boundary) and Minam (39 miles from headwaters to Eagle Cap Wilderness boundary) Rivers and Oregon State Scenic Waterway status is designated to the Minam and lower Wallowa Rivers.

Currently, this core area contains six local populations. The 2004 draft Recovery Plan describes three populations (Hurricane, Lostine/Bear, Minam/Deer) and which were recently split due to new information on distribution and abundance (including data from: telemetry; electrofishing, angling, snorkeling, and redd counts); as well as information on barriers (at least seasonally) that suggests limited connectivity and reduced expression of a fluvial life history. The Lostine River/Bear Creek populations and the Minam River/Deer Creek populations were split due to the distance between these spawning populations (geographical separation of the spawning areas); ≥21 miles distance between spawning areas of the Lostine River and Bear Creek populations and ≥32 miles distance between spawning areas of the Minam and Deer populations. Gene flow may occur between these populations but more infrequent than among individuals within the populations. These six populations are located in the; 1) Minam River and tributaries; 2) Deer Creek; 3) Lostine River; 4) Bear Creek and tributaries; 5) Wallowa Lake and upstream tributaries; and 6) Upper Hurricane Creek (Starcevich *et al.* 2010, Doyle 2011, Sausen 2011).

The entire occupied area of the Wallowa/Minam Core Area is essential to the conservation of bull trout in the Mid-Columbia RU. The six populations in this core area are spread over a large geographical area with multiple age classes, containing both resident and fluvial fish. Distribution for this core area includes a total of approximately 168.4 stream miles. (2.2 miles spawning/rearing upstream of Wallowa Lake, 1,496 acres FMO of Wallowa Lake, 41.1 miles FMO in Wallowa River (mouth to Hurricane), 5.0 miles spawning/rearing in Upper Hurricane Creek, 26.1 miles in Lostine River and tributaries (15.7 miles spawning/rearing and 9.4 miles FMO), 28.9 miles in Bear Creek and tributaries (28.9 miles spawning/rearing and 9.9 miles

FMO), 16.1 miles in Deer Creek (6.9 miles spawning/rearing and 9.2 miles FMO), and 54.6 miles in Minam River and tributaries (37.4 miles spawning/rearing and 17.2 miles FMO).

This core area of bull trout also has an anadromous prey base; connectivity with the Grande Ronde River; general distribution of bull trout throughout the habitat; and in general good habitat conditions. Potential barriers to bull trout connectivity (at least seasonally) within this FMO habitat include water quality impacts associated with high stream temperatures and sediment, low flows (in the late summer and early fall) in the Lostine, Minam, Hurricane, Bear, and Deer and bacteria on the Wallowa River (ODEQ 2010, ODEQ 1998). Interactions of bull trout with introduced non-native fish, (brook trout in all streams except Deer Creek, and Lake trout at Wallowa Lake) are significant threats to this core area. Overharvest and poaching of bull trout during upstream migration to and within spawning areas is a concern on the Lostine River, especially in the headwater reaches. To improve connectivity for bull trout in the Wallowa River, from the confluence with Hurricane Creek to the dam, both passage and screening should be evaluated as a need to improve (dependent on the status of the Wallowa Lake and upstream tributaries population) at the Wallowa River dam and downstream diversions. Hurricane Creek has low flow and passage/screening concerns associated with the consolidated ditch and potentially with upstream natural barriers. This area on Hurricane Creek should also be evaluated as a need to improve, dependent on the status of the Hurricane Creek population. Lostine and Bear Creek have passage/low flow concerns in the late summer and early fall especially in the lower reaches of these streams (and naturally in upper Bear Creek spawning habitat due to drought conditions and flows going subsurface). The Lostine River weir and Big Canyon Hatchery intake on Deer Creek (both near the confluence with the Wallowa River) may also be impacting bull trout in this core area by affecting migration, spawning timing, and distribution.

Bull trout were recently re-introduced to Wallowa Lake with 600 individuals salvaged from a decommissioned hydropower project on Big Sheep (Imnaha Basin) in 1997. Limited data are available on their abundance; however, some recent observations suggest they have persisted. A PacifiCorp fisheries biologist caught one fluvial size bull trout in the WF Wallowa River in June 2010. Two fluvial bull trout were captured in the Wallowa Falls tailrace on July 12, 2010 while electrofishing. One fluvial bull trout was reported in the tailrace on September 15, 2010 while snorkeling. The bypassed EF Wallowa River near the confluence with the WF Wallowa River, two bull trout were observed paired up, with the female constructing a redd. A brook trout was observed paired up with the fish. The male bull trout was reported to be the same fish captured during the tailrace fish salvage in July 12, 2010 (Doyle 2011). Due to low population abundance, potential hybridization with brook trout, competition with introduced lake trout, and potential incidental catch of bull trout at Wallowa Lake, there is a high level of uncertainty about the status of the Wallowa Lake and upstream tributaries population of bull trout.

The Lostine River and Bear Creek have several years of trend data. Total redds for 8.5 miles of survey on the Lostine River averaged 38 (range 22-70) redds or 4.6 redds/mile from 1999-2010. Bear Creek averaged 9 redds (range 5-12) redds or 4.7 redds/mile from 1999-2010. The Lostine River and Bear Creek populations appear to be stable for the survey period 1999-2008, with some recent downward trend in 2009 and 2010. The Lostine River was rated as a moderate risk of extinction by Buchanan et al. (1997). Data for the Deer Creek population is limited to observations of 12 resident size bull trout redds in 0.8 miles of stream (15 redds/mile), upstream of a newly installed culvert, that replaced a former passage barrier (Sausen 2011). The Deer Creek population was listed in Buchanan *et al*. (1997) as "of special concern." Sampling of bull trout in Hurricane Creek in 2002 by ODFW (using electrofishing) suggests a small population of approximately 200 resident bull trout which is potentially substantially hybridized with introduced brook trout. No abundance data are available for the Minam River.

Interactions of bull trout with introduced non-native species (brook trout, in all areas except Deer Creek, and lake trout in Wallowa Lake) is a significant threat to this core area.

4.1.3 Imnaha River

The Imnaha Core area is located in the Imnaha River subbasin in Oregon, in the farthest northeastern corner of Oregon, and drains an area of 850 square miles (2,202 square kilometers or 549,600 acres). The Imnaha River flows in a northerly direction and is a direct tributary to the Snake River. The Imnaha River joins the Snake River at river mile (RM) 191.7, approximately 48 river miles upstream of Lewiston, Idaho, and 3.4 miles upstream of the Salmon River confluence.

Currently, this core area contains eight local populations. The 2004 draft Recovery Plan (USFWS 2004f) describes four local populations, which were recently split due to new information on barriers (at least some years) and telemetry data that suggests limited connectivity and reduced expression of a fluvial life history (USFWS 2011b). These eight local populations are:

1) Upper Imnaha - mainstem Imnaha River and tributary streams upstream of Imnaha Falls (river km 117.5) (fluvial and resident);
2) Lower Imnaha - mainstem Imnaha River downstream of Imnaha Falls (fluvial and resident);
3) Cliff Creek (tributary to SF Imnaha) (resident);
4) Upper Big Sheep -Big Sheep Creek upstream of Wallowa Valley Irrigation Canal (WVIC), including Salt Creek above canal (resident);
5) Lower Big Sheep – Big Sheep Creek and tributary streams downstream of the WVIC (fluvial and resident);
6) Upper Little Sheep - Little Sheep Creek and tributary streams upstream of the WVIC (resident);
7) Lower Little Sheep – Little Sheep Creek and tributary streams downstream of the WVIC (fluvial and resident); and
8) McCully Creek (resident).

The Imnaha River Core area populations are generally healthy (stable); especially the Imnaha River population (local populations 1 and 2 above) which was rated at low risk of extinction by Buchanan et al. 1997). Little Sheep Creek (local populations 6 and 7 above) was rated at high risk of extinction and there is limited abundance data available for these populations. The Service sampled bull trout (using electrofishing) in Upper Little Sheep Creek in 2010 and captured very few fish between the 3920 Forest Road and the forks, and captured no fish above the forks (a large portion of which was affected by the 1989 Canal Fire). Distribution (and therefore abundance) appears to be extremely limited in this Upper Little Sheep population (M. Hudson USFWS pers. comm. 2011). The ten year average from 2001 to 2010 was 193 redds for the Imnaha River (Upper Imnaha River and tributaries). Total redds numbers on the Imnaha ranged from 101-262 within that period for 17.5 miles of stream. The eleven year average from 2000 to 2010 was 18 redds for the Big Sheep system for 9.6 miles (includes Big Sheep and Lick Creek). Total redd numbers within the Big Sheep system ranged from 8-34 for that period (Sausen 2011). Current abundance data (redd count and/or electrofishing data) are available for the Imnaha River, Big Sheep Creek, and McCully Creek local populations and they suggest relatively high abundance and/or stable trends (Cook and Hudson 2008, Sausen 2011).

The entire occupied area of the Imnaha River Core Area is essential to the Mid-Columbia River Recovery Unit (RU) because it is a bull trout stronghold within this RU and within the state of Oregon. These eight populations are spread over a large geographical area with multiple age classes, containing both resident and fluvial fish. This stronghold also has an anadromous prey base; connectivity with the Snake River; wide distribution throughout the habitat; and overall, excellent habitat conditions. Spawning activity in the Imnaha River has been documented to occur primarily in the wilderness headwaters, containing higher elevation, coldwater habitat that should help ameliorate future climate change effects on bull trout in the Columbia River Basin. The minimum estimate of adult bull trout abundance for this core area is at approximately 1000-2500. The Wallowa Valley Improvement Canal (WVIC) limits bull trout connectivity in the Big Sheep Creek, Little Sheep Creek, and McCully Creek populations. There are current fish passage, fish screening, and instream flow concerns as a result of this diversion that may limit fluvial life history expression and/or connectivity. The Imnaha Falls is a natural upstream barrier to fluvial bull trout depending on annual flow conditions. Hatchery weirs and intakes (at Imnaha satellite (km 74) and Little Sheep Creek satellite (km 8)) may also be impacting bull trout in this core area by affecting migration, spawning timing, and distribution.

There are no significant threats to this core area and it is a bull trout stronghold within the Mid-Columbia River RU and within the state of Oregon. However, catastrophic fire and other stochastic events are concerns for the resident populations that are isolated above barriers and are therefore, vulnerable to these events. These would include McCully Creek and Cliff Creek populations.

4.1.4 Clearwater River

The upper Clearwater River watershed encompasses 45 known local populations and 27 possible local populations distributed among seven core areas. These core areas are found in the South Fork Clearwater River, North Fork Clearwater River, Selway River, and Lochsa River. Local populations of bull trout in these core areas exhibit migratory (fluvial and adfluvial forms) and resident life history strategies. Except for the North Fork Clearwater River watershed, which is blocked by Dworshak Dam roughly two miles above its confluence with the Clearwater River, it is likely that the local populations of bull trout in the upper Clearwater River drainages can move freely between the core areas.

Relatively little is known about the status and trends of the local bull trout populations in the upper Clearwater River watershed and substantial areas of some river reaches remain not surveyed. Bull trout use of the lower mainstem Clearwater River is seasonal, as summer water temperatures exceed those suitable for bull trout. Some bull trout from the upper watershed may enter the Snake River during foraging activities. It is unknown how many fish may enter the

Snake River in a given year. Operations at Dworshak Dam may alter the natural temperature regime of river flows by reducing water temperatures below the North Fork Clearwater River confluence, which has the potential to disrupt natural cues for bull trout in the lower reaches to migrate to spawning locations (USFWS 2008a, pp. 32-33). However, it is currently unknown how these thermal changes may affect spawning migrations of bull trout from the upper Clearwater River core areas.

Land and water management activities that may depress local populations of bull trout and degrade habitat conditions in the upper Clearwater River watershed are similar to those in the other regional river systems. These activities may include; operation and maintenance of dams and other diversion structures, forest management practices, livestock grazing, agricultural run-off, road construction and maintenance, mining, and the presence of non-native fish species. Dams and diversion structures with inadequate passage or screening facilities can contribute to isolating and fragmenting some local bull trout populations in the upper Clearwater River watershed. Various forestry and grazing practices can impact local bull trout populations by increasing water temperatures through reduced shading of streamside vegetation, decreasing the recruitment of large woody debris, eliminating pools, increasing streambank erosion and sedimentation rates, and generally degrading water quality and aquatic habitat complexity. Some agricultural practices can also impact local bull trout populations through added inputs of pesticides, herbicides, and sediments to aquatic habitats.

The following are brief descriptions of planning and management actions specific to the upper Clearwater River watershed that may generally improve conditions for bull trout in these core areas.

In cooperation with several Federal and other State agencies, the Idaho Department of Fish and Game (IDFG) developed a management plan for bull trout in 1993 (USFWS 2002a, pp. 84-85). As part of the plan, IDFG updated maps of all known bull trout occurrences, spawning and rearing areas, and potential habitats in the State. The plan also calls for IDFG to annually report on all recovery actions that have been undertaken for bull trout in the State. IDFG has undertaken nutrient enhancement actions in Dworshak Dam and implemented eradication programs for non-native fish species in the upper Clearwater River watershed, which could improve conditions for bull trout in these core areas (USFWS 2008a, p. 8). The Idaho Department of Lands (IDL) has developed site specific implementation plans to alleviate identified water quality threats (e.g., from grazing, agricultural run-off) throughout the watershed (USFWS 2002, p. 86). In addition, IDL has been actively graveling roads that closely parallel bull trout streams to help minimize sediment delivery, and has adopted more stringent stream shading standards to insure that timber harvest activities will not increase water temperatures.

The Service entered into an HCP with the Plum Creek Timber Company in 2000 (USFWS 2002a, p. 87). This HCP helped address existing concerns, improved ongoing management, and should help to reduce potential future impacts to bull trout from actions on the enrolled lands. The USFS and BLM have undertaken various efforts to rehabilitate areas where roads are contributing excess sediment to bull trout habitat throughout the core areas (USFWS 2002a, p. 88). These activities have included upgrading culverts on existing roads and decommissioning other roads. The Forest Service has also developed various timber management prescriptions for the upper Clearwater River watershed to help avoid or reduce potential impacts from wild fires

(USFWS 2008a, p. 7). In 1995, the Nez Perce Tribe developed a reintroduction program for coho salmon (*O. kisutch*), which has provided a potential prey base for bull trout and may generally improve nutrient cycling within the river system (USFWS 2002a, p. 90). Many other past and ongoing agency efforts primarily designed to improve conditions for anadromous salmonids have also benefitted bull trout by increasing potential prey abundance, improving aquatic habitats, and enhancing connectivity between core areas within the upper Clearwater River watershed (USFWS 2002a, p. 83).

4.1.5 Asotin Creek

Historically, bull trout distribution in the Asotin Creek watershed was thought to be extensive and this core area supported both resident and migratory life forms (USFS 1998; WDFW 1997). Anecdotal accounts describe anglers catching large (> 20 inch) bull trout from Asotin Creek in the early 1960s (USFWS 2010b, p. 439), and the large sizes of these fish indicate that they probably used the mainstem Snake River to forage, migrate, and over-winter. Currently, a single local population of bull trout is known to occur in the Asotin Creek watershed, although there may be other as yet undetected local populations still present (USFWS 2010b, p. 439). Based on the relatively small sizes of surveyed fish and their occurrence primarily in headwater locations, it is possible that only resident bull trout remain in this core area and that they are largely isolated from other local populations (USFWS 2008a, pp. 17-18; USFWS 2010b, p. 439). However, recent trapping operations have documented a small number of juvenile and migratory adult bull trout near the mouth of Asotin Creek. It is unknown if the adult fish originated from Asotin Creek or from local populations in other core areas (e.g., Grande Ronde River, Upper Clearwater River) that utilize lower Asotin Creek seasonally as a cold water refuge or for foraging. Genetic samples have been collected from these fish, but they have not been analyzed so the source core area(s) of these fish remains uncertain.

Recent redd counts in the Asotin Creek watershed, although inconsistent, indicate this population may have further declined since about 2000. For example, in 1999 a total of 68 redds were observed in the two upper watershed tributaries known to support bull trout spawning and rearing, while only twelve redds were documented in these same two tributaries in 2006 (USFWS 2008a, p. 19). Currently, bull trout numbers in the Asotin Creek watershed are at critically low levels.

In general, bull trout in this core area have the potential to move freely among their natal streams, however, their movements throughout the lower watershed and into the mainstem Snake River are likely limited due to unsuitable water temperatures during the summer, sub-surface flows of some tributaries due to water withdrawals, and the existence of Head Gate Dam near the mouth of Asotin Creek (USFWS 2008a, pp. 20-22). In addition, the lower reaches of Asotin Creek are becoming increasingly urbanized. Residential development in this area has been identified as a primary limiting factor to migratory bull trout. Stream channels near these residential areas are heavily used by domestic animals and humans and are typically altered with riprap (i.e., armoring of the banks with stone to prevent erosion) or by diking, which can result in increased water temperatures and degraded stream complexity, cover conditions, and prey populations. Finally, the upper portion of the Asotin Creek watershed has been identified as a high fire-prone landscape by the USFS.

Based on the limited amount of known spawning and rearing habitat and the very low population size of primarily resident fish, threats from dewatering, water quality impairments, legacy effects from past forest management practices, and potential fire within spawning and rearing habitats all contribute significantly to threaten bull trout within this core area (USFWS 2008a, p. 26). To reverse the currently depressed condition of bull trout in the Asotin Creek watershed, occupied habitat would need to be further protected and enhanced, while unoccupied habitat would need to be restored so that the population could expand via natural reestablishment, or possibly via a supplementation program (USFWS 2010b, p. 439).

The following are brief descriptions of planning and management actions specific to the Asotin Creek watershed that may generally improve conditions for bull trout in this core area.

The final Asotin Creek Model Watershed Plan, developed by BPA in cooperation with the Natural Resources Conservation Service, WDFW, and Columbia Conservation District, was completed in 1995. The initiative identified various projects that could address limiting factors for salmonids in Asotin Creek, and represents a grass-roots planning effort that has resulted in local landowner support and participation. Passage improvements to Headgate Dam are proposed and expected to be finished within a few years.

There have been hundreds of acres of riparian habitat and several miles of stream reaches protected under CREP in this core area, in addition to various other agency and private conservation activities including reduced or modified grazing practices throughout most of the basin, upgraded culverts, road closures and obliteration, and riparian fencing (USFWS 2008a, pp. 22-25). In addition, several recent initiatives to purchase and protect key areas for salmonid populations or to establish easements to address development or other land use activities are ongoing in Asotin County. These efforts should generally contribute to improving the condition of aquatic habitats for bull trout throughout the watershed.

4.1.6 Tucannon River

Genetic analyses indicate that there are currently five local populations of bull trout, and possibly a sixth, within the core area of the Tucannon River watershed (USFWS 2008a, p. 4). These local populations are fairly isolated from local populations in other regional tributaries (USFWS 2010, p. 427). Both resident and migratory forms of bull trout still occur in the Tucannon River watershed (Martin *et al*. 1992; WDFW 1997), and some migratory bull trout likely use the mainstem of the Snake River in the general vicinity of the Tucannon River confluence on a seasonal basis (Underwood *et al*. 1995; WDFW 1997, J. Bumgarner, WDFW unpublished data 2015). The Corps' fish count data at the dams and other opportunistic bull trout observations (i.e., incidental captures and PIT tag studies) suggest that most of the bull trout documented in the lower Snake River likely originate from the Tucannon River core area, although records also indicate that some of these bull trout originated from other local populations in the Grande Ronde, Salmon, Asotin, or Clearwater Rivers.

Bull trout still occupy most of their historic range in the Tucannon River watershed and, prior to 2000, this population was considered relatively large (USFWS 2010b, p. 428). However, redd counts and capture records suggest that the population had undergone a pronounced decline by around 2007. For example, the average number of redds documented annually in the upper watershed dropped from over 100 during the early 2000s to less than 20 by 2007 (Mendel *et al.*

2008), while the number of migrating bull trout documented annually at the Tucannon Hatchery trap (located at approximately Tucannon River mile 35) went from over 250 to around 50 during the same time period (Mendel *et al*. 2008). Many of the bull trout captured in 2007 were also considered in poor health with new or recent injuries (cuts and scrapes) around their heads and gills. The cause(s) of this decline and the poor condition of some of the captured fish are unknown, although two large fires occurred in the Tucannon River watershed during the mid-2000s that resulted in higher sediment delivery to streams in the core area (USFWS 2008a, p. 6). Loss of nutrients and a declining prey base from dwindling anadromous salmonid populations and physical (e.g., dams, fences, nets, weirs) or temperature barriers in the mainstem Tucannon River and its tributaries are also likely contributing factors. More recent information indicates that the Tucannon River population may have rebounded somewhat since 2007, with over 230 bull trout observed during trapping and survey activities in 2013 (WDFW 2014, p. 113).

The local populations of bull trout within the Tucannon River watershed can still generally move freely among their natal streams, which largely occur in protected areas of the upper watershed that limit activities that could threaten bull trout (USFWS 2008a, p 12). However, there are likely seasonal temperature barriers in the migratory corridors from the river mouth upstream for roughly 30 miles of the lower reaches during the summer (USFWS 2008a, p. 6). The Tucannon Hatchery trap may also be a partial barrier to bull trout movements during the trapping season from January to September. In addition, recreational dams on several Tucannon River tributaries have been known to block migration of bull trout in the watershed. Ongoing threats within these migratory corridors likely prevent bull trout in this core area from recovering (USFWS 2008a, p. 12). These threats include crop production, irrigation withdrawals, livestock grazing, logging, hydropower production, management of non-native fish species, recreation, urbanization, and transportation networks.

The following are brief descriptions of planning and management actions specific to the Tucannon River watershed that may generally improve conditions for bull trout in this core area.

The final Tucannon River Model Watershed Plan, developed by the Bonneville Power Administration (BPA) in cooperation with the Natural Resource Conservation Service, WDFW, and Columbia Conservation District, was completed in 1995. The initiative identified various projects that could address limiting factors for salmonids in the Tucannon River, and represents a grass-roots planning effort that has resulted in local landowner support and participation.

Within the Tucannon River watershed, there are a number of landowners enrolled under the Conservation Reserve Enhancement Program (CREP) administered by the U.S. Department of Agriculture (USFWS 2008a, p. 10). These contracts help protect over 1,000 acres of land and fifty miles of riparian habitat in the watershed. There are also various program efforts to improve the efficiency of irrigation projects within the watershed, which have helped maintain roughly 11 cubic feet per second (cfs) of water in the river and placed roughly 951 acre-feet of water under conservation trust agreements. In addition, there have been 48 irrigation diversion screens installed and six diversion pump sites eliminated in the watershed.

The Broughton Land Company HCP has facilitated various measures to improve habitat conditions for bull trout in the Tucannon River watershed (USFWS 2008a, pp 10-11). In addition to enrolling lands under the CREP and irrigation efficiency programs discussed above, other measures implemented for this HCP include establishing riparian buffers, improved grazing management, and developing off-stream livestock watering sites.

In association with various projects, including floodplain restoration work by the Snake River Salmon Recovery Board, the USFS and WDFW have added large woody debris to several streams, and in the mainstem of the Tucannon River watershed (USFWS 2008a, p. 6). Work to remove or mitigate potential fish passage barriers (e.g., under-sized culverts, recreational dams) in this core area has also been undertaken. In general, ongoing management actions by these resource agencies will improve instream habitat, water temperature, large woody debris, and passage conditions for bull trout in the Tucannon River watershed.

4.1.7 Walla Walla River

There are at least five local populations of bull trout in the Walla Walla River watershed, two of which occur in the Walla Walla River core area and three of which occur in the Touchet River core area (an occupied tributary of the Walla Walla River). Currently, there is no evidence that bull trout move between these core areas (USFWS 2008a, p. 47). In addition, recent genetic analyses indicate that bull trout within these two core areas are genetically distinct and have remained relatively isolated from one another for some time. There is no apparent genetic differentiation between the migratory and resident forms of bull trout within each core area (USFWS 2008a, p. 49; Mahoney *et al*. 2012, p. 7). Migratory bull trout originating from both core areas have been detected moving into the Columbia River (USFWS 2008a, pp. 44, 63), however, only very few have ever been known to return to the Walla Walla core area or to move upstream to the mouth of the Snake River (Anglin *et al*. 2012, p. 2; Barrows *et al*. 2014, p.30).

The Walla Walla River core area still supports both resident and migratory forms of bull trout and is considered a stronghold population within the broader region (USFWS 2010b, p. 410). During the early 2000s, the bull trout population in this core area was considered fairly large with total annual redd counts exceeding 300. However, steep declines were noted in the mid to late 2000s (USFWS 2008a, pp. 45-46; Mahoney *et al*. 2012, p. iii). Further, these apparent declines were mainly due to a loss of migratory bull trout. The available information indicates that adequate winter flows in the upper Walla Walla River watershed are the main factor in maintaining migratory bull trout in this core area, yet the reliability of these flows may be threatened by recent management actions (USFWS 2008a, p. 50). While bull trout have been documented moving throughout the Walla Walla River core area on a seasonal basis and connectivity between the local populations is possible, current habitat conditions (e.g., high water temperatures, low flows due to water diversions) severely limit bull trout from moving freely in much of the lower and middle reaches of the river from about June through November.

Resident and migratory bull trout also still occur within the Touchet River core area (USFWS 2008a, p. 59). The local populations of bull trout within this core area are genetically distinguishable from one another (USFWS 2008a, p. 65). Based on redd surveys, bull trout in the Touchet River core area may have declined slightly during the mid-2000s, but appear to have remained relatively stable since about 1998 (Mendel *et al*. 2014, pp. 47-49). Very few bull trout have been documented at any time of year in the lower Touchet River below roughly river mile 44 near Waitsburg, Washington (USFWS 2008a, p. 61).

Several factors likely contribute to the depressed conditions of the local populations of bull trout within the Walla Walla River watershed (USFWS 2008a, pp. 63-65). These include construction of small recreational and irrigation dams, mining, road construction and maintenance, local fires, urban development, channelization, irrigation, and flood control measures. In various reaches throughout the watershed, these impacts have led to increased water temperatures and sedimentation levels, inadequate seasonal flows, reduced habitat complexity due to a lack of large woody debris and deep pools, and an increase in non-native predatory or competitive fish species.

The following are brief descriptions of planning and management actions specific to the Walla Walla River watershed that may generally improve conditions for bull trout in these core areas.

With regard to Federal actions, the Service entered into a settlement agreement in 2000 with three local irrigation districts to maintain instream flows in a stretch of the Walla Walla River that had been seasonally dewatered by irrigation diversions. Previous to this agreement, thousands of fish, including numerous bull trout, were impacted annually and it was necessary to implement salvage operations to try and rescue those that became stranded in the dewatered reach. Since implementation of the agreement, fish strandings are no longer a problem in this area. In 2007, the Service completed a section 7 consultation with the Corps regarding the maintenance and operations of the Mill Creek Flood Control Project (USFWS 2008a, p. 51). This effort resulted in further measures to avoid or minimize incidental take of bull trout in the Walla Walla River and addressed river hydrology, bull trout stranding's, connectivity of available habitats and fish passage, water quality, and protocols to address emergency operations. In order to help protect Chinook salmon, the BLM has implemented access restrictions to address potential impacts to Federal property due to summer fording of stream channels by vehicles. These measures also helped to protect a migratory corridor and potential prey species for bull trout. Finally, the Forest Service has implemented controlled burns to help avoid or reduce potential impacts from more catastrophic wild fires in the upper Walla Walla River watershed.

With regard to state and tribal efforts, WDFW has implemented game fish regulations within the Walla Walla River watershed that should help to control potential predator species of juvenile and sub-adult bull trout. In addition, the Confederated Tribes of the Umatilla Indian Reservation developed a reintroduction program for Chinook salmon, which has provided a potential prey base for bull trout and may generally improve nutrient cycling within the river system (USFWS 2007).

Other local conservation initiatives that have been undertaken within the Walla Walla River watershed include installing new or improved fish ladders at several passage barriers, implementing programs to improve irrigation efficiencies and in-stream flows, consolidating and screening various water diversion structures, and implementing measures to reduce the risk of wildfire. Numerous acres of riparian habitat and miles of stream channels within the Walla Walla River watershed have also been enrolled under the CREP. In addition, The Broughton Land Company HCP addresses improved management for bull trout on enrolled properties within the watershed. All of these efforts have helped to generally improve the habitat conditions for bull trout within the two Walla Walla River core areas.

4.1.8 Umatilla River

The Umatilla River is a tributary to the Columbia River in northeast Oregon. It drains the western slope of the Blue Mountains, flows through the town of Pendleton about mid-way along its 89-mile length, and enters the Columbia River from the south.

The Umatilla Core Area includes local populations in the North Fork Umatilla River and in North Fork Meacham Creek. The South Fork Umatilla River may serve as habitat for a potential local population. Small numbers of bull trout have recently been observed in Meacham Creek, along with consistent observations of a few bull trout in North Fork Meacham Creek (D. Crabtree, pers. comm. 2011). There is little evidence of a viable bull trout population in the South Fork Umatilla River, but past observations of bull trout or redds attributed to them (USFWS 2002e, 2004e) suggest it may be capable of supporting some level of bull trout production.

Bull trout spawning and early rearing in the Umatilla Core Area is currently known to occur only in the North Fork Umatilla River. The North Fork Umatilla River local population consists of migratory (fluvial) and resident individuals. The migratory form appears to predominate based on the relatively large size of most redds in the North Fork. Migratory adults and sub-adults migrate and rear throughout the Umatilla River in the colder months of the year, when temperatures are suitable. Their distribution is likely limited to the upper main stem, its tributaries, or any cold water refuges downstream during warmer months. Six irrigation dams in the lower Umatilla River hold the potential to negatively impact the movement of migratory fish, either as a result of reduced stream flows or passage issues at the dams. Movement of migratory individuals between the North Fork Umatilla River and other streams in the basin that could potentially support bull trout is restricted only by seasonally high stream temperatures.

Redd counts in the North Fork Umatilla River rose from 39 in 1994 to 153 in 1999, but declined steadily thereafter to 22 in 2014. In a seven-year study (2003-2008) in the North Fork Umatilla River, the annual abundance of bull trout between 120 and 220 mm in fork length ranged from a high of 2,434 (95 percent CI = 1,705 - 5,045) to a low of 630 (no 95 percent CI was reported due to insufficient sample size) (Budy *et al*. 2009). Abundance estimates for bull trout between 220 and 370 mm ranged from 343 to 61, and those for bull trout greater than 370 mm ranged from twenty-three to two (95 percent CIs again were not reported due to insufficient sample sizes). In the same study, growth of the population of bull trout between 120 and 220 mm was estimated to be stable (Budy *et al*. 2009). Redd counts from 1994 to 2008 indicated growth of the adult population was stable (Budy *et al*. 2009). However, since 2000, the redd counts in the North Fork Umatilla have been declining (Sankovich, USFWS, pers. comm. 2014). Adult abundance is currently low, however, based on redd counts from the past five years, which ranged from 11 to 34 (Crabtree 2014; Sankovich, USFWS, pers. comm. 2014; USFWS 2014a).

Major Threats in this core area include 1) Water quality degradation, primarily high water temperatures that create thermal barriers to migration and unsuitable spawning and rearing habitat; 2) fish passage issues caused by physical barriers, reduced flows and withdrawals and 3) over-harvest effects on a small population (USFWS 2014a).

This core area is small with a relatively low abundance of bull trout. Recovery for this core area would result in an increased number of local populations, but the total population is not likely to exceed 1000 adult spawners, the minimum number required to avoid genetic drift. However, this core area can contribute to the overall recovery of the Mid-Columbia Recovery Unit by maintaining representation of the genetic makeup of bull trout to conserve its adaptive capabilities.

Summary

Bull trout SR and FMO habitats and behaviors occur throughout the action area. Tributaries where actions related to broodstock collection, juvenile release, hatchery operations, and monitoring all occur within watersheds that have spawning and rearing bull trout populations including the Tucannon, Grande Ronde, Imnaha Rivers, and Asotin Creek. All activities related to this project occur within FMO for bull trout, whether in tributaries or the mainstem Columbia and Snake Rivers. In addition, activities in the Columbia and Snake Rivers occur in shared FMO habitat, where individuals from populations outside of the action may utilize for forage and overwintering. Relative to other salmonids, bull trout occur much less frequently within the Snake and Columbia Rivers and little is known about their specific movements and habitat use patterns while in the mainstems of these rivers. The available information indicates that a relatively small number of bull trout may occur in the Snake and Columbia Rivers during the proposed activities. Within the Tucannon, Grande Ronde, Imnaha Rivers, and Asotin Creek, however, it is expected that bull trout could be present during any and all activities related to facilities under consultation. A variety of past, ongoing, and planned landscape-scale management activities that influence the condition of aquatic habitats for bull trout within the action area are addressed below (see Condition of the Action Area).

4.2 Status of Critical Habitat for Bull Trout in the Action Area

The action area falls completely within the Mid-Columbia RU. Designated critical habitat for bull trout includes; the free flowing reaches of the Mainstem Upper Columbia River Critical Habitat Unit (CHU), and the Mainstem Snake River CHU and their reservoirs to the ordinary high water elevations and normal operating pool elevations, respectively. The action area encompasses the lower half of the Mainstem Snake River CHU and the lower portion of the Mainstem Upper Columbia River CHU. In addition, critical habitat is designated in the Lower Snake River Basins CHU (includes the Tucannon River and Asotin Creek), Grande Ronde River CHU and Imnaha River CHU. These CHUs are essential to the recovery of bull trout because they contain PBFs that comprise suitable spawning, rearing, foraging, migration, and over-wintering habitats within the action area and they provide connectivity between multiple core areas in tributaries throughout the broader region (USFWS 2010b, pp. 527 and 583). The current conditions of the PBFs that comprise bull trout critical habitat within the action area are described below.

1. *Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) that contribute to water quality and quantity and provide thermal refugia.*

   In each of the CHUs within the action area, the element of seeps, springs, groundwater sources, and subsurface flows varies. In the Mainstem Upper Columbia River CHU and

Mainstem Snake River CHU, where habitat is primarily reservoirs above several dams, this element has minimal presence and is not likely a significantly influence on available bull trout habitats. Reservoirs in the Snake and Columbia Rivers are highly stratified with cold waters at depth providing similar benefits of this PBF.

In tributaries, however, depending on locations of various activities, elements of this PBF may highly influence habitats for bull trout. Seeps, springs, groundwater sources, and subsurface flows are observed throughout each of the Lower Snake River Basins (includes the Tucannon River and Asotin Creek), Grande Ronde River, and Imnaha River CHU's. Therefore, this PBF is considered to have a meaningful presence in the action area.

2. *Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, over-wintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.*

   Throughout the action area, impediments to passage pose threats to bull trout. Within the Mainstem Upper Columbia River and Mainstem Snake River CHUs, Ice Harbor, Lower Monumental, Little Goose, Lower Granite, McNary, Priest Rapids, and Hells Canyon Dams have altered the Snake and mainstem Columbia Rivers by converting the historic river system to a series of reservoir environments. Most of the facilities have some form of passage structure, via fish ladders or traps, to minimize impediments to free-flowing upstream passage throughout the action area. However, these facilities were designed for salmon passage primarily and are often shut down during periods when bull trout need passage. As well, most facilities provide minimal downstream passage options for bull trout. The operation of dams on the mainstems disrupts bull trout migration by impeding upstream and downstream movements. The dams also create partial or seasonal barriers as a result of water temperature issues, mechanical impingement, and elevated dissolved gas levels.

   In the Lower Snake River Basins (includes the Tucannon River and Asotin Creek), Grande Ronde River, and Imnaha River CHUs, there are barriers of all forms that reduce the function of this PBF in the action area. In the Tucannon River, the broodstock collection weir for the Tucannon Fish Hatchery functions in two capacities: 1) back up water and create a pool for the hatcheries water intake, and 2) divert fish into the fish ladder and collection trap. While the trap is not in operation, bull trout can pass through the ladder upstream, but some delay in migration may occur. However, during operation of the collection trap on the ladder, bull trout migration is delayed while bull trout are collected, handled, sorted, and released. This collection and handling has resulted in mortality of bull trout at the facility. . In addition, Starbuck Dam in the Lower Tucannon River impacts free-flowing passage as do irrigation diversions throughout the river (SRSRB 2011, p. 163). Seasonal water quality issues may also prevent or limit bull trout movements in the watershed. In Asotin Creek, Headgate Dam in the lower reaches seasonally prevents movement of smaller bull trout. Temperature issues in the upper reaches of the mainstem and tributaries of Asotin Creek are of concern and are identified as a threat (SRSRB, 2011 p. 141). Water quality issues in the Grande Ronde River and Catherine Creek (high stream temperatures and sediment; low flows; and high nutrients, bacteria, and chemicals) impede bull trout passage. Passage barriers are located at Wallowa Lake Dam, and Upper Grande Ronde River, Catherine Creek, Lostine River, and Lookingglass fish weirs, and lack of screening at the hatchery intake at the Upper Grande

Ronde River, Big Canyon facility, and Wallowa hatchery. Several irrigation diversions throughout the Grande Ronde River basin impact bull trout passage. The Imnaha River Basin contains the Wallowa Valley Improvement Canal diversion on Big Sheep, McCully Creek, and Little Sheep (and tributaries). This diversion is a fish passage barrier, is unscreened, and bull trout are directed from the Big Sheep watershed into the Wallowa watershed or stranded due to irrigation canals and low water. The Imnaha River weir downstream of Gumboot Creek is a passage barrier to bull trout. In 2014, ODFW reported 29 bull trout mortalities in or near the Imnaha weir and trap facility (ODFW 2014).

3. *An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.*

   The entire action area currently supports an abundant food base for all life stages of bull trout. Potential forage fish for bull trout, such as juvenile salmon, steelhead, and whitefish (family Salmonidae), sculpins (family Cottidae), suckers (family Catostomidae), lamprey (family Petromyzontidae) and minnows (family Cyprinidae), are present throughout the lower Snake River, Columbia River, Tucannon River, Grande Ronde River, Asotin Creek, and Imnaha River.

4. *Complex river, stream, lake, reservoir, and marine shoreline aquatic environments, and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks, and unembedded substrates to provide a variety of depths, gradients, velocities, and structure.*

   The reservoir environments and flow regimes that are currently present in the lower Snake and Columbia Rivers within the action area are significantly altered from the historic riverine conditions that existed. Generally, the reservoirs have relatively stable channels and streambanks and in some portions, especially in the vicinity of the dams and urban areas, the shorelines have been extensively armored with riprap. In addition, floodplain encroachment by industrial, commercial, and private development over large portions of the action area have further degraded the historic habitat characteristics (e.g., riparian areas, off-channel habitats, water temperatures) of the original riverine environments. Consequently, the conditions and processes (e.g., seasonal flow patterns, channel complexity, large wood recruitment, litter fall) that supported historic riverine environments within the action area have been replaced with more simplified, adfluvial habitats.

   Tributaries offer more complexity. However, many have been channelized with armoring, levee construction, and residential encroachment. Within the Tucannon River and Asotin Creek, habitat complexity is listed as a limiting factor. Several large wood and floodplain connectivity projects have been occurring in the Tucannon River recently to improve complexity; add large wood and cover; reduce sediment inputs; and remove levees. Similar projects are occurring in the Asotin Creek watershed, including an Intensively Monitored Watershed (IMW) project where restoration actions are installed and monitored to determine full benefit to listed species. The Upper Grande Ronde River and Catherine Creek have ongoing stream restoration projects that include closing and/or obliterating roads within streamside areas, large wood and boulder input, and riparian plantings. The Wallowa River has had and continues to have stream restoration projects occurring on private lands (adding sinuosity, large wood and boulders, and riparian plantings). Most of the stream restoration that has occurred in the Imnaha has occurred on non-bull trout tributary streams. Post the 1996/1997 flood event on the Imnaha River, the stream and road prism has had limited restoration.

5. *Water temperatures ranging from 36 °F to 59 °F, with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form, geography, elevation, diurnal and seasonal variation, shading (e.g., provided by riparian habitat), streamflow, and local groundwater influence.*

   The timing, frequency, magnitude, and duration of water temperature and flow regimes in the lower Snake and Columbia Rivers have been significantly altered by human activities, such as hydropower production and irrigated agriculture, since at least the mid-1900s. As a result, water temperatures in the lower Snake and Columbia Rivers, including the action area, often exceed 68^{o} F during the summer (USFWS 2010a, p. 36). Because of dam release flows of impounded water during the winter, water temperatures in the action area are also typically warmer during the winter compared to many tributary reaches and historic mainstem river conditions. Summer water temperatures in major tributaries in the action area (e.g., Tucannon River, Asotin Creek, Imnaha River, and Grande Ronde River) are also significantly elevated, primarily as a result of warm return flows from adjacent farmland and developed areas, and contribute to the degraded water temperature conditions within the action area. Some temperature issues are believed to be somewhat natural conditions, for example in the Asotin Creek. However, the elevated temperatures compound other limiting factors within the action area.

6. *In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo over-winter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates, is characteristic of these conditions. The size and amount of fine sediment suitable to bull trout will likely vary from system to system.*

   Available historical data suggests that the mainstems of the Columbia and Snake Rivers did not support spawning or early rearing of bull trout. Therefore, elements of this PBF are not present in the mainstem portions of the action area. However, bull trout spawning and rearing does occur within tributaries of the Asotin Creek and the Tucannon, Grande Ronde, and Imnaha Rivers located within the action area.

   In the Tucannon River, spawning and rearing occurs in the mainstem Tucannon River upstream of Hixon Canyon including Meadow, Panjab, and Bear Creeks, and in Cummins Creek. Substrates suitable for spawning and early rearing occur in these streams. High sediment loading in the Tucannon watershed is attributed to agricultural practices and roads throughout the basin (SRSRB 2011, p. 163). Many restoration projects are underway to reduce this threat to bull trout.

   Spawning and rearing substrates in Asotin Creek are found primarily in North Fork Asotin and Charley Creek. While other areas of Asotin Creek have suitable substrates, such as in

George Creek or the upper South Fork Asotin Creek, currently these areas are not known to support spawning bull trout populations. Sedimentation and fines are identified as a limiting factor for salmonids, including bull trout, in the Asotin Creek watershed (SRSRB 2011, p. 143). Elevated sedimentation and fines limit egg and embryo survival.

Ratliff and Howell (1992) listed habitat degradation, passage barriers, over harvest, and hybridization and competition with nonnative brook trout as possible suppressing factors for bull trout populations in the Grande Ronde River Basin. Agricultural practices, mining, timber harvest, and road construction in the upper Grande Ronde River watershed have resulted in the alteration and degradation of instream habitats, and have been implicated in stream channel simplification and reduced frequency of large, deep pools (McIntosh *et al.* 1994). Irrigation diversions and water withdrawals have created passage barriers and reduced stream flows, which often results in elevated water temperatures. The Grande Ronde River basin has variable conditions for bull trout spawning gravels dependent on past land use activities and location in the watershed. East Fork Wallowa River, upstream of Wallowa Lake, is impacted by hydroelectric operations (regulated minimum flows and sediment flush associated with flushing the forebay) and therefore has a moderate to high level of fines. The Lostine River spawning area on national forest lands is primarily within a wild and scenic river corridor which borders wilderness and has stream spawning gravels in good condition. Bull trout spawn in Catherine Creek upstream of the weir in the tributaries and conditions range from good to fair dependent on location to roads, grazing, irrigation canals, and other land-use activities. In Lookingglass Creek, bull trout spawning is located in the headwaters and is generally in good condition. The Upper Grande Ronde tributaries where bull trout spawn are generally in fair to poor condition as a result of past land management activities (including historic splash dams on the Grande Ronde River).

Within the Imnaha River, historical and current land use activities have impacted bull trout local populations. There has been a combination of human-induced factors that have affected bull trout including forest management practices, irrigation withdrawals, livestock grazing, past bull trout harvest, and introduction of non-native species. Bull trout spawning areas in the Imnaha River are generally in good condition for spawning gravels with many of these headwater spawning tributary streams in wilderness.

7. *A natural hydrograph, including peak, high, low, and base flows, within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph.*

All of the streams in the action area have some modification of the natural hydrograph as a result of dam, irrigation diversion, hatchery weirs, and flood protection levees. The operation of dams throughout the Snake and Columbia River watersheds has significantly altered the natural river hydrograph by decreasing spring and summer flows and increasing fall and winter flows from historic river conditions. In the Grande Ronde basin, dependent on level and location of past land management activities (roads, harvest, irrigation withdrawals, mining, etc.), the baseline condition of this PBF varies from good to poor, but generally in fair condition. In the Imnaha basin, this PBF is generally in good condition, except for in the Big Sheep Creek watershed which is impacted by the Wallowa Valley Improvement Canal. In this location this PBF is in poor condition.

8. *Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.*

   Water quality varies greatly within the action area, but major consistencies surround the influence of agriculture and temperature. The water quality of the lower Snake River is described as excellent (Class A) (Washington Administrative Code [WAC] Chapter 173-201A-030). However, historic flow and temperature regimes within the action area have been significantly altered since construction of the dams. Within the Tucannon River drainage, the Washington Department of Ecology (Ecology) indicates that water quality has been a concern for temperature, fecal coliform, pH, and ammonia for many years (Ecology 2014a). Suspended solids and phosphates have also exceeded state water quality standards within the past few years (Ecology 2014a). The Tucannon River and Pataha Creek are currently under a Total Maximum Daily Load (TMDL) Water Improvement Plan for temperature, fecal coliform and pH (Bilhimer *et al.* 2010). Asotin Creek is listed on the 303(d) list of impaired waterbodies for temperature. In 2011, Ecology developed a Quality Assurance Project Plan Temperature Straight-to-Implementation Vegetation Study (Stuart 2011). The plan describes the process for bringing temperatures below water quality standards. ODEQ has identified many stream segments with the Grande Ronde subbasin as water quality limited. Oregon's 1998 303 (d) List of Water Quality Limited Waterbodies identifies nine parameters of concern in the Upper Grande Ronde River subbasin: algae, bacteria, dissolved oxygen, flow modification, habitat modification, nutrients, PH, sedimentation, and temperatures. All of these concerns exist within the Grande Ronde River valley portion of the subbasin. Three of these nine concerns – temperature, sediment, and habitat modification – are widespread throughout the rest of the subbasin outside of the Grande Ronde River Valley (USFWS 2004a, b). The U.S. Environmental Protection Agency approved Oregon's 2002 §303(d) list on March 24, 2003. The §303(d)-listed streams within the Imnaha Subbasin, which includes the entire Imnaha River mainstem and some stream reaches in key tributaries, exceed the numeric criteria of the water quality standard for temperature. Accordingly, a TMDL is being developed for the Imnaha. Riparian modification is known to have influenced stream temperatures throughout private land parcels bordering the mainstem (roughly from the town of Imnaha upriver to Gumboot Creek (USFS 2000). Cultivation, farming, and settlement have reduced the occurrence of riparian species in certain areas, and are believed to be primary contributors to stream temperature increases (NPT *et al*. 2004). Wallowa Valley Improvement Canal in Big Sheep watershed is impacting flow quantity and the diversion and associated reduced flow at this location impacts connectivity for bull trout in this watershed and within the larger Imnaha River basin.

9. *Sufficiently low levels of occurrence of non-native predatory (e.g., lake trout [Salvelinus namaycush], walleye [Stizostideon vitreum], northern pike [Esox lucius], smallmouth bass [Micropterus dolomieu]), interbreeding (e.g., brook trout [Salvelinus fontinalis]), or competing (e.g., brown trout [Salmo trutta]) species that, if present, are adequately temporally and spatially isolated from bull trout.*

   Various non-native predatory fish species that are known to prey on juvenile and sub-adult salmonids are present in every watershed in the action area. As well, some level of competitive and interbreeding species such as hatchery rainbow, brook trout, and brown trout are present in some of the action area watersheds, or in small isolated areas.

4.3 Condition of the Action Area

The dams and reservoirs within the action area are all part of the Federal Columbia River Power System (FCRPS), which is comprised of a series of multi-purpose, hydroelectric facilities constructed on the lower Snake and Columbia Rivers and operated by the Corps and Bureau of Reclamation. All of the dams on the lower Snake River are operated by the Corps as run-of-the-river facilities primarily for navigation, hydropower production, and flood control. Under current operations, the pool elevations of the reservoirs within the action area have a maximum potential fluctuation of about five feet. The reservoir shorelines throughout the action area are often steep and characterized by cliffs and talus substrate, while much of the remaining shoreline areas are lined with riprap to protect adjacent structures. Relatively little riparian vegetation remains along the shorelines within the action area and the remaining riparian areas are highly fragmented.

In addition to construction of the dams themselves, numerous other human activities (e.g., construction of ports, docks, roads, railways, landscaping, and agriculture) have contributed to altering or displacing shoreline riparian and in-stream habitats in the action area. These activities have further reduced the quantity and quality of nearshore habitat by eliminating native riparian vegetation, disrupting natural hydrological cycles, and disconnecting the river mainstems from their historic floodplains. In addition, many native plant species that evolved under the riverine ecosystem are not well suited to the largely static, slackwater conditions that are currently present within the action area, and many shoreline areas now support vegetation assemblages that include vigorous stands of non-native, invasive plant species. These altered habitats often provide inadequate protection and refugia for various animal species within the action area.

The majority of activities occur at fish hatchery (FH) facilities in the Lower Snake River, Mainstem Columbia River, the Tucannon River, and within the mainstem and tributaries of the Grande Ronde and Imnaha Rivers. The facilities themselves have altered habitat conditions and created impediments to passage through water quality impairments and weir construction. The Irrigon FH, located on the mainstem Columbia River, and the Lyons Ferry FH, located on the Snake River, potentially disrupt or delay passage if bull trout enter the facility, affect water quality parameters and predator/prey relationships in the rivers. However, due to their location on mainstem rivers and water sources, impacts of these facilities are likely minimal as described in detail in Effects of the Proposed Action.

The Tucannon River and Asotin Creek fall within the Lower Snake River CHU. The Tucannon FH (River kilometer [Rkm] 57.9) is located within FMO for bull trout and during collection of broodstock, the hatchery weir blocks or delays passage of bull trout. Bull trout spawning and rearing occurs above this facility. In Asotin Creek, spring/summer Chinook and summer steelhead spawning ground surveys occur within the stream.

The Upper Grande Ronde River weir is located at Rkm 247 which is FMO habitat, with spawning/rearing habitat upstream, and downstream in the headwaters of Fly Creek, a tributary to the Upper Grande Ronde River. The Catherine Creek weir is located at Rkm 70 which is FMO habitat, with spawning/rearing habitat in upstream tributaries. The Lookingglass Fish Hatchery is located on Lookingglass Creek at Rkm 3.5 which is FMO habitat, with spawning and rearing habitat upstream in the headwaters. Lostine River weir is located at Rkm 1.6 within FMO habitat, with spawning and rearing habitat in the headwaters of the Lostine River. Big Canyon Adult Collection Facility is located on Deer Creek at Rkm 0.1 within FMO habitat, with spawning/rearing habitat several miles upstream in the headwaters of Deer Creek and Sage Creek. The Imnaha River weir is located at Rkm 73.2, within spawning/rearing habitat, although the annual spawning surveys (primary spawning habitat) occurs upstream of the weir, from Indian Crossing on the Imnaha River upstream into the headwaters. Little Sheep Adult Collection Facility is located at Rkm 8.4 within FMO habitat with spawning habitat in the headwaters of Little Sheep Creek. These weirs are major blockages to passage of bull trout (with Little Sheep and Big Canyon blocking passage in the spring for steelhead collection, and the others blocking passage in the spring and fall for chinook passage). Numbers of bull trout collected at the Little Sheep Creek and Big Canyon Creek weirs over the recent years have been few (R. Harrod, ODFW, pers. comm. 2014).

4.3.1 Consultations and Conservation Efforts in the Action Area

The Service has undertaken numerous section 7 consultations pursuant to the Act within the action area in coordination with various Federal agencies. To date, none of the Federal actions that have underdone consultation were determined to jeopardize the continued existence of bull trout in the Columbia River Interim Recovery Unit or to adversely modify designated critical habitat for bull trout. Many of these federal actions included measures to help avoid or minimize potential impacts to bull trout and bull trout critical habitat. Most of these past consultation efforts also included conservation recommendations from the Service that the Federal action agencies could take to benefit bull trout and other Federal species of concern in the action area. The following discussions address several of these consultation efforts with specific bearing on this current Opinion.

In 2000, the Service consulted with the Corps and other Federal agencies on the operations of the FCRPS, which evaluated potential effects to bull trout from dam operations on the lower Snake and Columbia Rivers (USFWS 2000). In connection with the FCRPS, operations at the dams are reviewed on a regular basis and the Corps also routinely consults with the Service and NOAA on operational changes and other agency initiatives that affect threatened and endangered salmonids, along with other listed species Some of the general effects addressed by the FCRPS and other associated consultations in the broader region include the following: 1) fish passage barriers and entrainment; 2) modifications of stream flows and water temperature regimes; 3) dewatering of shallow water zones; 4) reduced productivity in the reservoirs; 5) gas supersaturation of waters in dam outflows; 6) management of native riparian habitats; 7) water level fluctuations associated with power peaking operations; and 8) control of non-native, invasive species.

The Service has consulted with the Environmental Protection Agency (EPA) regarding their issuance of permits associated with the National Pollutant Discharge Elimination System (NPDES). The NPDES seeks to control water pollution levels by regulating point sources that discharge pollutants into waters of the United States. In 2004, the Service issued a Biological Opinion to EPA regarding a permit issued to the Potlatch Corporation (now Clearwater Paper Corporation) within the action area. The Potlatch NPDES Permit Biological Opinion was renewed in 2011. Of greatest concern during this consultation was the potential bioaccumulation of organic compounds in the bull trout and bald eagle (*Haliaeetus leucocephalus*) resulting from the mill's discharge of industrial return waters into the Clearwater River at Lewiston, Idaho (USFWS 2004c, p. 36). The EPA has also issued NPDES permits to various municipalities in the broader region of the action area, including one to the City of Lewiston for its wastewater facility discharges into the Clearwater River. The treatment facility provides secondary treatment and disinfection of domestic and industrial wastes prior to discharging them into the river. Issuance of many NPDES permits has not undergone consultation with the Service. Nevertheless, all of the permits issued by EPA established discharge limits to protect downstream water quality.

In 2003, the Service consulted with EPA regarding proposed limits for total maximum daily loads (TMDL) of dissolved gas and dioxins in the lower Snake River (USFWS 2004c, pp. 34-35). Corps actions taken during Phase I of efforts to manage these TMDL were expected to have a positive effect on listed species under the Service's jurisdiction during voluntary spill periods. The Service anticipated further ESA consultation with the Corps prior to implementation of actions undertaken in association with any future phase(s) to specifically manage these TMDL.

Multiple aspects of bull trout recovery efforts are incorporated into (and funded through) the BPA's Fish and Wildlife Program. This program included subbasin planning efforts for the Tucannon River, Asotin Creek, Grande Ronde River, and Imnaha River. Subbasin plans for these watersheds were completed in 2004. The Service has consulted on numerous restoration projects in the Tucannon River, Asotin Creek, Grande Ronde River and Imnaha River Watersheds that result in improvements to habitat structure, complexity, and water quality for bull trout in recent years.

In 2004, the Service consulted with BPA on the Northeast Oregon Hatchery Program, Grande Ronde-Imnaha spring Chinook hatchery project in Wallowa and Union counties, Oregon (USFWS 2004g). In 2006, BPA sent the Service a supplement to the 2004 BA on the Northeast Oregon Hatchery Program, Grande Ronde-Imnaha spring Chinook hatchery project and the Service responded with a letter confirming that the modifications did not change effects determination for the original consultation (USFWS 2006). In 2008, the Service consulted with BPA on the Lostine River Satellite facility renovation project (replacement of the Lostine River weir), part of the NE Oregon Hatchery Program (USFWS 2008b). In 2008, the Service also consulted with BPA on the Umatilla Hatchery Program (USFWS 2008c). The Umatilla Hatchery is located approximately 500 yards from the Irrigon Fish Hatchery. While the Irrigon Fish Hatchery produces fish through funding from the LSRCP for programs included in this consultation, the Umatilla Hatchery, which is BPA funded, does not produce fish in the programs subject to this consultation. In 2015, the Service consulted with the LSRCP on the Imnaha River Satellite Facility Weir Modification (replacement of the existing Imnaha River picket weir with a bridge-mounted bar rack weir spanning above the Imnaha River)(USFWS 2015c).

4.3.2 Effects of Climate Change in the Action Area

The potential effects of climate change were estimated by manipulating the elevational limits of fish distributions over a range bounding the predicted effects of warming over the next 50 plus years (Rieman *et al.* 2007). Results of these modeling efforts indicate that bull trout populations in some subbasins, particularly in the southern and central portions of the Columbia Basin

Interim Recovery Unit (including the major tributaries neighboring the action area) are already at high risk of extirpation under the base model conditions. The predicted effects of climate change would not only be expected to increase water temperatures, but could also intensify dewatering events in important habitats for bull trout due strictly to changed weather patterns or from effects of ongoing forestry and agricultural practices. While portions of the upper-most watersheds may be somewhat insulated from climate change (e.g., minimal management activities in designated wilderness areas), the core area populations would likely become increasingly fragmented and their migratory life histories could be lost. Increased water temperatures and dewatering events would also further limit the ability of bull trout throughout the broader region to refound previously occupied habitat, seek refuge during catastrophic events, or reach seasonal use habitats for foraging, migrating, or over-wintering. Some studies indicate that climate induced effects may alter the rate of hybridization impacts (Muhlfeld *et al.* 2014, p. 3). Many of the core areas in the action area are experiencing impacts of hybridization, further intensifying the long term effects of climate change.

Bull trout are already exposed to unsuitable water temperatures during much of the summer within the action area and many of the neighboring tributary reaches. These core populations would likely be further impacted by climate change if there are no cold water refuges remaining for them in the lower tributary reaches and mainstems of the river systems.

4.4 Conservation Role of the Action Area

The conservation of the coterminous U.S. population of the bull trout is dependent upon the persistence of bull trout within six recovery units. Persistence of bull trout is dependent upon maintaining viable core areas. Viable core areas are dependent on the persistence of local bull trout populations, which are in turn dependent upon reliable habitat connectivity for migratory bull trout that provides for genetic and demographic resiliency, especially in response to stochastic events. Therefore, recovery units should provide for the long-term persistence of self-sustaining, complex, interacting local populations of bull trout in core areas distributed throughout the species range. The relatively small number and potential isolation of local bull trout populations in the Tucannon River and Asotin Creek core areas make them vulnerable to extirpation from stochastic events, and increase the importance of maintaining connectivity between them. The entire occupied area of the Imnaha River Core Area is essential to the recovery unit because the Imnaha River Core Area is a bull trout stronghold within the Columbia basin and within the state of Oregon. The Imnaha River Core area contains eight populations that are generally healthy; especially the Imnaha River population which was rated at low risk of extinction by Buchanan *et al.* (1997). These eight populations are spread over a large geographical area with multiple age classes, containing both resident and fluvial fish. This bull trout stronghold also has an anadromous prey base; connectivity with the Snake River; wide distribution throughout the habitat; and overall, excellent habitat conditions. Primary spawning activity on the Imnaha River has been documented to occur in the headwaters, which lie within wilderness, and contain higher elevation, coldwater habitat that should help ameliorate future climate change effects on bull trout in the Columbia River Basin.

The entire occupied area of the Upper Grande Ronde/Catherine/Indian Core Area is essential to the conservation of bull trout in the Mid-Columbia RU. The six populations in this core area are spread over a large geographical area with multiple age classes, containing both resident and fluvial fish. Distribution for this core area includes a total of approximately 231.4 stream miles. This core area of bull trout also has an anadromous prey base; connectivity with the Grande Ronde River; general distribution of bull trout throughout the habitat; and varying habitat conditions. Ratliff and Howell (1992) estimated the Upper Grande Ronde, Catherine and Indian Creek populations as being at moderate risk of extinction. The Grande Ronde FMO habitat provides connectivity to populations in the three nearby core areas; the Upper Grande Ronde/Catherine/Indian; Lookingglass/Wenaha; and Wallowa/Minam as well connectivity to the Snake River and nearby bull trout populations. Major barriers to bull trout movement (seasonally) within this FMO habitat include water quality problems associated with high stream temperatures (in the late summer and early fall), low flows (in the late summer and early fall) and high sediment (ODEQ 1998, 2010). Bull trout interactions with non-native fish in this FMO habitat may affect abundance and distribution of bull trout within the Grande Ronde River and in nearby core areas. The eight dams downstream of the Grande Ronde FMO habitat; closest dam being Lower Granite dam, and the Hells Canyon complex of dams upstream, may affect connectivity between this FMO habitat and portions of the Snake River. The entire occupied area of the Little Minam Core area is essential to the recovery unit because it is a resident bull trout stronghold within the Mid-Columbia Recovery Unit and within the state of Oregon. The Little Minam Core area contains one healthy resident population (an average of 306 redds from 1997 to 2004, or 27 redds/mile). This bull trout stronghold has resident bull trout that are distributed throughout the habitat and habitat conditions are excellent (located within the Eagle Cap wilderness). The Little Minam resident population is stable with a low risk of extinction. The entire occupied area of the Wallowa/Minam Core Area is essential to the conservation of bull trout in the Mid-Columbia RU. The six populations in this core area are spread over a large geographical area with multiple age classes, containing both resident and fluvial fish. Distribution for this core area includes a total of approximately 168.4 stream miles. This core area of bull trout also has an anadromous prey base; connectivity with the Grande Ronde River; general distribution of bull trout throughout the habitat; and in general good habitat conditions. Potential barriers to bull trout connectivity (at least seasonally) within this FMO habitat include water quality impacts associated with high stream temperatures and sediment, low flows (in the late summer and early fall) in the Lostine, Minam, Hurricane, Bear, and Deer and bacteria on the Wallowa River (ODEQ 1998, 2010). Interactions of bull trout with introduced non-native fish, (brook trout in all streams except Deer Creek, and Lake trout at Wallowa Lake) are significant threats to this core area.

The lower Snake and mainstem Columbia Rivers are essential to the long-term conservation of bull trout in the region (USFWS 2010b, pp. 427 and 527). Although currently fragmented by the presence of dams, the lower Snake and mainstem Columbia Rivers continue to play an important role in maintaining the migratory life history strategy of local bull trout populations and potential interactions between them in the neighboring tributaries, including genetic exchange and recolonizing opportunities. The lower Snake and mainstem Columbia Rivers also provide an abundant food source for migrating and over-wintering bull trout during fall, winter, and spring (USFWS 2010b, p. 584). Forage fish such as juvenile salmonids, sculpins, suckers, lamprey, and minnows are present throughout the action area. Mainstem habitats in the lower Snake and mainstem Columbia Rivers will likely become increasingly important to bull trout as recovery plans are implemented in the neighboring tributaries and the status of their local populations improves (USFWS 2010b, p. 584).

The conservation role of the action area is to provide foraging, migration, and over-wintering habitats for bull trout throughout most of the Mid-Columbia Recovery Unit including the lower Snake and mainstem Columbia Rivers, as well as to support viable core areas within the Tucannon River, Asotin Creek, Walla Walla River, Clearwater River, Umatilla River, Grande Ronde River, and Imnaha River watersheds. The action area also provides significant conservation value to spawning and rearing areas within the Tucannon River, Asotin Creek, Grande Ronde River, and Imnaha River.

5. Effects of the Proposed Action

Direct effects are those effects from the project that immediately affect bull trout. Indirect effects are those impacts from the projects that are later in time and may occur outside of the areas directly affected by the actions. Indirect effects must be reasonably certain to occur before they can be considered as an effect of the actions. Indirect effects may occur from changes in habitat that affect bull trout ability to use habitat or through other changes such as decreased prey abundance and availability. In this section, we examine the response of bull trout to the various stressors and determine the effects these may have on individual bull trout, the core population, and the Recovery Unit. First, we examine the exposure to which bull trout will be subject. Then we assess which actions will result in only insignificant and/or discountable effects, as well as those components that may be beneficial to bull trout. Lastly, we consider both the direct and indirect effects of actions which will result in adverse effects to bull trout and/or critical habitat. Our analysis focuses on impacts from individual facilities and less on the specific propagation program (i.e. Steelhead or Spring/Summer Chinook). In most cases, the operation of individual facilities, not the specific propagation program, results in effects to bull trout or designated critical habitat.

Exposure Analysis

Bull trout are found throughout the Action Area. The timing of their use of various parts of the watershed (mainstem Columbia and Snake Rivers) is not well understood and neither is the function of the various parts of the action area for bull trout. The location of spawning areas is known or suspected in the Tucannon, Grande Ronde, and Imnaha Rivers and Asotin Creek. In most parts of the action area, bull trout are utilizing the action area for spawning, rearing, foraging, migrating, and overwintering. Within mainstems and tributaries of the Tucannon, Grande Ronde, and Imnaha Rivers and Asotin Creek, we assume that spawning and rearing of juveniles can and does occur. However, most of the facilities identified in the action are located downstream of spawning and rearing areas. The mainstem Columbia and Snake Rivers provide foraging, migrating and overwintering habitat for adult and sub-adult bull trout throughout the year. This exposure analysis is based on information provided in the *Status of the Species, Status of the Species in the Action Area,* and the *Environmental Baseline.*

5.1 Locations and Associated Actions Resulting in Insignificant and/or Discountable Effects

Some locations of activities within the action are anticipated to result in insignificant and/or discountable effects or be completely beneficial to bull trout and designated critical habitat.

These effects are separated and summarized by action. Bullets under each action summarize specific facilities, while the following paragraphs detail our analysis.

5.1.1 Adult Collection

- Cottonwood Facility/Cottonwood Creek – no critical habitat; no bull trout captured between 1999 and 2011; no documented bull trout within Cottonwood Creek.
- Wallowa Facility/Spring Creek – no critical habitat; no bull trout captured between 1999 and 2011; no bull trout documented in Spring Creek.
- Lyons Ferry Facility/Snake River – no bull trout captured between 1999 and 2011; low likelihood of bull trout presence due to lack of suitable habitat near facility
- Irrigon and Curl Lake Facilities – no adult collection occurs

It is expected that bull trout are highly unlikely to be present and will not be captured during adult trapping activities at the Cottonwood, Wallowa, and Lyons Ferry facilities. At each of the facilities, there have been no collections of bull trout in more than a decade of collection activities. Habitat within the vicinity of the facilities is unsuitable or lacking characteristics of complexity, cover, or forage typically used by bull trout. No adult broodstock collection occurs at the Irrigon and Curl Lake facilities; therefore, no impacts to bull trout are expected at these facilities.

5.1.2 Hatchery Origin Spring Chinook Adult Outplanting

- Catherine Creek Weir – Collection of surplus chinook adults and outplanting to Indian Creek and Lookingglass Creek. Insignificant effects to bull trout and critical habitat due to relatively low anticipated numbers of outplanted salmon, release methods minimize effects to bull trout, and uncertainty of spatial and temporal overlap of these species. Both species have evolved under this sympatric life history. Additional spawning chinook would provide benefits to bull trout as a food source and providing nutrients to the stream system. Outplanting in Lookingglass Creek supports additional harvest; therefore, most outplanted adults would be harvested and would not be likely to reach chinook and bull trout spawning grounds in appreciable numbers.
- Lostine Weir – Collection of surplus chinook adults and outplanting to Bear Creek and the Wallowa River. Insignificant effects to bull trout and critical habitat due to relatively low anticipated numbers of outplanted salmon, release methods minimize effects to bull trout, and uncertaintly of spatial and temporal overlap of these species. Both species have evolved under this sympatric life history. Additional spawning chinook would provide benefits to bull trout as a food source and providing nutrients to the stream system.
- Imnaha Weir – Collection of surplus chinook adults and outplanting to Big Sheep and Lick Creeks. Insignificant effects to bull trout and critical habitat due to relatively low anticipated numbers of outplanted salmon, release methods minimize effects to bull trout, and uncertaintly of spatial and temporal overlap of these species. Both species have evolved under this sympatric life history. Additional spawning chinook would provide benefits to bull trout as a food source and providing nutrients to the stream system.

5.1.3 Water Diversions

- Cottonwood Facility/Cottonwood Creek – no bull trout observed, not located within critical habitat.
- Wallowa Facility/Spring Creek – no bull trout observed, not located within critical habitat.
- Lostine River Facility – withdraws 3.6 percent of flows during upstream migration; insignificant to total water available; meets screening criteria.
- Catherine Creek Facility – withdraws 8.6 percent; insignificant to total water available; the instream pump is screened.
- Tucannon Fish Hatchery – withdraws up to 5.7 percent of flows; insignificant to total water available; meets screening criteria.
- Curl Lake Facility – diverts up to 1.4 percent of flows in Tucannon River; insignificant to total water available; meets screening criteria.
- Lyons Ferry and Irrigon Facilities – use well water.

The intake structure at the Cottonwood Facility consists of a temporary weir and water intake structure located on Cottonwood Creek about 500 yards upstream from the Grande Ronde River. The main water source for the facility is Cottonwood Creek. Cottonwood may divert a significant percentage of the total stream volume in Cottonwood Creek during operation of the acclimation facility, especially during low flow years. While there is potential to affect bull trout migration in Cottonwood Creek during operation of the acclimation facility, the facility is located on a tributary that has not been identified as occupied by bull trout in the Grande Ronde River Core Area, is not included in critical habitat, and no bull trout have been trapped at the Cottonwood Facility during operations of the facility in the last 12 years. The intake at Cottonwood Facility does not meet NOAA screening criteria (NOAA 2011); however, the intake at the facility is checked on a regular basis during operation of the facility. Based on these factors, effects to bull trout in the Grande Ronde River from the operation of the water diversion at Cottonwood are discountable.

The intake structure at Wallowa FH consists of a permanent diversion across Spring Creek and a water intake structure. The main water source for Wallowa FH is Spring Creek and well water. Wallowa FH diverts a large percentage of the total stream volume in Spring Creek. While the potential for blocking bull trout migration in Spring Creek is large, there has been no reported bull trout trapped in Spring Creek during operations of the facility in the last 12 years (not included in critical habitat) and the creek above the facility drains agriculture lands in the Wallowa Valley with poor habitat available for bull trout. The Spring Creek intake at Wallowa FH has 1/8-inch screen. Adequate in-stream flow is maintained to provide rearing habitat within the bypass reach. The intake at the facility is checked on a regular basis during operation of the facility. Due to the poor upstream habitat and the lack of observed bull trout in the area, bull trout from the Grande Ronde River Core Areas are unlikely to be present within the diversion area and thus impacts from the Wallowa diversion are discountable.

The Catherine Creek Juvenile Acclimation Facility has a 5 cfs water right, though actual water use data from between 2000 and 2011 indicate that withdrawals are typically 3.1 cfs per month during the facility’s one acclimation period (mid-March to mid-April). Withdrawals are made through a stationary intake pipe with a screened submersible pump. The Catherine Creek Juvenile Acclimation Facility water intake meets NOAA screening criteria (NOAA 2011) and is operated within the design specifications. All acclimation water is returned to the creek via an outfall pipe located approximately 90 feet downstream of the intake. The Catherine Creek Juvenile Acclimation Facility diverts a maximum of approximately 8.6 percent of the total Catherine Creek water volume. The facility is located within SR habitat (Rkm 84.4) and its operation overlaps with rearing periods in the area. There have been no documented instances or reports of entrainment or impingement of bull trout at the facility. Further, due to the use of screens that meet NOAA screen criteria, it is unlikely that any bull trout present within the immediate intake area will be entrained or impinged. Dewatering or significant drawdown of water from the river channel between the intake and outflow have not been observed and are not likely to strand bull trout present in the 90 feet between the two points. While juvenile bull trout may be present within the withdrawal area, withdrawal impacts are minimized based on the use of appropriate fish screens and the relatively small percentage of the creek diverted between the intake and outfall. Because water withdrawals are not expected to be notable over background conditions for bull trout potentially present in the area and the diversion is screened, effects of water withdrawals in support of operation of the Catherine Creek facilities are expected to be insignificant.

The intake at the Lostine River Juvenile Acclimation Facility is a mobile pump that is placed in different channel locations annually depending on river flows. The pump meets NOAA screening criteria (NFMS 2011) and is operated in accordance with the specifications. The outflow pipe from the acclimation facility is located between 50 and 300 feet downstream of the intake box, depending on stream flows. A maximum of 5.7 cfs is withdrawn from the Lostine River during acclimation activities. Typically, water is diverted at lower quantities (approximately 1 cfs per raceway) at the beginning of the acclimation period (typically late February) and then gradually increased to 5.7 cfs prior to release (typically late April).

The Lostine River Juvenile Acclimation Facility is located within the lower reach of SR habitat. While adult bull trout typically begin their upstream migration in May in the Lostine River, acclimation facility operation may overlap with some early migrant use of the area. While adult bull trout may be present during water withdrawals, enough flow remains in the channel between the intake and outflow to prevent bull trout stranding. The total amount withdrawn does not exceed 5 percent of flows and is not expected to be noticeable over background conditions to bull trout in the area. Further, due to the use of appropriate fish screens, any adult bull trout present within the vicinity of the withdrawal area are unlikely to become impinged on the intake. Water withdrawals occur below the majority of SR habitat (spawning/rearing primarily occurring upstream of the acclimation facility on the Lostine River) early migrants may be in the vicinity of the slight draw down area. Therefore, effects of water withdrawals in support of the Lostine River facilities are expected to be insignificant.

The Tucannon facility is located below all spawning and most of the juvenile rearing areas of the Tucannon River. Withdrawals are less than 10 percent of the total water volume and meet NOAA screening criteria. Bull trout potentially present during water withdrawals are not anticipated to experience effects noticeable above background conditions. Therefore, water withdrawals in support of operating the Tucannon facilities are expected to be insignificant.

The Irrigon FH and Lyons Ferry FH utilize well water in their operation and do not divert water from the Columbia or Snake Rivers. Therefore, no impacts to bull trout or designated critical habitat from water diversions in the mainstem Snake and Columbia River are expected.

5.1.4 Effluent

- Cottonwood Facility/Cottonwood Creek: no bull trout observed, not located within critical habitat.
- Wallowa Facility/Spring Creek: no bull trout observed, not located within critical habitat.
- Imnaha River, Little Sheep Creek, Tucannon River, Curl Lake, Lyons Ferry, and Irrigon Facilities comply with federal and state water quality standards and guidelines through NPDES permitting, and do not discharge significant portions of total river flow.

LSRCP facilities will continue to follow NPDES and IHOT criteria, monitor effluent, and make any modifications necessary to meet standards. It is expected that effluent from facilities regulated by the NPDES permits will not be noticeable or measurable over background conditions or result in effects to bull trout. Impacts from the introduction of infectious disease by NPDES-regulated facilities are unlikely. These facilities implement BMPs to reduce the potential for exposure of bull trout to infectious diseases.

The Cottonwood Facility is located on the Grande Ronde River (Rkm 46.7), and not within a known bull trout use area or designated critical habitat. A small proportion of effluent will be released into the receiving waters (< 0.2 percent) from February through April which may result in insignificant increases in chemical and organic loading into the river below the outfall. It is expected that this small percentage released will have an insignificant and discountable effect on bull trout within the vicinity of the outfall.

The Wallowa FH is located on Spring Creek and not within a known bull trout use area or within designated critical habitat. Because no bull trout would likely be present within the effluent discharge area, bull trout in the Grande Ronde River Core Area are not expected to experience minor impacts to water quality from the Wallowa FH.

Discharges of chemical and organic pollutants at Imnaha River Facility and Little Sheep Creek Facility comply with federal and state water quality standards and guidelines (NPDES Standards). Average monthly discharge from the Imnaha River Facility ranges from 9.0 cfs to 24.0 cfs. Total discharge volume to river flow ranges from 0.98 percent to 12.95 percent. The Imnaha River Facility location within spawning/rearing habitat for bull trout would result in likely bull trout presence within the effluent area. A small proportion of effluent will be released into the receiving waters (< 0.98 to 12.95 percent), which may result in insignificant increases in chemical and organic loading into the river below the outfall.

Average monthly discharge from Little Sheep Creek Facility ranges from 4.5 cfs to 12.1 cfs. Total discharge volume to river flow may be significant during facility operations. While the volume of discharge at the site makes up a significant proportion of Little Sheep Creek (especially in months of February and March), the facility is located below SR habitat, and the limited number of bull trout captured at the facility reduces potential impacts to migrants that may be passing through the area. Flows in Little Sheep Creek vary through the trapping season starting in February and ending in June. During February and March, (cold and frozen conditions) the facility removes more than 75 percent into the facility. During April –June (spring thaw) the facility removes a smaller amount (approximately 25 percent) of Little Sheep Creek, so there is a larger amount of water in the creek between the intake and the facility. The facility has water rights of 19.6 cfs and they typically maintain 9-11 cfs through the facility while they are operating.

Average monthly discharge from Tucannon FH ranges from 2.2 cfs to 9.3 cfs. Total discharge volume to river flow ranges from 2.1 percent to 10.8 percent. The low volume of discharge (2.2 cfs – 9.3 cfs) and low percent of discharge to river volume (2.1 percent - 10.8 percent) at the outflow should minimize any potential impacts to the area immediately below the outflow. Effluent (discharges of chemicals and organics) from Tucannon FH is located below primary SR habitat, meets federal and state water quality standards (NPDES), and makes up less than 10.8 percent of the total river volume below the outfall during any month. Effluent is not expected to result in a substantial, long-term degradation of water quality.

Average monthly discharge from Curl Lake Facility ranges from 3.3 cfs to 3.8 cfs during the three months of operation. Total discharge volume to river flow averages 1.4 percent. The low volume of discharge (3.3 cfs – 3.8 cfs) and low percent of discharge to river volume (1.4 percent) at the outflow should minimize any potential impacts to the area immediately below the outflow. Curl Lake is located below primary SR habitat and thus reduces potential impacts to migrants that may be passing through the area. Effluent (discharges of chemicals and organics) from Curl Lake Facility is located below primary SR habitat, meets federal and state water quality standards (NPDES), and makes up less than 1.4 percent of the total river volume below the outfall during any month. Effluent is not expected to result in a substantial, long-term degradation of water quality.

Discharges of chemical and organic pollutants at Lyons Ferry FH comply with federal and state water quality standards and guidelines (NPDES Standards). Average monthly discharge from Lyons Ferry FH ranges from 51.9 cfs to 108.3 cfs. Total discharge volume to diver flow ranges from 0.08 percent to 0.48 percent. The low volume of discharge (51.9 cfs – 108.3 cfs) and low percent of discharge to river volume (0.08 percent - 0.48 percent) at the outflow should minimize any potential impacts to the area immediately below the outflow. Lyons Ferry FH is located well below primary SR habitat. There is a low likelihood of bull trout being present near the effluent release and a high likelihood of effluent dilution within the Snake River, therefore, the effluent from the Lyons Ferry FH is not expected to be measureable over background conditions in the Snake River.

Discharges of chemical and organic pollutants at Irrigon FH comply with federal and state water quality standards and guidelines (NPDES Standards). Average monthly discharge from Irrigon FH ranges from 19.2 cfs to 36.1 cfs (Table 51). Total discharge volume to diver flow ranges from 0.01 percent to 0.03 percent. The low volume of discharge (19.2 cfs – 36.1 cfs) and low percent of discharge to river volume (0.01 percent - 0.03 percent) at the outflow should minimize any potential impacts to the area immediately below the outflow. Irrigon FH is located well below primary SR habitat. There is a low likelihood of bull trout being present near the effluent release and a high likelihood of effluent dilution within the Columbia River; therefore, the effluent from the Irrigon FH is not expected to be measureable over background conditions in the Columbia River.

5.1.5 Facility Operation and Maintenance

- In-Structure activities and minor building maintenance above the OHWM at all facilities

Facility operations and maintenance include adult holding, spawning, incubation, rearing, on-station M&E, semi-routine and routine maintenance activities that occur above the OHWM at the facilities, within existing structures, and implement Best Management Practices (BMPs) to reduce the potential for affects to adjacent water bodies. These activities are highly unlikely to affect bull trout or disrupt natural behaviors significantly.

5.1.6 Acclimation and Release

- Irrigon FH: no release of juveniles occurs.
- All other facilities, expect beneficial or insignificant effects from acclimation and release.

It is possible that releases of spring Chinook and steelhead may negatively impact bull trout. However, data regarding potential effects is limited or unavailable. While spring Chinook and steelhead released from the program coexisted with bull trout historically, stream and river environments have changed and habitat quality and quantity may be much lower. These factors may increase the impact competition among species has on bull trout more notably than in the past or in pristine habitat. Predation by spring Chinook and steelhead smolts on the smallest age classes of bull trout may occur. However, there is currently no data regarding potential effects on bull trout from hatchery fish wandering/straying into bull trout habitat. We assume the risk is small given the species evolved using the same habitat and releases are below primary bull trout spawning and rearing habitat. As well, spring Chinook and steelhead are released at a size and time to rapidly migrate from the release site to the ocean and typically below spawning and rearing areas for juvenile bull trout. Releases of spring Chinook and steelhead are also expected to benefit bull trout by increasing the prey source for adult and sub-adult bull trout in FMO downstream of release sites.

Due to the lack of certainty on the effects of hatchery releases on bull trout, LRSC and BPA have initiated studies to assess how hatchery fish distribute after release. Based on information obtained, the action agencies will continue to assess release strategies and potential effects to bull trout. The LSRCP Program will continue to adaptively refine strategies as the recovery process goes forward and new data on bull trout will be used to assess recovery objectives.

Based on the likely beneficial effects of smolt releases to foraging bull trout, implementation of research and adaptive management of facilities to minimize potential impacts, and the existing practice of releasing smolts below SR habitat (excluding Catherine Creek, Upper Grande Ronde, and the Lostine River) and at a time when they are expected to quickly immigrate to the ocean, acclimation and release at all facilities is not expected to significantly impact normal behaviors of bull trout. In many instances, the benefits of additional forage in FMO will improve conditions for bull trout.

The Irrigon FH does not acclimate or release smolts. Therefore, no impacts from smolt releases to bull trout or bull trout critical habitat are anticipated in the mainstem Columbia River from this facility.

5.1.7 Monitoring and Evaluation

Monitoring and evaluation activities do not occur in the mainstem Snake and Columbia Rivers associated with operations at the Irrigon and Lyons Ferry Facilities. In addition, habitat adjacent to these facilities does not contain many of the characteristics of suitable bull trout habitat, further reducing the likelihood of impacts at these sites. Therefore, no impacts from monitoring and evaluation in the Snake and Columbia Rivers are expected from activities associated with the Lyons Ferry and Irrigon facilities.

5.2 Direct Effects to Bull Trout

5.2.1 Adult Collection

- Big Canyon Facility/Deer Creek: complete barrier during operation between Mid-Feb and early June in FMO; five bull trout captured between 1999 and 2011, no mortalities; delayed passage and spawning/rearing
- Lookingglass Facility/Lookingglass Creek: complete barrier during operation between May and September in FMO; 889 bull trout captured between 1999 and 2011, 18 documented mortalities; delayed passage and spawning/rearing
- Upper Grande Ronde Facility/Upper Grande Ronde River: complete up and downstream barrier to adults during operation between April and September in FMO; 2 bull trout captured between 1999 and 2011, no mortalities; delayed upstream passage and spawning/rearing, possible delay in downstream migration
- Lostine Facility/Lostine River: complete up and downstream barrier to adults during operation between April and September in FMO; 536 bull trout captured between 1999 and 2011, no documented mortalities; delayed upstream passage and spawning/rearing, possible delay in downstream migration
- Catherine Creek Facility/Catherine Creek: complete up and downstream barrier to adults during operation between May and September in FMO; 113 bull trout captured between 1999 and 2011, one documented mortality; delayed upstream passage and spawning/rearing, possible delay in downstream migration
- Imnaha Facility/Imnaha River: complete up and downstream barrier to adults during operation between May and September located in spawning and rearing habitat approximately ten miles downstream of annual bull trout spawning surveys in the headwaters; 652 bull trout captured between 1999 and 2011, no mortalities documented; potential delayed upstream passage and spawning/rearing, possible delay in downstream migration. Twenty-nine bull trout mortalities reported in or near weir in 2014 (ODFW 2014).
- Little Sheep Creek Facility/Little Sheep Creek: complete up and downstream barrier to adults during operation between February through May in FMO; 2 bull trout captured between 1999 and 2011, no mortalities; delayed upstream passage and spawning/rearing, possible delay in downstream migration
- Tucannon Facility/Tucannon River: partial up and downstream barrier to adults during

operation between May through September in FMO; 1,399 bull trout captured between 1999 and 2011, 5 mortalities; delayed upstream passage and spawning/rearing, possible delay in downstream migration
- Hook and Line may also be used for the Tucannon River Facility, incidental capture and injury of bull trout likely limited.

Operation of the traps and weirs will directly impact bull trout in the form of passage delays, physical handling, and in some cases, complete blockage of migration. Some upstream migrants may be injured by the trapping process or may fail to enter the trap and simply drop back and cease upstream movement. Delays in migration can reduce spawning, impede spawning, or cause bull trout to abandon spawning. Intakes may entrain migrating juveniles or adults and smaller juveniles may become impinged on screens and trash racks. These adverse effects can be substantially minimized, but only if the facility is well designed, well maintained, and conscientiously operated.

While trapping facilities are regularly used to achieve salmon management goals, there are only a few studies that have looked at how they affect non-target migratory fish, commonly referred to as 'bycatch'. The existing studies do indicate that trapping facilities which block fish passage can have sizeable adverse effects on non-target fish.

On the Wenatchee River in Washington, a Chinook salmon trap operated 7 days a week from 2008 through 2010 on the fish ladder at Tumwater Dam resulted in up to 38 percent of sockeye salmon being inadvertently blocked from reaching spawning tributaries (Murauskas *et al.* 2014). These fish had trouble making it into the trap box for upstream transfer. Others did eventually make it into the trap, but experienced delays in migration that commonly exceeded 8 days. When the trapping operation was reduced to 3 days per week in 2011, less than 1 percent of the run was blocked and median delays were 6 minutes (Murauskas *et al.* 2014).

The trapping operation at Tumwater Dam began in 2004, and passage delays went unnoticed until installation of PIT-tag detection arrays at the facility in 2008. After three years of documenting the fish passage problems associated with operating the trap continuously, the trapping operation was permanently reduced to 3 days per week after 2011. The authors of this study recommend a precautionary approach where trapping of adult migratory fishes is proposed but the effects are unknown, and intensive trapping efforts should be closely evaluated prior to and during implementation (Murauskas *et al.* 2014).

Radio-tagged bull trout also experienced substantial migration delays at a collection trap and weir on the Chiwawa River, a tributary of the Wenatchee River (Ringel *et al.* 2014). Over 25 percent of tagged bull trout were delayed by the weir, most for 3 to 5 days. One was delayed for 18 days. A few bull trout avoided entering the trap and waited downstream until the weir was down before moving upstream. This behavior may reflect an individual or learned behavior, as demonstrated by one tagged bull trout that during both years it was tracked held for 3 to 4 nights before the weir was lowered and then passed (Ringel *et al.* 2014). Passage delays could occur for numerous reasons (e.g., a ready food supply at the base of the weir, improper attraction flows at the ladder, etc.), thus additional studies may be necessary to determine true causes of delay.

A New Zealand study looked at stress responses in wild rainbow trout, by tracking changes in plasma cortisol and lactate levels, as they entered fish traps on their upstream spawning migration, were confined, handled, and then released (Clements *et al.* 2002). Based on the results of this study, the authors concluded that the trapping procedure induces a severe and prolonged stress response in wild rainbow trout and that it is important to minimize the length of disturbance during trapping and processing (Clements *et al.* 2002).

When using the hook and line method to collect broodstock at Tucannon Facility weir, it has the potential to significantly impair natural behaviors of bull trout. Incidental capture and handling of bull trout may cause loss of scales, increase stress levels, and cause direct injury. Capture during hook and line collection will cause short-term delays in migration and foraging. The hook and line method has only been used once in the Tucannon basin and no bull trout were captured. It is expected that few bull trout will be captured during hook and line broodstock collection since methods and gear used are not typically driven toward bull trout. The Service assumes fewer than five bull trout will be impacted by the annual hook and line broodstock collection in the Tucannon River, and no more than one bull trout will be injured to the point of mortality.

5.2.2 Water Diversions

- Big Canyon Facilities: withdraws 33 percent of flows during upstream bull trout migration, meets screening criteria
- Upper Grande Ronde Facilities: withdraws 20.8 percent, during upstream bull trout migration, meets screening criteria
- Lookingglass Creek Facilities: withdraws up to 54 cfs (50 to 90 percent of flows), reduces flows during July, August, September; bull trout passage restricted. Current passage ladder does not meet standards.
- Imnaha River Facility: withdraws up to 12.95 percent of flows, screening does not meet standards
- Little Sheep Creek Facilities: withdraws significant flow, meets screening standards

Grande Ronde River

Water withdrawals for operation of LSRCP and BPA facilities for spring Chinook and steelhead operations may significantly affect normal behaviors of bull trout. Four of the LSRCP facilities (Cottonwood Facility, Lookingglass FH, Wallowa FH, and Big Canyon Facility), divert a significant portion of river flows during periods of operation. The Wallowa FH and the Cottonwood Facility are located on tributaries where bull trout have not been reported in the last 12 years (1999 – 2010) and outside of critical habitat. However, the Big Canyon and Lookingglass Facilities are both located below primary SR areas in Deer Creek and Lookingglass Creek. Big Canyon water withdrawals (Feb. – June) reduce flows in Deer Creek up to about 33 percent in May when they overlap with the bull trout pre-spawning migration period (May – June). The Upper Grande Ronde acclimation facility is located in SR habitat where bull trout may be rearing during withdrawals (maximum withdrawals are 20.8 percent of streamflow at Upper Grande Ronde).

Water diversion could affect bull trout with outcomes as benign as a minor delay in migration to outcomes as severe as injury or mortality. Facility water intakes have the potential to affect bull trout by removing or reducing water levels in the river between the facility intake and outfall resulting in the potential loss of rearing habitat and/or blockage of passage for both adults and juveniles. Unscreened diversions may also result in fish diverted and entrained into the facilities' water system and improperly screened diversions may result in impingement of bull trout juveniles.

The intake structure at Lookingglass FH consists of a permanent diversion structure constructed across Lookingglass Creek and a water intake structure. The main water source for Lookingglass Hatchery is Lookingglass Creek. Water is diverted year round. Maximum water rights are typically diverted, but during certain times, the full water right is not needed.

Lookingglass FH water intake diverts a maximum of 54 cfs that results in reduced flows between the diversion and the outfall of the hatchery over a distance of approximately 500 meters (1640 feet). These reduced flows are most prominent during late July, August, and September when hatchery water demands are high and the creek is at its lowest flow. The hatchery typically maintains a minimum of 5 cfs river flow in the diverted reach during the low flow period to maintain flows for Chinook to swim through the diverted reach to the adult ladder and passage for bull trout. During this period and at extreme low flow conditions, bull trout upstream passage may be restricted or impeded.

The Lookingglass FH water diversion structure and water withdrawals from Lookingglass Creek have been identified as a passage issue. The Denali ladder bypass structure, located at the water intake diversion, does not meet current upstream or downstream passage standards. Both issues are currently identified on the LSRCP long term non-routine maintenance project list and will be addressed based on priorities and funding availability. All bull trout entering the bypass structure and trap are released above the intake structure. While some mortality at the diversion and bypass structure has occurred, bull trout redd counts conducted in Lookingglass Creek from 1994 to 2011 have been stable over the years, with less fluctuation than most other streams. The diverted section of Lookingglass Creek is located below SR habitat (Lookingglass Creek and Summer Creek). Therefore, migrating bull trout may be blocked during low flows resulting in significant impacts to bull trout behaviors from migration delay, injury, or in some cases mortality.

The intake at the Big Canyon Facility consists of a water intake structure with no permanent diversion structure. The main water source for Big Canyon is Deer Creek. Big Canyon may divert a significant percentage (33 percent) of the total stream volume in Deer Creek between the intake and outfall (~500 yards) early in the trapping season. While the potential for affecting bull trout migration in Deer Creek is greater early in the trapping period, there have only been 5 bull trout reported trapped at Big Canyon during operations of the facility in the last 12 years, which suggests that few bull trout are likely to be within the withdrawal area. The diverted section of Deer Creek is located below SR habitat (Deer Creek and Sage Creek). Because some bull trout have been captured at the facility and could be present between the intake and outfall at the Big Canyon Facility, withdrawals have the potential to significantly disrupt normal behaviors of bull trout. The intake at Big Canyon meets NOAA screening criteria (NOAA 2011) and is checked on a regular basis during operation of the facility to minimize effects to bull trout individuals.

The surface water supply system at the Upper Grande Ronde Juvenile Acclimation Facility consists of a screened gravity flow cement head box that can deliver up to 5 cfs into the facility. While the facility has a 5 cfs water right, the facility typically uses approximately 3.1 cfs of water for operation. The pump meets NOAA screening criteria (NOAA 2011) and is operated in accordance with the specifications. The raceway outflow discharges into the river approximately 1,200 feet below the intake.

The Upper Grande Ronde River Juvenile Acclimation Facility is located (Rkm 274.4 [RM 170.5]) in SR habitat); therefore, rearing bull trout will likely be present within the area during water withdrawals. Hatchery staff has not observed significant dewatering of the river due to water withdrawals, though if the entire water right (5.0 cfs) were used and if river flows were atypically low, there may be a drawdown of river levels between the intake and outflow, which may result in the stranding of bull trout in the area. The water intakes have appropriate screens to prevent the impingement or entrainment of any bull trout that may be rearing in the vicinity. Due to the potential use by migrating and rearing bull trout between the intake and outflows, water withdrawals in support of the Upper Grande Ronde Juvenile Acclimation Facility at atypical low flows is likely to significantly impact normal behaviors of bull trout through stranding.

Imnaha River

The water diversion intake structure at the Imnaha River Satellite Facility is located approximately 175 yards above the outflow at the fish ladder. Mean monthly water use at the facility is typically 9 cfs during the juvenile acclimation period (March-April) and 24 to 18 cfs during the adult trapping and initial holding period (May-September). Percent water diverted from the Imnaha River during the facility operations ranges from approximately 0.98 percent to 12.95 percent (river flows measured downstream at the town of Imnaha). Water withdrawals are not a significant issue for bull trout at the Imnaha River Facility. Stream discharge is sufficiently high during smolt acclimation and adult collection periods, the percent river flow diverted is low, and the distance between the intake and outflow is short.

The existing Imnaha River Facility intake does not meet NOAA screening standards. Juvenile bull trout currently can enter the facility intake and have access to the acclimation pond and outflow back to the river. During the spring/summer Chinook acclimation period, juvenile bull trout may be confined in the pond until screens are removed and Chinook smolts are released (up to 3 weeks). During the adult holding period, juveniles that enter the pond can move through the screens down through the outflow (fish ladder) back to the river. Up-grading the facility intake was a part of the NEOH project that has currently not been funded. Compliance for intake screen criteria is currently being evaluated. Therefore, since juveniles are known to be trapped within the facility, significant impacts to bull trout from trapping and entrainment are expected from operation of the Imnaha River Facility's intake.

The water diversion intake structure at the Little Sheep Satellite Facility is located approximately 100 yards above the outflow at the acclimation pond. Mean monthly water use at the facility is typically 4.5 – 12.1 cfs during the juvenile acclimation and adult trapping periods, resulting in significant fluctuations in flows for Little Sheep Creek. Water diversion does not overlap significantly with the adult fluvial migration period and the distance between the intake and outflow is short. In 13 years of record, two bull trout have been captured at the diversion. Delays in migrations and significant fluctuations in streams flows impact normal behaviors of bull trout during feeding and migration.

5.2.3 Effluent/Fish Health

- No NPDES permits for small facilities (EPA does not require permits for facilities producing <20,000 lbs), less regulations, and no monitoring of effluent releases (Upper Grande Ronde Acclimation Facility, Catherine Creek Acclimation Facility and Lostine Acclimation Facility)
- Lookingglass and Big Canyon Facilities release effluent into significant proportions of total stream flows and reduced water quality occurs in the streams.

<u>Grande Ronde River</u>

Bull trout life cycles, population sizes, and distribution may be affected by facility effluents. While the LSRCP facilities all meet or exceed state and federal NPDES water quality standards for effluent and fish health protocol, these water quality standards have not been evaluated relative to potential effects on bull trout or other listed fish. Effects from effluents may be in the form of nutrient loading, addition of chemicals to the waterways, and transmission of parasites and pathogens. The effects of effluents may depend on water temperature, life stage of fish present, and the rate of dilution.

The return flow from Lookingglass FH comprises between 50 percent and 90 percent of the flow in Lookingglass Creek during the lower flow months from July through January and overlaps with the post-spawning migration period in October and November. The Lookingglass FH's location on Lookingglass Creek, below the primary SR areas for bull trout and the facility location 1.4 km (2.2 miles) above the Grande Ronde Rivers would result in potential bull trout presence within the effluent area. The release of effluent, affecting up to 50 to 90 percent of stream flows, has the potential to significantly modify behaviors of bull trout by creating temporary water quality barriers (thermal or contaminant), impact or disorient migrating individuals, or delay migration.

The return flow from the Catherine Creek Juvenile Acclimation Facility comprises a relatively small portion (less than 8.6 percent) of the average stream flow and is returned to the creek when bull trout may be present in SR habitat. NPDES general permits are not required for this facility due to the limited number of juveniles reared. Limited, localized increases in nutrients in effluent from juvenile acclimation facilities during the 2 to 3 month operation will quickly dissipate due to the level of water flow in the discharge area. Discharge water in SR habitat could temporarily decrease water quality in a localized area. While effluent is not expected to result in a substantial, long-term degradation of water quality, due to the potential presence of bull trout in SR habitat during discharge and due to the lesser regulations on effluent concentrations, effluent releases from the Catherine Creek Juvenile Acclimation Facility may significantly affect normal behaviors for bull trout.

The return flow from the Upper Grande Ronde River Juvenile Acclimation Facility typically comprises less than 20.8 percent of the overall stream flow. NPDES general permits are not required for this facility due to the limited number of juveniles reared. There will be localized increases in nutrients in effluent from facilities during the 2 to 3 month operation. As the Upper Grande Ronde acclimation facility is located in SR habitat, bull trout rearing in the area may be temporarily displaced due to localized decreases in water quality, particularly during lower flow conditions. Displacement of juveniles during feeding and rearing has the potential to increase predation, slow growth, or significantly impact other normal behaviors.

The return flow from the Lostine River Juvenile Acclimation Facility typically comprises less than 12 percent of the average stream flow. There will be limited, localized increases in nutrients in effluent from juvenile acclimation facilities during the operation. NPDES general permits are not required for this facility due to the limited number of juveniles. The effluent discharge location is located in the lower reach of bull trout spawning habitat. As the Lostine River Juvenile Acclimation Facility is located in SR habitat, bull trout rearing in the area may be temporarily displaced due to localized decreases in water quality, particularly during lower flow conditions. Therefore, significant effects to normal behaviors of rearing juveniles are expected.

The Big Canyon Facility is located on Deer Creek, below the primary SR habitat for bull trout, and directly downstream is the Wallowa River (FMO habitat). The return flow from the Big Canyon Facility comprises from 33 percent to 75 percent of the flow in Deer Creek and overlaps with the pre-spawning migration period of bull trout in May and June. While effluent is not expected to result in a substantial, long-term degradation of water quality, due to the potential presence of bull trout migrating upstream to SR habitat during discharge, the effluent from the Deer Creek Juvenile Acclimation Facility likely significantly modify behaviors of bull trout migrating or foraging near the outfall.

While bull trout may be present in the rivers near the location of facility effluent discharge sites, most locations are below bull trout SR habitat (with the exception of the Upper Grande Ronde Juvenile Acclimation Facility, Catherine Creek, and the Lostine). Based on the lack of good water quality and seasonally high water temperatures in the mainstem areas (poor rearing habitat), the proportion of surface water discharged for the facilities relative to the volume of river water present at most sites are expected to further minimize the potential for effects to bull trout. While Lookingglass FH and Big Canyon Facility discharge significant proportions of flow into Lookingglass Creek and Deer Creek and overlap with migration periods of bull trout, their locations low in the watersheds immediately above the mainstem Grande Ronde and Wallowa River should reduce the potential for effects to rearing juvenile bull trout.

5.2.4 Facility Operation and Maintenance

Semi-Routine Maintenance activities that occur below the OHWM (with a frequency of a few times within a 5-10 year period) have the potential to cause short-term adverse affects to bull trout individuals. These actions occur below the OHWM where bull trout may be residing and the timing of such activities is unknown. Examples of semi-routine maintenance include in-stream work such as clearing gravel blockages from water intakes, outfalls, or traps after larger flow events, bridge repair, replacement of failed equipment, or weir or ladder maintenance. These instream activities are likely to cause short-term adverse habitat effects associated with increases in sediment, turbidity, and stream bank erosion. Potential indirect effects to bull trout include behavioral changes resulting from elevated turbidity (Sigler *et al*. 1984; Berg and Northcote 1985; Whitman *et al*. 1982; and Gregory and Levings 1998) during instream work.

Water turbidity, resulting from elevated levels of total suspended solids (TSS) has been reported to cause physiological stress, reduce growth, and adversely affect survival. Of key importance in considering the detrimental effects of TSS on fish are the frequency and the duration of the exposure, not just the TSS concentration. Chronic exposure can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Redding *et al.* 1987; Lloyd 1987; Servizi and Martens 1991). The elevated TSS levels resulting from this project should be limited primarily to the period of semi-routine maintenance activities that increase turbidity and thus should be short-term in nature.

Increased sedimentation can lead to increased embeddedness of spawning substrates. However, most known bull trout spawning habitat is upstream of the project sites (except at the Upper Grande Ronde and Catherine Creek facilities), so the proposed action should have low to moderate effects on spawning habitats. The proposed timing of instream work during low flow periods should help minimize sediment transport.

There is also the potential for fuel or other contaminant spills associated with use of motorized equipment in or near the stream. Operation of back-hoes, excavators, and other motorized equipment requires the use of fuel, lubricants, and other substances which, if spilled into the channel of a waterbody or into the adjacent riparian zone, can injure or kill aquatic organisms. Petroleum-based contaminants (such as fuel, oil, and some hydraulic fluids) contain polycyclic aromatic hydrocarbons (PAHs), which can be acutely toxic to salmonids at high levels of exposure and can also cause mortality and have acute and chronic sub-lethal effects on aquatic organisms (Neff 1985). Instream work if conducted with motorized equipment will elevate the risk for chemical contamination of the aquatic environment within the action area. However, given the proposed conservation measures, which should reduce the risk of a contaminant spill, and the localized and short-duration of the activities, the probability of direct mortality from chemical contamination is low.

Because these activities will be conducted during times when bull trout may be present and would result in temporary disturbance, modifications to substrate, elevated in-water noise, disruption of forage species, and other impacts typical of in-water work, it is expected that adverse effects to normal behaviors are expected. Short-term adverse effects to bull trout near the facilities during semi-routine maintenance could occur.

5.2.5 Acclimation and Release

No significant impacts to bull trout are anticipated from the release of juvenile salmonids at the Facilities. In some situations, there may be a benefit with prey for adults moving into the system where releases are occurring.

5.2.6 Monitoring and Evaluation

<u>Grande Ronde River</u>

Spawning ground surveys are conducted in the Upper Grande Ronde River, Lostine River, Catherine Creek, and Lookingglass Creek to determine natural spawning abundance and distribution, density and proportion of hatchery-origin spring Chinook in key natural spawning areas. These surveys are conducted annually in various reaches of spring Chinook spawning habitat from August through September. Spawning ground surveys may temporarily disturb bull trout in the survey sections, although the encounters are expected to be brief and of short duration. The locations of spring Chinook spawning areas are generally lower in the Grande Ronde River Basin than primary bull trout SR areas, although some overlap occurs.

CTUIR and ODFW conduct snorkel surveys, which are often accompanied by seining or dip net use in Lookingglass Creek, Grande Ronde River, and Catherine Creek to assess outmigration of natural-origin juvenile spring Chinook salmon in order to describe life history and production characteristics of the reintroduced stocks. CTUIR snorkel/seines collect 50 spring Chinook parr from several standard sites in Lookingglass Creek to describe seasonal growth and condition. Sampling is conducted once a month in June, July, August, September, and October. ODFW conducts snorkel surveys in the summer and winter to capture juvenile spring Chinook for PIT tagging. Summer snorkel surveys are accompanied by juvenile collection via seine nets while the winter tagging is conducted using dip nets. Bull trout may be collected during the sampling with seining nets. No bull trout have been captured during winter dip net collections. All bull trout collected during the sampling are enumerated and released. Further, bull trout present within the snorkel survey area may be temporarily startled by the presence of snorkelers and may temporarily vacate the sampling area.

During snorkel sampling operations, bull trout are trapped, handled and released immediately. During the 13 year sampling period from 1999 through 2011, the CTUIR have captured 77 bull trout with no reported mortalities. From 2003 to 2012, ODFW has reported indirect take ranging from zero to 85 juvenile bull trout during seining activities. Furthermore, on an annual basis, ODFW has reported 200 or less juveniles being temporarily harassed by the presence of snorkelers. No bull trout have been incidentally taken during dip net sampling. Due to the incidental capture of bull trout associated with seining and temporary harassment associated with snorkeling, snorkel surveys and sampling may significantly disrupt normal bull trout behavior in the Grande Ronde Core Area.

CTUIR operates an out-migrant trap year round about 0.2 km (0.1 mile) below the adult Lookingglass FH water intake at Rkm 4.1 (RM 2.6) to sample out migrating natural-origin juvenile spring Chinook salmon in order to describe life history and production characteristics of the reintroduced Catherine Creek population in Lookingglass Creek. ODFW also operates several floating rotary screw traps to monitor juvenile outmigration in the Minam River (RMs 0.2 and 1.9), Grande Ronde River (RM 100.6), Upper Grande Ronde River (RM 185.8) Catherine Creek (RM 19.9), and Lostine River (RM 1.9). ODFW screw traps also collect out-migrating juvenile life history data and are used to capture juvenile Chinook that are tagged with PIT tags to monitor migration through dams and returns as adults.

During juvenile trapping operations, bull trout are routinely trapped, handled and released into the sampled water bodies. During the 13 year trapping period from 1999 through 2011, CTUIR's Lookingglass Creek out-migrant trap captured 1,229 bull trout (range 41-213/yr.) with seven reported mortalities (0.57 percent). During the 2003 to 2012 juvenile trapping periods, ODFW captured a combined total of 609 juvenile bull trout (range 61 to 85/yr.), 57 adult bull trout (range 0 to 8/yr.) and seven 'unknown age' bull trout. No mortalities were reported at the ODFW traps. The capture of bull trout in these traps result in a delay in migration and may result in delayed mortality as a result of injury from the trap.

ODFW conducts steelhead spawning ground surveys on Deer Creek, a tributary that enters the Wallowa River at the Big Canyon Juvenile Acclimation Facility. The locations of steelhead spawning areas in Deer Creek may overlap with primary bull trout SR areas. Surveys are conducted on foot at two-week intervals with two or more surveyors. The first survey is conducted within one to two weeks after the first female is passed above the weir. Redd counts are compared to weir counts of fish to estimate spawner/redd ratios to estimate annual escapement of steelhead to streams without weir counts. Surveyor presence within SR habitat may result in the disturbance and fleeing behavior of bull trout as surveyors walk in Deer Creek. Spawning ground surveys are likely to result in a short-term adverse effect to bull trout found in the survey sections.

Imnaha River

Spawning surveys are conducted annually in various reaches of spawning habitat from August through September to determine natural spawning abundance and distribution, density and proportion of hatchery-origin fish in key natural spawning areas. Experienced surveyors walk along the stream, crossing when necessary, avoiding redds, counting redds, and observing live fish and carcasses. Although every effort is made to observe adults and determine their origin without disturbance, spawners are occasionally forced to seek cover. These encounters are brief and spawning fish generally resume their activity within a short period of time. Surveyors occasionally disturbed existing redds while walking in the river (Lower Snake River Compensation Plan Imnaha Spring/Summer Chinook Program HGMP, May 2011, ODFW). Disturbance and additional stress to spawners may delay spawning or adults may abandon sites.

Electro-fishing, snorkeling and hook and line sampling may be used to monitor density, size, and food habits of juvenile Chinook and to collect genetic samples from naturally produced Chinook. Also, juvenile Chinook are PIT tagged to monitor survival and migration rate and timing. These activities, which generally occur from May through October, will result in take of juvenile listed steelhead and occasionally spring Chinook and bull trout. Electro-fishing efforts conform to NOAA electro-fishing guidelines to minimize disturbance and injury to listed fish. Snorkeling is a low impact sampling method that may be used to identify relative proportion of residual hatchery steelhead in key stream reaches. Disturbance of rearing juveniles associated with snorkeling is generally limited to forcing individuals to seek cover and is a short duration effect. Snorkeling surveys are conducted when stream temperatures are low, so as to minimize potential for stress and incidental mortality to listed fish. From 1999 through 2011, 135 bull trout were taken during sampling (ODFW & NPT) in the Imnaha River (average of 10.4 per year, range 0-60) with no reported mortalities.

A smolt monitoring trap is operated at Rkm 7 (RM 4.3), downstream of the Imnaha River weir at Rkm 73.2 (RM 45.5) from March-November each year by NPT research staff to estimate juvenile survival, timing, and production in the Imnaha. At a minimum, all fish captured are identified and enumerated. Most fish captured are counted and released or anesthetized, measured, weighed and then released. Smaller groups of fish are PIT-tagged and then released in order to estimate survival to Lower Granite Dam and to monitor migration. From 1999 through 2011 a total of 2,116 bull trout were captured in the smolt monitoring trap (average 162.8 per year, range 31- 524) with 6 reported mortalities (0.28 percent) (Table 9).

Table 9. Bull Trout Take at the NPT Smolt Monitoring Trap Located at RK 7 on the Imnaha River from 1999 through 2011.

Year	Take	Mortalities	percent Mortalities
1999	49	0	0
2000	94	0	0
2001	146	0	0
2002	51	0	0
2003	125	0	0
2004	31	1	3.2
2005	131	1	0.8
2006	258	1	0.4
2007	184	0	0
2008	196	3	1.5
2009	107	0	0
2010	220	0	0
2011	524	0	0
Total	**2,116**	**6**	**0.3 percent**

A smolt monitoring trap is also operated by ODFW on Little Sheep Creek at the Little Sheep Facility at Rkm 8.0 (RM 5.0) mostly year-round with some gaps due to weather. From 2009 to 2014 a total of 85 bull trout were captured in the smolt monitoring trap (average 14.2 per year, range 112-276) with no mortality reported (Lance, ODFW, *in litt*. 2014).

Snake River

WDFW annually conducts spawning ground surveys in spring/summer Chinook and steelhead spawning habitat from late-August through early-October in the Tucannon River (Rkm 0 – 86 [RM 0 -- 53.4]) and Asotin Creek (Rkm 14.6 – 41.3 [RM 9.1 – 25.7]) for spring Chinook, and from March-June in the upper Tucannon River (Rkm 55-86). Surveyors walk the stream sections to enumerate redds, sample carcasses to determine hatchery/wild ratios, and collect genetic samples. Spawning ground surveys may result in disturbance of migratory or rearing bull trout.

WDFW operates an out-migrant trap on the lower Tucannon River at Rkm 3 (RM 1.9) to assess and estimate survival of Tucannon River spring Chinook production, fall Chinook, and summer steelhead natural and to estimate survival of hatchery and wild production from the Tucannon River. WDFW may also operate (if funded in the future) an out-migrant trap in the upper Tucannon River near the adult trap to assess spring Chinook hatchery/wild interactions (microsatellite analysis) in the upper basin. Trapping occurs from October through August on an annual basis.

Bull trout are captured during operation of the out-migrant traps. For the time period of 1999 through 2011, WDFW trapped a total of 131 bull trout (range 1 – 28 per year) during operations of the out-migrant traps (average of 10 per year), with 1 reported mortality (0.76 percent). Protocols employed at the traps minimize trap time, handling, and stress on bull trout prior to release back into the Tucannon River.

Snorkel surveys have been terminated in recent years in the Tucannon River because of concerns about the degree of bias in the estimates that result. However, snorkel surveys may be initiated again if methods to reduce bias are found or a specific need for the juvenile data is described.

Take, in the form of "observe/harass", occurs during snorkel surveys. Snorkel surveys may occur between July-September, and are conducted to monitor distribution and abundance of juvenile spring Chinook in the Tucannon River. Bull trout are observed during snorkeling sampling. There is no estimate of the degree of harm, injury, or mortality to listed fish associated with snorkeling activities. Based on observations during snorkeling, the fish observed move slightly when the snorkelers pass, but quickly re-establish themselves near their original location.

Electrofishing surveys have also been terminated in recent years. However, electrofishing surveys may be reinitiated in the future if methods/techniques are developed to reduce bias, and a specific purpose of the data is described. Incidental takes bull trout in the Tucannon River may occur during electrofishing surveys. Electrofishing surveys may occur from July through October, and are usually conducted to monitor distribution and abundance of natural-origin steelhead. Protocols employed during electrofishing are designed to minimize impacts of electrofishing, capture time, handling, and stress on bull trout prior to release back into the river. For the time period of 1999 through 2008, WDFW captured/observed (sampling take includes electrofishing during steelhead monitoring) a total of 410 (range 1 – 132 per year) bull trout during surveys (average of 4.1 per year), with two reported mortalities (0.49 percent).

5.3 Direct Effects to Critical Habitat for Bull Trout

Adult Collections

<u>Grande Ronde River CHU</u>

Adult collections at Lookingglass FH, Big Canyon Facility, Catherine Creek Facility, Upper Grande Ronde River Facility, and Lostine River Facility for spring/summer Chinook and steelhead is likely to adversely affect the PBF identified for bull trout migration habitat (PBF 2). Operation of the Lookingglass FH weir to collect spring/summer Chinook from March through September, Upper Grande Ronde and Lostine River Adult Collection Facilities to collect spring/summer Chinook from April to September, Catherine Creek Adult Collection Facility to collect spring/summer Chinook from May to September, and Wallowa FH and Big Canyon Facility weirs to collect steelhead from February through June results in all bull trout migrating past the adult trap sites to enter the adult traps and be handled and passed upstream above the trap structures. Further, there may be a delay in migration for those bull trout traveling downstream of the Lookingglass FH, Lostine River, Catherine Creek, and Upper Grande Ronde River traps that may be temporarily blocked by brood-stock collection. All adult trap locations, are located below the primary SR habitat in the Grande Ronde River CHU. Trap operations (except for Cottonwood Facility) for spring/summer Chinook and steelhead collections overlaps with the bull trout fluvial migration period in the Grande Ronde River.

Protocols in place at the adult collection facility are expected to maintain current criteria to minimize potential impacts (holding time and stress) to bull trout and allow continued passage above the existing adult trap/water diversion.

Adult collections at the Grande Ronde River facilities for spring/summer Chinook and steelhead are not expected to affect the remaining PBFs (1, 3, 4, 5, 6, 7, 8, and 9) identified for bull trout.

Imnaha River CHU

Annual operation of the Imnaha River Facility weir and adult collection facility is expected to have a long-term adverse effect on PBF 2 (minimal barriers to migration). Currently, the weir acts as at least a partial barrier to migration. Trap operations (initial timing of weir operation and length of trapping period) varied significantly during that time due to annual variation in spring runoff and ODFW's ability to place the weir panels in the river during high flows. The current weir allows ODFW to place the weir panels at the site at average flows of about 800 cfs measured at the town of Imnaha. The new weir design should allow for ODFW to operate the weir for spring/summer Chinook brood-stock collection earlier, at higher flows, and extend the trapping period earlier into the spring. Bull trout take at the weir may increase due to the extended trapping period. Conservation Measures employed at the facility are expected to minimize trapping and handling effects to bull trout at the site after the weir modification. Adult collections at the Imnaha River Facility for spring/summer Chinook is not expected to affect the remaining PBFs (1, 3, 4, 5, 6, 7, 8, and 9) identified for bull trout.

Operation of the Little Sheep Creek weir for adult collections is likely to adversely affect PBF 2 (minimal barriers to migration). The weir is a known barrier to migration during operation. Conservation Measures employed at the facility are expected to minimize trapping and handling adverse effects to bull trout at the site. Adult collections at the Little Sheep Creek Facility for steelhead is not expected to affect the remaining PBFs (1, 3, 4, 5, 6, 7, 8, and 9) identified for bull trout.

Lower Snake River CHU

Adult collections at Tucannon Fish Hatchery (FH) for spring/summer Chinook and steelhead significantly impacts migration habitat (PCE 2) for bull trout in the Tucannon River. The Tucannon River FH weir is operated to collect steelhead from January through May and spring/summer Chinook from May through September. The operation of this weir likely delays or restricts migration during seasonal operation.

Protocols in place at the adult collection facility are expected to maintain current criteria to minimize potential impacts (holding time and stress) to bull trout and allow continued passage above the existing adult trap/water diversion. However, the function of the PBF for migration habitat is continually impacted by the operation of the structure and will continue to function at a lower level while the structure is in operation in the future.

Adult collections at Tucannon FH for spring/summer Chinook and steelhead are not expected to adversely affect the remaining PBFs (1, 3, 4, 5, 6, 7, 8, and 9) identified for bull trout.

The adult collection facility at the Lyons Ferry Fish Hatchery (FH) for steelhead may be a partial migration (PBF 2) barrier to bull trout, if collected. However, in 13 years of operation, no bull trout have been captured within the trap. In addition, the majority of the critical habitat in the Snake River is not impacted by the operation of the adult collection facility. Therefore, it is expected that critical habitat within the area of the Lyons Ferry adult collection facility will continue to function.

Adult collections at Lyons Ferry FH for steelhead are not expected to adversely affect the remaining PBFs (1, 3, 4, 5, 6, 7, 8, and 9) identified for bull trout.

Water Diversions

Grande Ronde River CHU

Water diversions at Lookingglass FH, Big Canyon, Lostine Juvenile Acclimation Facility, Catherine Creek Juvenile Acclimation Facility, and Upper Grande Ronde River Juvenile Acclimation Facility may adversely affect PBF 2 (minimal barriers to migration), PBF 7 (flows), and PBF 8 (water quality and quantity). The percent water diverted into Lookingglass FH (4.5 percent - 100 percent) and Big Canyon Facility (33 percent- 66 percent)substantially reduce flows between the facility intakes and outflows (diverted sections) of Lookingglass Creek, Deer Creek, Spring Creek, and Cottonwood Creek, respectively. The Lostine River Juvenile Acclimation Facility diverts a lesser proportion of the stream flow (approximately 12.1 percent). The large percentage of river flows diverted is expected to affect water quantity and quality (PBF 8) within critical habitat. The operation of Catherine Creek and Upper Grande Ronde River juvenile acclimation facilities; which are located in SR habitat, divert lesser quantities of flow (a maximum of 8.6 percent and 20.8 percent, respectively) between the intakes and outflows. The decrease in flows between the intakes and outflows of these facilities in SR habitat will cause a decrease in available rearing and migration habitat (PBF 8 and PBF 2) during acclimation facility operation. Water diversions at all facilities (except for Lookingglass FH) are screened to meet the NOAA screening criteria (NOAA 2011) and minimize effects to migration habitat (PBF 2).

In 2005, ODFW identified two issues concerning fish passage between the Lookingglass FH water intake structure and the hatchery outfall: 1) The concrete sill located in Lookingglass Creek at the mouth of the hatchery ladder creates a juvenile passage problem at low flows due to water depth and velocity across the sill, and 2) upstream and downstream passage in the denil ladder bypass structure located at the water intake diversion (the existing bypass does not meet current passage standards). Both issues are currently identified on the LSRCP long-term non-routine maintenance project list and will be addressed based on priorities and funding availability.

Water diversions at the facilities are expected to have an insignificant effect on the remaining PBFs (1, 3, 4, 5, 6, and 9) identified for bull trout.

Imnaha River CHU

The water diversion at the Imnaha River Facility may adversely affect PBF 2 (minimal barriers to migration), PBF 7 (flows), and PBF 8 (water quality and quantity) for bull trout. The water diversion intake structure at the Imnaha River Satellite Facility is located approximately 175 yards above the outflow at the fish ladder. Mean monthly water use at the facility is typically nine cfs during the juvenile acclimation period (March-April) and 24 to 18 CFS during the adult trapping and initial holding period (May-September). Percent water diverted from the Imnaha River during the facility operations ranges from approximately 0.98 percent to 12.95 percent (river flows measured downstream at the town of Imnaha). Stream discharge is sufficiently high during smolt acclimation and adult collection periods, the percent river flow diverted is low, and the distance between the intake and outflow is short.

The existing Imnaha River Facility intake does not meet NOAA screening standards. Juvenile bull trout currently can enter the facility intake and access to the acclimation pond and outflow back to the river. During the spring/summer Chinook acclimation period juvenile bull trout may be confined in the pond until screens are removed and Chinook smolts are released (up to 3 weeks). During the adult holding period juveniles that enter the pond can move through the screens down through the outflow (fish ladder) back to the river.

Water diversion at the Imnaha River Facility for spring/summer Chinook is not expected to affect the remaining PBFs (1, 3, 4, 6, and 9) identified for bull trout.

The water diversion intake structure at the Little Sheep Satellite Facility may adversely affect PBF 2 (minimal barriers to migration), PBF 7 (flows), and PBF 8 (water quality and quantity). Mean monthly water use at the facility is typically 4.5 – 12.1 cfs during the juvenile acclimation and adult trapping periods. Percent water diverted from Little Sheep Creek is significant during the facility operations. While a significant portion of the creek is diverted into the facility it does not appear that water withdrawals are a significant issue for bull trout at the Little Sheep Creek Facility (two bull trout captured in 13 years). Water diversion does not overlap significantly with the adult fluvial migration period and the distance between the intake and outflow is short. There are currently no data available to assess potential impacts (temporal and spatial distribution effects) of weir operations on bull trout migration.

Water diversion at the Little Sheep Creek Facility for steelhead is not expected to affect the remaining PBFs (1, 3, 4, 6, and 9) identified for bull trout.

<u>Lower Snake River CHU</u>

Water diversions at Tucannon FH and Curl Lake Facility may affect PBF 2 (migration habitat), PBF 7 (flows), and PBF 8 (water quality and quantity); although, the percent water diverted into Tucannon FH (0.0 percent - 5.1 percent) and Curl Lake Facility (1.4 percent) are not expected to be significant in the diverted sections of the Tucannon River. The small percentage of river flows diverted is expected to have a minor effect to water quantity and quality for bull trout. Water diversions at both facilities are screened to meet the latest NOAA screening criteria, divert a small portion of the Tucannon River, diverted sections are not large, and are expected to have a minimal effect on PBFs identified for bull trout.

Water diversions at Tucannon FH and Curl Lake are not expected to affect the remaining PBFs (1, 3, 4, 5, 6, and 9) identified for bull trout.

Well water is used for operations at Lyons Ferry FH (no water diverted from the Snake River).

Effluent

<u>Grande Ronde River CHU</u>

Effluent may adversely affect PBF 8 (water quality and quantity) in the area immediately below the facility outfall structures. While the LSRCP and BPA facilities all meet or exceed state and federal NPDES water quality standards for effluent and fish health protocol, these water quality standards have not been evaluated relative to potential effects on bull trout or other listed fish. Effects from effluents may be in the form of nutrient loading, addition of chemicals to the waterways, and transmission of parasites and pathogens. The effects of effluents may depend upon water temperature, life stage of fish present, and the rate of dilution.

Lookingglass FH, Wallowa FH, Big Canyon, Cottonwood Facility, Lostine Juvenile Acclimation Facility, Upper Grande Ronde Juvenile Acclimation Facility, and Catherine Creek Juvenile Acclimation Facility may adversely affect PBF 8 (water quality and quantity). Effluent from Lookingglass FH may constitute from 5.1 percent up to 100 percent of the Lookingglass Creek flow below the outlet, during annual operations. The hatchery is located 2.2 miles upstream from the Grande Ronde River. Big Canyon effluent ranges from 33 percent to 66 percent during operations (February to June). Effluent released from the Lostine, Upper Grande Ronde, and Catherine Creek juvenile acclimation facilities represents up to 20.8 percent of the average streamflow in each waterbody and significantly modifies the water quality and quality (PBF 8) and natural hydrograph (PBF 7) and may have a minor impact on water temperatures (PBF 5).

The lack of good water quality and seasonally high water temperatures (poor rearing habitat) in the mainstem areas and the proportion of facility withdrawal and discharge relative to the volume of river water present at most sites are expected to minimize the potential for effluent effects to bull trout FMO. Lookingglass FH and Big Canyon Facility discharge a significant proportion of Lookingglass Creek and Deer Creek and overlap with migration periods of bull trout. The Lostine River, Catherine Creek and Upper Grande Ronde River juvenile acclimation facilities discharge effluent within spawning and rearing areas (PBF 6). While effluent is likely to dissipate quickly due to the higher background stream flows, there may be a minor decrease in water quality (PBF 8) and temperature (PBF 5) in the immediate vicinity of the outlet during the short operation period. LSRCP and BPA facilities will continue to follow NPDES and IHOT criteria, monitor effluent, and make any modifications required to meet standards if modified to meet ESA concerns to listed species. Effluent at the facilities is expected to have an insignificant or no effect on the remaining PBFs (PBFs 1, 2, 3, 4, 7, and 9) identified for bull trout critical habitat.

Spring/summer Chinook and steelhead reared at Lookingglass FH, Big Canyon, Lostine River Juvenile Acclimation Facility, Upper Grande Ronde River Juvenile Acclimation Facility, and Catherine Creek Juvenile Acclimation Facility have the potential to adversely affect PBF 8 (water quality and quantity) as a result of transmission of disease to bull trout caused by; facilities effluent and rearing and fish releases.

There is little evidence to suggest that diseases are routinely transmitted from hatchery to natural fish. Fish health monitoring and disease management procedures diminish the likelihood that pathogens would impact water quality. Established disease management policies and protocols including the IHOT policies, Pacific Northwest Fish Health Protection Committee fish health model program, and state, federal, and Tribal policies are expected to reduce potential water quality effects to bull trout habitat. Existing protocols employed to minimize potential effects to bull trout during fish health management should reduce any potential impacts to remaining PBFs (1, 2, 3, 4, 5, 6, 7, and 9) identified for bull trout to insignificant levels.

Imnaha River CHU

Effluent may adversely affect PBF 8 (water quality and quantity) in the area immediately below the facility outfall structures. While the LSRCP and BPA facilities all meet or exceed state and federal NPDES water quality standards for effluent and fish health protocol, these water quality standards have not been evaluated relative to potential effects on bull trout or other listed fish. Effects from effluents may be in the form of nutrient loading, addition of chemicals to the waterways, and transmission of parasites and pathogens. The effects of effluents may depend on water temperature, life stage of fish present, and the rate of dilution.

Imnaha Facility and Little Sheep Creek Facility may adversely affect PBF 8 (water quantity and quality). Average monthly discharge from the Imnaha River Facility ranges from 9.0 cfs to 24.0 cfs. Total discharge volume to river flow ranges from 0.98 percent to 12.95 percent. The low volume of discharge and low percent of discharge to river volume (0.98 percent - 12.95 percent) at the outflow is expected to minimize adverse effects. Average monthly discharge from Little Sheep Creek Facility ranges from 4.5 cfs to 12.1 cfs.. The lack of good water quality and seasonally high water temperatures in the mainstem Imnaha River (poor rearing habitat), the proportion of facility withdrawal and discharge into the river are expected to significantly modify PBF 8 of designated critical habitat. The Little Sheep Creek Facility discharges a significant proportion of flows in Little Sheep Creek. Therefore significant effects to water quantity (PBF 8) and the natural hydrograph (PBF 7) are expected. These effects are expected to occur seasonally during operation and during certain river flows.

LSRCP and BPA facilities will continue to follow NPDES and IHOT criteria, monitor effluent, and make any modifications required to meet standards if modified to meet ESA concerns to listed species. Effluent at the facilities is expected to have an insignificant effect on the remaining PBFs (1, 2, 3, 4, 5, 6, and 9) identified for bull trout.

Discharges of chemical and organic pollutants at the Satellite Facilities currently comply with federal and state water quality standards and guidelines (NPDES Standards). Effluent at the Imnaha River and Little Sheep Creek facilities is expected to have an insignificant effect on PBFs (1, 2, 3, 4, 5, 6, 7, and 9) identified for bull trout.

Spring/summer Chinook and steelhead reared at Imnaha Facility and Little Sheep Creek Facility have the potential to adversely affect PBF 8 (water quality and quantity) through transmission of disease to bull trout through effluent from the facilities and during rearing and fish releases.

There is little evidence to suggest that diseases are routinely transmitted from hatchery to natural fish. Fish health monitoring and disease management procedures minimize the likelihood that natural populations would be adversely affected by hatchery-origin fish diseases. Established disease management policies and protocols including the IHOT policies, PNFHPC fish health model program, and state, federal, and Tribal policies are expected to reduce adverse effects to bull trout. Existing protocols employed to minimize adverse effects to bull trout during fish health management should reduce any potential impacts to remaining PBFs (1, 2, 3, 4, 5, 6, 7, and 9) identified for bull trout to insignificant levels.

Lower Snake River CHU

Discharge of effluent into the Tucannon River below Curl Lake and Tucannon FH and into the Snake River below Lyons Ferry FH may significantly impact water quality and quantity (PBF 8) in the Tucannon River and Snake River. Discharge of chemical and organic pollutants at Lyons Ferry FH, Tucannon FH, and Curl Lake Facilities comply with federal and state water quality standards and guidelines (NPDES Standards). Average monthly discharge from Tucannon FH ranges from 2.2cfs to 9.3cfs, ranging from 2.1 percent to 10.8 percent of the total river flows. Average monthly discharge from Curl Lake Facility ranges from 3.3cfs to 3.8cfsaveraging less than 1.4 percent of river flows. Average monthly discharge from Lyons Ferry FH ranges from 51.9 cfs to 108.3 cfs. Total discharge volume to river flow ranges from 0.08 percent to 0.48 percent of flows in the Snake River.

The low volume of discharge over total river flow at Lyons Ferry FH (51.9cfs – 108.3cfs), Tucannon FH (2.2cfs – 9.3cfs), Curl Lake Facility (3.3cfs – 3.8cfs), and Lyons Ferry FH (0.08 percent - 0.48 percent) minimize adverse effects to water quality within designated critical habitat. It is unlikely that discharges will significantly impair the function of critical habitat within these areas, while NPDES regulations are in place.

Effluent at Tucannon FH and Curl Lake are not expected to affect the remaining PBFs (1, 2, 3, 4, 5, 6, 7, and 9) identified for bull trout.

Spring/summer Chinook, steelhead, and rainbow trout reared at Lyons Ferry FH, Tucannon FH, and Curl Lake Facilities have the potential to adversely affect PBF 8 (water quality and quantity) as a result of transmission of disease to bull trout caused by effluent from the facilities and rearing and fish releases.

There is little evidence to suggest that diseases are routinely transmitted from hatchery to natural fish. Fish health monitoring and disease management procedures diminish the likelihood that natural populations would be affected by hatchery-origin fish diseases. Established disease management policies and protocols including the IHOT policies, PNFHPC fish health model program, and state, federal, and Tribal policies are expected to reduce potential effects to bull trout. Existing protocols employed to minimize potential effects to bull trout during fish health management and facility locations below primary SR habitat and are expected to have minimal effect on PBFs identified for bull trout.

Fish health/disease protocols at Lyons Ferry FH, Tucannon FH and Curl Lake not expected to affect the remaining PBFs (1, 2, 3, 4, 5, 6, 7, and 9) identified for bull trout.

Facility Operation and Maintenance

<u>Grande Ronde River CHU</u>

Routine operation and maintenance above the OHWM at the facilities will be conducted using Conservation Measures to reduce the potential to affect bull trout in the Grande Ronde River. Existing protocols employed to minimize potential effects to bull trout during maintenance operations within the facilities should reduce any potential impacts to PBFs (1, 2, 3, 4, 5, 6, 7, 8, and 9) identified for bull trout to insignificant levels.

<u>Imnaha River CHU</u>

Routine operation and maintenance above the OHWM at the facilities will be conducted using Conservation Measures to reduce the potential to affect bull trout in the Imnaha River and are not expected to adversely affect PBFs (1, 2, 3, 4, 5, 6, 7, 8, and 9) identified for bull trout.

Lower Snake River CHU

Routine operation and maintenance above the OHWM at the facility will be conducted using Conservation Measures to reduce the potential to affect bull trout in the Tucannon River and Snake River. Existing protocols employed to minimize potential effects to bull trout during operation and maintenance activities and facility locations below primary SR habitat are expected to have an insignificant effect on PBFs (1, 2, 3, 4, 5, 6, 7, 8, and 9) identified for bull trout.

Acclimation and Release

Releases of spring Chinook and steelhead are expected to benefit forage base (PBF 3) of designated critical habitat by increasing the availability of prey in all action area watersheds. Additional beneficial effects (PBF 3, food base) include increased primary productivity from marine derived nutrients deposited within the basin due to increased adult Chinook abundance.

Existing release protocols, designed to promote rapid emigration from release sites downstream to the ocean should reduce any potential negative impacts to PBFs 2, 3, and 9. This activity would not affect PBF's 1, 4, 5, 6, 7, and 8.

Monitoring and Evaluation

Grande Ronde River CHU

Spawning ground surveys are conducted in the Upper Grande Ronde River, Lostine River, Catherine Creek, Lookingglass Creek, and Deer Creek to determine; natural spawning abundance and distribution, density and proportion of hatchery-origin spring Chinook and steelhead in key natural spawning areas, and are unlikely to adversely impact designated critical habitat. These surveys are conducted annually in various reaches of spring Chinook spawning habitat from August through September; typically downstream of bull trout spawning areas. Some activities within critical habitat may result in behavioral changes in bull trout. However, the function of the habitat will remain the same before, during, and after surveys.

Snorkel and seining surveys are conducted in Lookingglass Creek, Catherine Creek, Upper Grande Ronde River, Lostine River, Imnaha River, and Minam River for juvenile spring Chinook salmon and these activities in the short-term, may adversely affect PBF 2 (minimal barriers to migration). During snorkel and seine sampling operations for Chinook salmon; bull trout are trapped, handled, and immediately released, thus causing a temporary delay in migration. While the capture of bull trout may occur and delay migration during snorkel and seining surveys, any barrier to migration would be temporary in nature and not modify the function of habitat into the future.

While M&E operations may adversely affect bull trout migration habitat, existing M&E protocols are designed to minimize delays to migration and sampling sites below the primary SR habitat for bull trout in the Grande Ronde River, which should reduce any potential impacts to remaining PBFs (1, 3, 4, 5, 6, 7, 8, and 9) identified for bull trout to insignificant levels.

Imnaha River CHU

Spawning ground surveys are conducted in the Imnaha River to determine natural spawning abundance and distribution, density and proportion of hatchery-origin spring Chinook in key natural spawning areas. Electro-fishing, snorkeling and hook and line sampling may be used to monitor; density, size, and food habits of juvenile Chinook, and to collect genetic samples from naturally produced Chinook. Both types of activities are unlikely to significantly impact designated critical habitat for bull trout. These spawning surveys are conducted annually in various reaches of spawning habitat from August through September. Other types of surveys generally occur from May through October. Experienced surveyors walk along the stream, crossing when necessary, avoiding redds, counting redds, and observing live fish and carcasses. Although every effort is made to observe adults and determine their origin without disturbance, spawners are occasionally forced to seek cover. These encounters are brief and spawning fish generally resume their activity within a short period of time. Surveyors occasionally disturbed existing redds while walking in the river (Lower Snake River Compensation Plan Imnaha Spring/Summer Chinook Program HGMP, May 2011, ODFW). Therefore, minor, short-term impacts to migration (PBF 2) and spawning gravels (PBF 6) may occur during surveys. These impacts are not anticipated to change or permanently modify the function of critical habitat.

Sampling in the Imnaha River is not expected to adversely affect the remaining PBFs (1, 3, 4, 5, 6, 7, 8, and 9) identified for bull trout.

A smolt monitoring trap is operated at Rkm 7 (RM 4.3), downstream of the Imnaha River weir (Rkm 73.2 [RM 45.5]) from March-November each year by NPT research staff. The trap is operated to estimate; juvenile survival, timing, and production in the Imnaha. The trap may represent a partial seasonal barrier to migration (PBF 2) when in operation. Most fish captured are counted and released; or anesthetized, measured, weighed, and then released. Smaller groups of fish are PIT-tagged and then released in order to estimate survival to Lower Granite Dam and to monitor migration. From 1999 through 2011 a total of 2,116 bull trout were captured in the smolt monitoring trap (average 162.8 per year, range 31-524) with six reported mortalities (0.28 percent).

Smolt trapping in the Imnaha River is not expected to adversely affect the remaining PBFs (1, 3, 4, 5, 6, 7, 8, and 9) identified for bull trout.

Lower Snake River CHU

Spawning ground surveys conducted in the Tucannon River and Asotin Creek; operation of out-migrant traps; and sampling programs can impact elements of critical habitat for bull trout in the Tucannon River and Asotin Creek. Impacts to migration habitats (PBF 2) and spawning areas (PBF 6) occur during spawning ground surveys. Bull trout migrations may be temporarily blocked during operation of smolt traps and spawning substrates disturbed or crushed during spawning ground surveys. These impacts are anticipated to be short-term during surveys and not permanently modify or degrade critical habitat for bull trout. Protocols employed during M&E are designed to; minimize trap time, handling, and disturbance within critical habitat. In addition, surveys conducted within the Tucannon River are typically downstream of spawning areas for bull trout, further limiting significant impacts to spawning grounds (PBF 6) of critical habitat.

M&E activities for spring/summer Chinook and steelhead are not expected to affect the remaining PBFs (1, 3, 4, 5, 6, 7, 8, 9) identified for bull trout.

There are no M&E activities occurring in the Snake River associated with the Lyons Ferry steelhead program.

Semi-Routine Maintenance

Grande Ronde River CHU

Semi-routine maintenance actions occur below the OHWM and in the short-term are likely to adversely affect PBF 2, (minimal barriers to migration), PBF 3 (Prey base), PBF 4 (complex river channels), PBF 6 (minimal fine sediment in SR areas), and PBF 8 (water quality and quantity). To minimize and mitigate adverse effects to critical habitat, these types of actions; are not expected to occur frequently; will be localized at the work site; will occur in areas that have been modified when the facilities were constructed; will be conducted during the established instream work windows; and will employ the appropriate Conservation Measures.

Semi-routine maintenance actions at Lookingglass FH, Big Canyon, Lostine Facility, Catherine Creek Facility, and Upper Grande Ronde Facility are not expected to adversely affect the remaining PBFs (1, 5, 7, and 9) identified for bull trout.

Imnaha River CHU

Semi-routine maintenance actions occur below the OHW and in the short-term are likely to adversely affect PBF 2, (minimal barriers to migration), PBF 3 (Prey base), PBF 4 (complex river channels), PBF 6 (minimal fine sediment in SR areas), and PBF 8 (water quality and quantity). To minimize and mitigate adverse effects to critical habitat, these types of actions; are not expected to occur frequently; will be localized at the work site; will occur in areas that have been modified when the facilities were constructed; will be conducted during the established instream work windows; and will employ the Conservation Measures.

Semi-routine maintenance actions at Imnaha Facility and Little Sheep Creek Facility are not expected to adversely affect the remaining PBFs (1, 5, 7, and 9) identified for bull trout.

Lower Snake River CHU

Semi-routine maintenance actions occur below the OHWM and are likely to adversely affect PBF 2 (minimal barriers to migration), PBF4 (complex river channels), and PBF 6 (SR areas for bull trout migration in the Tucannon River and Snake River). These types of actions are not expected to occur frequently, will be localized at the work site, will occur in areas that have been modified when the facilities were constructed, will be conducted during the established instream work windows, and will employ Conservation Measures to minimize/mitigate effects to critical habitat.

Semi-routine maintenance actions at Lyons Ferry FH, Tucannon FH, and Curl Lake are not expected to adversely affect the remaining PBFs (1, 3, 5, 7, 8, and 9) identified for bull trout.

5.4 Indirect Effects

Adult Collections

Less clear but equally concerning are the indirect effects of passage delay (Murauskas *et al*. 2014). Stress experienced during the final stages of gonad development has been shown to result in lower reproductive success (Patterson *et al*. 2004; Crossin *et al*. 2009: Roscoe *et al.* 2011). Additionally, arrival timing to spawning tributaries has been linked to important aspects of reproductive success in *Oncorhynchus* spp. (Dickerson *et al*. 2002; Hruska *et al*. 2011). In combination with the potential influence on energetic reserves (Nadeau *et al*. 2010), authors Murauskas *et al*. (2014) suspect that the passage delays ranging up to several weeks under 7 days/week trapping significantly influenced the reproductive success of Wenatchee Sockeye Salmon. They also hypothesize that the magnitude of delays they measured under 7 days/week trapping—102 to 2,095 times greater compared to 3 days/week would have similar effects on the reproductive success of other imperiled anadromous fishes. Endangered spring-run Chinook salmon and steelhead were the target species in the trapping efforts analyzed by their study, where up to 38 percent of Sockeye Salmon were inadvertently blocked from reaching spawning tributaries during the study. Murauskas *et al.* (2014) reports that endangered species, such as steelhead and bull trout (*Salvelinus confluentus*; Nelson *et al*. 2012) are likely also affected by intensive trapping operations. Clements *et al*. (2002) reported that trapping results in a significant stress response in wild rainbow trout. Trapping effects are likely a result of the multiple stressors encountered during trapping including; approach to the barrier; frequent bursts to seek passage; and confinement, crowding, handling, and recovery.

Delayed mortality can occur for several days following capture (Olla *et al*. 1997), and capture-related stress levels can remain elevated in fish that are subsequently held in captivity (Farrell *et al.* 2000; Wedemeyer and Wydoski 2008). Previous studies that have held migrant adult sockeye in pens or tanks have also noted that captivity increases rates of mortality (e.g., Patterson *et al*. 2004; Crossin *et al*. 2008), collectively suggesting an inherent difficulty in holding salmon captive, particularly females, as they undergo the final stages of sexual maturation. Although the more energetically intensive migration experiences were associated with higher levels of stress in study animals, the treatments did not affect survival rates within the ranges that were examined. However, sub-lethal accumulations of stress can slow the rate of sexual maturation by suppressing reproductive hormones (Pankhurst and Van Der Kraak 1997; Portz *et al*. 2006), and may directly reduce offspring size and survival (McCormick 2006; Mingist *et al*. 2007). Thus, there may be intergenerational fitness consequences related to energy depletion (Nadeau *et al*. 2010).

Hatchery Origin Spring Chinook Adult Outplanting

The addition of hatchery origin chinook adults outplanted in these waterbodies would primarily be beneficial to bull trout as additional spawning Chinook would introduce nutrients to the system. After successful spawning, the progeny from the outplanted chinook would serve as a food source for adult bull trout residing near rearing areas, and the addition of marine derived nutrients (salmon carcasses) would serve to incrementally increase productivity of these stream systems. Though the interactions between spawning fluvial bull trout and chinook salmon are not well understood, there may be some competition for spawning habitat in some locations (for example Lick and Bear Creeks), where spawning and timing may overlap. While there may be some spawning overlap, it should be noted, with the exception of the Lookingglass outplanting, the purpose of these activities is intended to restore natural Chinook production levels; both species have evolved under this sympatric situation, thus any overlap between spawning should mimic historical conditions. Outplanting in Lookingglass Creek supports additional harvest; therefore, most outplanted adults would be harvested and would not be likely to reach Chinook spawning grounds in appreciable numbers.

Because of the relatively low anticipated numbers of outplanted salmon, the low potential for effects to bull trout caused by release methodologies, and the uncertainty of spatial and temporal overlap of these species, any negative effects resulting from outplanting efforts are expected to remain insignificant.

Water Diversions

Reduced flows from water diversions that occur in combination with warm stream temperatures, reduced stream cover, and associated crowding (due to less instream habitat available) can create a stressful environment for bull trout and result in adverse impacts to bull trout.

Effluent

Effluent, when in combination with low discharge and warm stream temperatures, is likely to have indirect effects associated with decreased aquatic insect production and is likely to have adverse effects to bull trout prey (including fish).

Acclimation and Release

Indirect effects could be beneficial - increased prey base to bull trout from release of chinook and steelhead prey. Marine nutrients from chinook carcasses are important for primary production, which will influence bull trout prey base.

Monitoring and Evaluation

The indirect effects from monitoring and evaluation including; spawning ground surveys, electrofishing, snorkeling, seining, hook and line sampling, and monitoring traps is similar to the discussion under adult collections (related to a delay in migration and stress). The indirect effects of passage delay are concerning (Murauskas *et al*. 2014). Stress experienced during the final stages of gonad development has been shown to result in lower reproductive success (Patterson *et al*. 2004; Crossin *et al*. 2009: and Roscoe *et al*. 2011). Clements *et al*. (2002) reported that trapping results in a significant stress response in wild rainbow trout. Trapping effects are likely a result of the multiple stressors encountered during trapping, including; approach to the barrier; frequent bursts to seek passage; and confinement, crowding, handling, and recovery.

5.5 Interrelated/Interdependent Effects

Interrelated actions are those that are a part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Both interdependent and interrelated activities are assessed by applying the "but for" test, which asks whether any action and its associated impacts would occur "but for" the proposed action. The proposed project is not anticipated to have any interrelated or interdependent effects.

6. Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local governmental, non-governmental, or private actions that are reasonably certain to occur in the action area considered in this Opinion. Future Federal actions that may affect bull trout or critical habitat for bull trout within the action area are not considered in this Opinion because they would require separate section 7 consultation pursuant to the Act.

Current on-going, non-Federal actions described in the environmental baseline are expected to continue to affect ESA-listed bull trout in Northeast Oregon and Southeast Washington at similar levels of intensity. Current ongoing activities anticipated to continue into the future includes timber harvest, livestock grazing, and agricultural production. Water withdrawals for agricultural use will continue. Tribal treaty and sport salmon fishing in the Snake River Basin will continue in the future in accordance with their applicable fishery management plans.

Recreational and tribal fishing in the Lostine River, Imnaha River, and Lookingglass Creek will continue to result in some incidental impacts to bull trout. Most future actions by the State of Oregon are described in the Oregon Plan for Salmon and Watershed measures, which includes a variety of programs designed to benefit salmon and watershed health.

In Washington State, the EPA has delegated NPDES permitting authority to the State (for state facilities), which issues NPDES permits. Section 7 consultation with EPA on the effects of these State-issued permits is not always conducted. Therefore, the Service has not consulted on a subset of the NPDES permits that are issued in the State including those for hatcheries. These State-permitted discharges would be expected to potentially contribute to cumulative effects within the action area.

Due to the extensive nature of the action area for this Project, there are numerous potential cumulative effects. Many State, Tribal, and local governmental actions are likely to be in the form of legislation, administrative rules, or policy initiatives. Many non-governmental or private actions may include changes in land and water use patterns, including ownership and management intensity, any of which could affect listed species or their habitat. Even actions that are already authorized are often subject to subsequent political, legislative, and fiscal uncertainties.

State and local governments are likely to be faced with pressures from future population growth and other demographic factors. Growth in local businesses could increase demands for buildable land, infrastructure, water, electricity, and waste disposal. Such population trends will place greater overall and localized demands on the resources within the action area that could affect water quality directly and indirectly, and increase the need for transportation and communication infrastructure. The effects of private actions are the most uncertain. Private landowners may convert their lands from current uses, or they may intensify, discontinue, or otherwise alter those uses in the future.

Potential impacts to the aquatic environments within the broader region that may contribute specifically to cumulative effects, especially within the neighboring major tributaries, include water flow fluctuations, degraded water quality, migration barriers, habitat degradation, resource competition, and introduction of non-native invasive species. Because the action area primarily encompasses aquatic environments, water quality and availability are primary concerns when evaluating potential effects to listed species. Elevated levels of contaminants in the waterways can adversely affect aquatic species through direct lethal or sub-lethal toxicity, through indirect effects on their food supply, or through interactions with other compounds present in the water. Agricultural practices associated with irrigation also have the potential to adversely affect aquatic environments. Water withdrawals and runoff of irrigation water containing residual constituents of pesticides and fertilizers can contribute excessive nutrients, elevated levels of chemicals, and substantial amounts of sediment to natural waterways further degrading the water quality and quantity within the river systems throughout the broader region. Likewise, urban and rural land uses for residential, commercial, industrial, and recreational activities, such as boating and golf courses, often require water withdrawals and can further contribute pollutants and sediments to surface waters.

There are a number of other State and private interest approaches that have generally helped to address potential impacts to bull trout from urban development within the broader region encompassing the action area. These approaches include initiatives under Critical Areas Ordinances and measures associated with the State's Shoreline Management Act (SMA). All cities and counties in Washington are required to adopt Critical Areas Ordinances under the State's Growth Management Act. Among other concerns, the ordinances address important fish and wildlife habitats, including wetlands, rivers, streams, lakes, and marine shorelines. No regulated activity can be undertaken in a critical area or protection zone without a Critical Areas Permit, which are designed to give additional protections to fish and aquatic habitats over existing conditions. The SMA seeks to prevent harm to identified resources due to haphazard development of State shorelines. The responsibilities of local governments under the SMA, with support and oversight provided by the Washington Department of Ecology, include: 1) administering a shoreline permit system for proposed substantial development; 2) conducting and compiling a shoreline inventory; and 3) developing a Shoreline Master Program for regulating the State's shorelines.

Various entities have developed plans and conservation initiatives that may benefit listed species within the broader region encompassing the action area, however, comprehensive results from most of these ongoing or planned actions must be documented before they can be considered reasonably foreseeable for purposes of cumulative effects analyses. Considering the available information, cumulative effects within the action area that could potentially impact bull trout or critical habitat for bull trout are likely to increase in the future. However, given the geographic scope of the action area, which encompasses numerous governmental entities exercising various authorities and many non-governmental and private land holdings, analysis of cumulative effects that may be associated with the proposed action is difficult and relatively speculative.

7. Conclusion

After reviewing the current status of bull trout and bull trout critical habitat, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's Biological Opinion that the action, as proposed, is not likely to jeopardize the continued existence of the bull trout, and is not likely to destroy or adversely modify designated critical habitat. The Service reached this conclusion for the following reasons.

7.1 Bull Trout

- Management practices (including conservation measures) employed at the facilities are expected to minimize and mitigate for adverse effects to bull trout in the project area.

- Although operation of the adult collection facilities, water diversions, acclimation and release, monitoring and evaluation, and non-routine maintenance activities associated with the proposed programs will likely result in continued incidental take of bull trout (mostly non-lethal take), the effects are unlikely to be of sufficient scale and scope to appreciably reduce the current distribution and abundance of the bull trout local populations in the Imnaha River, Grande Ronde River, Asotin Creek, and Tucannon River, or appreciably degrade current habitat indicators beyond existing baseline conditions.

7.2 Bull Trout Critical Habitat

- The limited scale and scope of the Northeast Oregon and Southeast Washington Spring/Summer Chinook, Steelhead and Rainbow Trout Hatchery Programs activities, including Semi-Routine Maintenance (during instream work windows) and conservation measures described in the proposed action, are expected to minimize the extent and duration of habitat effects, such that it is unlikely that the function or conservation role of the critical habitat will be adversely affected in the long-term by the proposed activity.

- PBF 3 will have a beneficial effect from project activities (release of steelhead and chinook prey base). PBF 1 and 9 will be affected by project activities but these effects will be insignificant. PBFs 2, 4, 5, 6, 7, and 8 in the short-term will be adversely affected. Any adverse impacts to PBFs 2, 4, 5, 6, 7, and 8 will not permanently alter or destroy the quality or function of bull trout critical habitat in the action area.

8. Incidental Take

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 to attempt to engage in any such conduct. Harm is defined by the Service as an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3). 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 NOAA, BPA and the LSRCP, as appropriate, for the exemption of section 7(o)(2) to apply. Each action agency has a continuing duty to regulate the activity covered by this incidental take statement. If the action agencies fail to assume and implement the terms and conditions of the incidental take statement, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the action agencies must report the progress of the action and its potential impact on the bull trout to the Service as specified in this incidental take statement [50 CFR 402.14(i)(3)].

8.1 Amount/Extent of Take Anticipated

The Service anticipates the following take as a result of implementing the proposed action (see Table 10 for amount of take by facility and activity). A narrative is provided for each facility as well.

Table 10. Project Incidental Take by Facility and Activity

Facility	Total Annual Non-lethal for all activities	Total lethal for all activities	Weir Broodstock (non-lethal)	Weir Broodstock (lethal)	Hook and Line Broodstock (non-lethal)	Hook and Line Weir Broodstock (lethal)	Acclimation, Release, and Adult Outplanting	Diversions	Effluent	Maintenance (non-lethal)	Maintenance (lethal)	RME (smolt traps, surveys, etc) (non-lethal)	RME (smolt traps, surveys, etc) (lethal)
Tucannon	535/yr	80 total, ≤13/yr	300	25 total, ≤ 5/yr	5/yr	1/yr	none, beneficial	none	none	50/yr	≤ 2/yr	180/yr	25 total, ≤5/yr
Lyons Ferry	None	None	None	None	N/A	N/A	none, beneficial	N/A	none	none	none	N/A	N/A
Curl Lake	None	None	N/A	N/A	N/A	N/A	none, beneficial	none	none	none	none	N/A	N/A
Cottonwood	None	None	None (no BT or CH)	None (no BT or CH)	N/A	N/A	none, beneficial	none	none	None (no BT or CH)	None (no BT or CH)	None (no BT or CH)	None (no BT or CH)
Big Canyon	15 total, ≤2/yr	1 total	5 total	1 total	N/A	N/A	none, beneficial	none	none	5 total	0 total	5 total	0 total
Lostine	135/yr	6 total	95/yr	3 total	N/A	N/A	none, beneficial	none	none	3/yr	1 total	37/yr	2 total
Lookingglass	251/yr	25 total, no more than 5/yr	80/yr	18 total	N/A	N/A	none, beneficial	none	none	5 total	1 total	166/yr	6 total
Upper Grande Ronde	21/yr	3 total	4/yr	1 total	N/A	N/A	none, beneficial	none	none	2/yr	0 total	15/yr	2 total

Facility	Total Annual Non-lethal for all activities	Total lethal for all activities	Weir Broodstock (non-lethal)	Weir Broodstock (lethal)	Hook and Line Broodstock (non-lethal)	Hook and Line Weir Broodstock (lethal)	Acclimation, Release, and Adult Outplanting	Diversions	Effluent	Maintenance (non-lethal)	Maintenance (lethal)	RME (smolt traps, surveys, etc) (non-lethal)	RME (smolt traps, surveys, etc) (lethal)
Catherine Creek	182/yr	6 total	56/yr	2 total	N/A	N/A	none, beneficial	none	none	5/yr	1 total	121/yr	3 total
Imnaha	989/yr	35 total	450/yr	29 total	N/A	N/A	none, beneficial	none	none	5/yr	0 total	634/yr	6 total
Little Sheep	12/yr	2 total	2/yr	1 total	N/A	N/A	none, beneficial	none	none	1/yr	0 total	9/yr	1 total

Grande Ronde River Management Unit

Big Canyon Facility

Based on the effects analysis, incidental take in the form of harm and harassment (non-lethal) due to adult collection, semi-routine maintenance, and monitoring and evaluation (M&E) activities at Big Canyon Facility within the Grande Ronde River Management Unit is expected to be 15 total bull trout (adults and juveniles) for the life of this project (10 years) (Table 10). This total assumes no more than two bull trout are harmed or harassed (non-lethal) in any given year. These non-lethal effects are associated with stress from handling individuals (collections), disturbance during instream construction and M&E activities (e.g., construction noise, sediment mobilization, etc.), and due to passage delay during migratory or normal daily/seasonal movements. No more than 1 bull trout is expected to be injured or killed (lethal take) over the life of this consultation (10 years).

Lostine Facility

Based on the effects analysis, incidental take in the form of harm and harassment (non-lethal) due to adult collection, semi-routine maintenance, and monitoring and evaluation (M&E) activities (including smolt trap operations) in the Lostine River within the Grande Ronde River Management Unit is expected to be no more than 135 bull trout (adults and juveniles) per year for the life of this project (10 years) (Table 10). These non-lethal effects are associated with stress from handling individuals (collections), disturbance during instream construction and M&E activities (e.g., construction noise, sediment mobilization, etc.), and due to passage delay during migratory or normal daily/seasonal movements. No more than 6 bull trout are expected to be injured or killed (lethal take) over the life of this consultation (10 years).

Lookingglass Fish Hatchery

Based on the effects analysis, incidental take in the form of harm and harassment (non-lethal) due to adult collection, water diversions, semi-routine maintenance, and monitoring and evaluation (M&E) activities in Lookingglass Creek within the Grande Ronde River Management Unit is expected to be 251 bull trout (adults and juveniles) per year for the life of the consultation (10 years) (Table 10). An additional 25 bull trout are expected to be injured or killed (lethal take) over a ten-year period at this facility. This total assumes no more than five bull trout are injured or killed (lethal take) in any given year.

Upper Grande Ronde Facility

Based on the effects analysis, incidental take in the form of harm and harassment (non-lethal) due to adult collection, semi-routine maintenance, and monitoring and evaluation (M&E) activities in the Upper Grande Ronde River within the Grande Ronde River Management Unit is expected to be no more than 21 bull trout (adults and juveniles) per year for the life of the project (10 years) (Table 10). These non-lethal effects are associated with stress from handling individuals (collections), disturbance during instream construction and M&E activities (e.g., construction noise, sediment mobilization, etc.), and due to passage delay during migratory or normal daily/seasonal movements. No more than 3 bull trout is expected to be injured or killed (lethal take) over the life of this consultation (10 years).

Catherine Creek Facility

Based on the effects analysis, incidental take in the form of harm and harassment (non-lethal) due to adult collection, semi-routine maintenance, and monitoring and evaluation (M&E) activities in Catherine Creek within the Grande Ronde River Management Unit is expected to be no more than 182 bull trout (adults and juveniles) per year for the life of the project (10 years) (Table 10). These non-lethal effects are associated with stress from handling individuals (collections), disturbance during instream construction and M&E activities (e.g., construction noise, sediment mobilization, etc.), and due to passage delay during migratory or normal daily/seasonal movements. No more than 6 bull trout are expected to be injured or killed (lethal take) over the life of this consultation (10 years).

Imnaha River Management Unit

Imnaha River Facility

Based on the effects analysis, incidental take in the form of harm and harassment (non-lethal) due to adult collection, semi-routine maintenance, and monitoring and evaluation activities (includes the Nez Perce smolt trap operations) at the Imnaha River Facility within the Imnaha-Snake River Management Unit is expected to be no more than 863 bull trout (adults and juveniles) per year for the life of the project (10 years) (Table 10). These non-lethal effects are associated with stress from handling individuals (collections), disturbance during instream construction and M&E activities (e.g., construction noise, sediment mobilization, etc.), and due to passage delay during migratory or normal daily/seasonal movements. No more than 35 bull trout are expected to be injured or killed (lethal take) over the life of this consultation (10 years).

Little Sheep Creek Facility

Based on the effects analysis, incidental take in the form of harm and harassment (non-lethal) due to adult collection, semi-routine maintenance, and monitoring and evaluation activities in Little Sheep Creek within the Imnaha-Snake River Management Unit is expected to be no more than 12 bull trout (adults and juveniles) per year for the life of the project (10 years) (Table 10). These non-lethal effects are associated with stress from handling individuals (collections), disturbance during instream construction and M&E activities (e.g., construction noise, sediment mobilization, etc.), and due to passage delay during migratory or normal daily/seasonal movements. No more than 2 bull trout is expected to be injured or killed (lethal take) over the life of this consultation (10 years).

Snake River Washington Management Unit

Tucannon River, Curl Lake, and Lyons Ferry Facilities

No incidental take of bull trout as a result of the operation of the Lyons Ferry or Curl Lake facilities is expected. Based on the effects analysis, incidental take in the form of harm and harassment (non-lethal) due to adult collection, semi-routine maintenance, and monitoring and evaluation (M&E) activities at the Tucannon facility within the Snake River Washington Management Unit is expected to be no more than 535 bull trout (adults and juveniles) per year for the life of the project (10 years) (Table 10). These non-lethal effects are associated with stress from handling individuals (collections and PIT tagging), disturbance during instream construction and M&E activities (e.g., construction noise, sediment mobilization, etc.), and due to passage delay during migratory or normal daily/seasonal movements. No more than 80 bull trout are expected to be injured or killed (lethal take) over the life of this consultation (10 years). Since not all conditions resulting in lethal take can be predicted, this total assumes no more than thirteen bull trout are injured or killed (lethal take) in any given year and in other years little to no lethal take will occur.

Columbia River– Irrigon Fish Hatchery

Based on the effects analysis, incidental take in the form of harm and harassment (non-lethal) due to semi-routine maintenance, activities at the Irrigon Fish Hatchery Facility on the Columbia River is expected to be 1 bull trout per year for the life of the consultation (10 years). No bull trout are expected to be injured or killed each year from these activities at this facility.

8.2 Effect of Take

In the accompanying Opinion, the Service determined that the anticipated level of incidental take due to the Project is not likely to jeopardize the continued existence of the bull trout or destroy or adversely modify designated critical habitat.

8.3 Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measure(s) (RPMs) are necessary and appropriate to minimize impacts of incidental take of bull trout:

1. Minimize the impacts to bull trout from adult/brood-stock collection.

2. Minimize impacts to bull trout caused by water diversions.

3. Minimize the potential for incidental take from construction activities in or near the river during semi-routine maintenance.

4. Minimize the potential for incidental take from in-water disturbance of bull trout during monitoring and evaluation activities.

5. Minimize fish passage issues during project activities.

6. Report incidental take of bull trout through annual reporting of project activities.

8.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the NOAA, BPA, and LSRCP must comply with the following terms and conditions (T&Cs), which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. The following terms and conditions are necessary for the implementation of RPM 1:

   a. A monitoring group/technical team will be established (including representatives from ODFW, LSRCP, CTUIR, NPT, and USFWS) for the Lostine adult fish collection facility and Lookingglass Hatchery. The Lostine team will be formed within 1 year post final Opinion to evaluate current and new information regarding bull trout capture numbers and potential bull trout passage delays at the Lostine adult fish collection facility. The team will identify an agreed upon time frame by which review and discussion of baseline data will occur, and a determination made regarding the need for a more robust study. As part of baseline information being collected at the facility (i.e., numbers, length, and weight), bull trout genetic information will be collected to aid in population monitoring. Specifically, bull trout captured at the Lostine weir will have fin clip tissue samples (approximately 5 mm in size) taken for future genetic analysis (two small tissue samples per fish and saved in two separate labeled containers), and a photo record of the dorsal fin of each fish sampled will be linked with the tissue samples. The Lookingglass monitoring plan shall specifically address: 1) the concrete sill located in Lookingglass Creek at the mouth of the hatchery ladder which is creating a juvenile passage problem at low flows due to water depth and velocity across the sill, and 2) upstream and downstream passage issues in the Denil ladder bypass structure located at the water intake diversion. The monitoring group will be established within 1 year post final Opinion, and a plan that identifies needed actions, a schedule for securing funding, and implementation timeline will be developed within 2 years after establishment of the monitoring group. It is understood that LSRCP has already initiated an assessment of the structures at the Lookingglass Hatchery; results from this assessment will be used to guide the monitoring group in their development of a strategy for corrective actions.

   b. As per the RPMs and T&Cs identified in the Imnaha River Satellite Facility Weir Modification Biological Opinion (FWS reference 01EOFW00-2013-F-0174), and as further refined in Standard Operating Procedures established by the existing monitoring group, the LSRCP office will continue to implement a bull trout passage study at the Imnaha weir that relies on existing PIT tagging efforts. The study is intended to assess bull trout incidental take (through passage and delay), and reduce impacts, if necessary, through an adaptive management strategy by revising criteria, implementing operational changes, or modifying structures.

c. Upon signature of this Opinion, the LSRCP and WDFW will continue to develop an evaluation of bull trout passage and delay at the Tucannon River Hatchery fish ladder/trap during periods of operation; initial discussions have already been initiated. As with the Imnaha study, it is understood that the Tucannon study design will use existing and improved PIT tag arrays and opportunistic PIT tagging efforts for completion. A monitoring group will be established to address bull trout passage and delay issues similar to that already described for the Imnaha weir (see T&C 1b of this Opinion and T&Cs in the associated Imnaha Weir Biological Opinion, incorporated here by reference) such that information from both the Tucannon and Imnaha studies may be used to more broadly answer the extent of passage and delay impacts in the action area. Progress reports will be submitted by WDFW and LSRCP after the second full year of data collection, and annual meetings will be convened between the monitoring group, co-managers, and cooperators to review the data and discuss potential operational changes to minimize adverse effects and reduce take associated with Tucannon facility operations. If proposed weir modifications are identified within the study period, those modifications must be implemented within a timeframe agreed to by the Service, LSRCP, and the co-managers in the Tucannon basin; follow-up actions, if needed, will be included in a final report following the study. If study results indicate that passage delays are not significantly impacting bull trout migration, co-managers and the Eastern Washington Field Office will determine whether continued PIT tagging and data collection are desired as a means of better understanding bull trout life history within the Tucannon River system; continuation of agreed upon aspects of the study will not be the responsibility of the LSRCP.

d. Include the Service (Ecological Services Field Office or Fisheries Office staff) in meetings to deal with weir issues and lessening impacts to bull trout.

e. Captured bull trout shall be released as soon as possible and time spent in the trap box or other holding facility shall not exceed 24 hours during the Monday through Friday time period and shall not exceed 48 hours at any time.

f. LSRCP, BPA, and NOAA designees shall notify the appropriate Service Field Office as soon as possible when they find evidence, or are told about evidence, of bull trout mortality or passage difficulties at any of the facilities in this action area.

2. The following term and condition is necessary for the implementation of RPM 2:

a. Fish screens sufficient to protect bull trout must be installed, operated, and maintained at hatchery facility intakes, and during water diversions associated with construction (e.g., installation of screens on pumps used to isolate in-water work areas), unless fish screens that meet NOAA Fisheries fish screening criteria are already present. Following the finalization of this Opinion, LSRCP shall initiate a 3-phased strategy to address screening and passage issues at all LSRCP facilities, with the intent of completing necessary structural changes (as dictated by design and funding constraints) prior to issuance of the next Opinion. Phase 1, initiated within 1 year of the signing date of this Opinion, will identify bull trout screening and passage deficiencies; LSRCP is currently finalizing a contract to assess screening and passage needs at their facilities. Phase 2 will involve the prioritization of facility modifications and the development of a strategy to implement corrective actions. Phase 2 prioritization will be done via coordination among Federal agencies and their cooperators. Phase 3 will entail designing corrective actions in order of priority, securing funding, and implementing actions as outlined by the strategy.

3. The following terms and conditions are necessary for the implementation of RPM 3:

a. Develop effective erosion and pollution control measures and implement them throughout the area of disturbance. The measures shall minimize the movement of soils and sediment both into and within the river, and will stabilize bare soil over both the short-term and long-term. Erosion control measures shall be sufficient to ensure compliance with applicable water quality standards and this Opinion. The Pollution Control Plan (PCP) shall be maintained on-site and shall be available for review upon request. An appropriate plan would include:

i. An outline of how and to what specifications various erosion and pollution control devices will be used to meet water quality standards, and will provide a specific inspection protocol and time response. Effective erosion control measures shall be in place at all times during the contract. Construction within the five-year floodplain will not begin until all temporary erosion controls (e.g., straw bales, silt fences, or other methods) are in place within the riparian area. Erosion control structures will be maintained throughout the life of the project.

ii. All exposed areas will be replanted with native shrubs and locally present herbaceous species. Erosion control planting will be completed following completion of work, as early as possible and dependent on timing when survival will be the most successful.

iii. All erosion control devices will be inspected throughout the construction period to ensure that they are working adequately. Erosion control devices will be inspected weekly during construction. Should a control measure not function effectively, the control measure will be immediately repaired or replaced. Additional erosion controls will be installed as necessary.

iv. A supply of erosion control materials (e.g., straw bales and clean straw mulch) will be kept on hand to cover small sites that may become bare and to respond to sediment emergencies.

v. All equipment that is used for instream work will be cleaned prior to entering the two-year floodplain. External oil and grease will be removed, along with dirt and mud. Untreated wash and rinse water will not be discharged into streams and rivers without adequate treatment.

vi. Unneeded material removed during excavation shall only be placed in upland locations where it cannot enter sensitive aquatic habitat. Conservation of topsoil (removal, storage and reuse) will be employed when practicable.

vii. Project actions will follow all provisions of the Clean Water Act (40 CFR Subchapter D), Washington Department of Ecology, and Department of Environmental Quality (ODEQ) provisions for maintenance of water quality standards. Toxic substances shall not be introduced above natural background levels in Waters of the State in amounts which may be harmful to aquatic life.

viii. The Contractor will develop and implement an adequate, site-specific Spill Prevention and Countermeasure or PCP, and is responsible for containment and removal of any toxicants released. The PCP shall include the following:

- A spill containment and control plan that includes: notification procedures; specific containment and clean up measures which will be available on site; and proposed methods for disposal of spilled materials.

ix. Areas for fuel storage, refueling and servicing of construction equipment and vehicles will be located at a minimum of 100 feet above the top of bank.

x. Hazmat booms will be maintained on-site in locations where there is potential for a toxic spill into aquatic systems. "Diapering" of vehicles to catch any toxicants (oils, greases, brake fluid) is mandatory when the vehicles have any potential to contribute toxic materials into aquatic systems.

xi. Effective erosion control measures shall be in place at all times during the contract. Construction within the five-year floodplain will not begin until all temporary erosion controls (e.g., straw bales, silt fences, or other methods) are in place within the riparian area. Erosion control structures will be maintained throughout the life of the project.

b. During the period of in-water non-routine maintenance work, a project inspector shall monitor construction activities frequently to ensure that all the following provisions are met.

i. Alteration or disturbance of stream banks and existing riparian vegetation will be minimized. Where bank work is necessary, bank protection material shall be placed to maintain normal waterway configuration whenever possible.

c. All work within the active channel will be completed within the ODFW or WDFW - approved in-water work periods. Any adjustments to the in-water work period will first be approved by, and coordinated with the Service, and WDFW or ODFW (or both if appropriate).

4. The following terms and conditions are necessary for the implementation of RPM 4:

a. Purposeful take of bull trout which are actively spawning or are near bull trout spawning sites is prohibited. Incidental take of spawning bull trout or redds shall be reduced by minimizing RM&E activities in known spawning habitat and in critical habitat designated for spawning/rearing uses during critical time frames. Redd sites (both "pit" and "mound") shall not be physically disturbed during instream activities. Because some bull trout redds may be small and difficult to see, take precautions to avoid stepping in areas that may be potential redd locations for bull trout (i.e. small gravel deposits behind boulders; under overhanging vegetation; near woody debris or logs; or areas of hydraulic influence such as confluences of tributaries, springs, seeps, pool tail crests, or edges of pools).

b. For RM&E electrofishing activities, the following measures must be adhered to:

i. Electrofishing methods shall use the minimum voltage, pulse width, and rate settings necessary to immobilize fish. Water conductivity shall be measured in the field before electrofishing to determine appropriate settings. Electrofishing equipment and methods shall comply with the electrofishing guidelines outlined by the NMFS (NMFS 2000) or current equivalent.

ii. If electrofishing is utilized to capture salmonids in bull trout habitat, conduct fish capture when stream temperatures are at or below 15 degrees C (59 degrees F), to the extent practicable. Recommend work be conducted early and late in the day when water temperatures are cooler to minimize stress to bull trout and other salmonids.

iii. Electrofishing activities shall be minimized where larger, fluvial bull trout might be captured and in spawning areas where redds are present.

iv. Fish capture and removal operations must be conducted by a qualified biologist and all staff participating in the operation have the necessary knowledge, skills, and abilities to ensure safe handling of fish. Fish capture and removal operations shall take all appropriate steps to minimize the amount and duration of handling. The operations shall maintain captured fish in water to the maximum extent possible during seining/netting, handling, and transfer for release, to prevent and minimize stress.

v. Water quality conditions must be adequate in the buckets or tanks used to hold and transport captured fish. The operations shall use aerators to provide for the circulation of clean, cold, well-oxygenated water, and/or shall stage fish capture, temporary holding, and release, to minimize the risks associated with prolonged holding.

vi. All bull trout encountered during work site isolation that includes salvage must be documented by submitting a fish handling and injury-occurrence report to the Service, as included in the annual report outlined in 6 below. The report shall include: 1) the name and address of the supervisory fish biologist; 2) methods used to isolate the work area and minimize disturbances to bull trout; 3) stream conditions before and following placement and removal of temporary barriers; 4) the means of fish removal; 5) approximate the number of fish removed by species and age class, the number of bull trout removed; 6) condition of all bull trout released; and 7) any incidence of observed injury or mortality to bull trout. Specifically, for all bull trout captured, we ask that the fisheries biologist in charge of handling record the date and time, capture location, capture method used, length and weight of the specimen, condition (if abnormal), search for and record identification numbers from any tags that may be present, and provide the collector's name.

5. The following term and condition is necessary for the implementation of RPM 5:

   a. Passage, where currently existing, must be maintained for any bull trout present in the project area during semi-routine maintenance, unless otherwise approved in writing by the Service.

6. The following term and condition is necessary for the implementation of RPM 6:

   a. Annual reports submitted by BPA and LSRCP in coordination with the program operators, due March 1 of each year, shall be provided to the Service's La Grande Field Office for facilities in Oregon and the Eastern Washington Field Office (Spokane, WA) for facilities in Washington. The report shall briefly summarize bull trout collections at the facilities, and bull trout sampled during monitoring and evaluation activities, monitoring results, and any modifications or improvements that have been implemented to avoid or minimize impacts to bull trout.

8.5 Reporting Requirements

If, during the course of the proposed activities, the amount or extent of incidental take identified above is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. In such instances, the action agencies) 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.

The Service is to be notified immediately if any dead, injured, or sick bull trout are documented. If in Washington, initial notification must be made to the Service's Law Enforcement Office in Richland, Washington, at (509) 727-8358 and if in Oregon, initial notification must be made to the Service Law Enforcement Office, located at 9025 SW Hillman Court, Suite 3134, Wilsonville, OR 97070, at telephone number (503) 682-6131. Notification must include the date, time, precise location of the injured animal or carcass, and any other pertinent information. Care shall be taken in handling sick, injured, or dead specimens to preserve biological materials in the best possible state for later analysis of cause of death, if such occurs. In conjunction with the care of any sick or injured bull trout or preservation of biological materials from a dead animal, NOAA, LSRCP, and BPA have the responsibility to ensure that evidence associated with the specimen is not unnecessarily disturbed.

9. 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 further develop the available information base concerning listed species or other natural resources associated with a proposed action. The Service provides the following conservation recommendation with regard to the proposed Project.

a. Working with all partners (including NOAA and the Service), evaluate how Chinook salmon and potentially steelhead trout management objectives at the facilities can be met with the least amount of impact to local bull trout populations. Considerations may include modifying the timing and length of weir operations during bull trout migration periods, and evaluating opportunities to reduce handling effects.

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.

10. Reinitiation Notice – Closing Statement

As provided in 50 CFR §402.16, reinitiation 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 reinitiation.

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