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U.S. Fish and Wildlife Service
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Allyson Purcell, Acting Chief
National Marine Fisheries Service
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
Portland, Oregon 97232

Subject: National Marine Fisheries Service Authorization of the Continued Operation of the Hells Canyon and Salmon River Steelhead and Spring/Summer Chinook Salmon Programs—Idaho (Adams, Custer, Clearwater, Gooding, Idaho, Lemhi, Valley, and Valley Counties) and Oregon (Baker County)—Biological Opinion
In Reply Refer to: 01EIFW00-2017-F-1079

Dear Ms. Purcell:

Enclosed is the U.S. Fish and Wildlife Service's (Service) Biological Opinion (Opinion) and concurrence on the National Marine Fisheries Service's (NMFS), the Bonneville Power Administration's (BPA), the Service's, the Service's Lower Snake River Compensation Plan's (LSRCP), and the Army Corps of Engineers' (Corps), collectively the federal action agencies (action agencies), determinations of effect on species listed under the Endangered Species Act (Act) of 1973, as amended, for the authorization and funding of the continued operation of the Hells Canyon and Salmon River Steelhead and Spring/Summer Chinook Salmon Programs (Programs), encompassing facilities and operations in Idaho and Oregon.

This consultation addresses all aspects of the Programs as outlined in the Hatchery and Genetic Management Plans (HGMPs), and is intended to document compliance with the Act for all associated partners who authorize, fund, or carry out various components of the Programs. In addition to the federal action agencies, partners include Idaho Department of Fish and Game (IDFG), the Nez Perce Tribe (NPT), the Shoshone-Bannock Tribes (SBT), and Idaho Power Company (IPC) as Program operators.

In an email dated June 9, 2017 and received by the Service on the same day, IDFG, on behalf of federal action agencies[1], requested formal consultation on the determination under section 7 of the Act that the proposed actions (i.e., authorization and funding) are likely to adversely affect bull trout (*Salvelinus confluentus*), bull trout critical habitat, the Bliss Rapids snail (*Taylorconcha serpenticola*), and the Snake River physa snail (*Physa natricina*)[2]. The agencies

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[1] BPA initiated Section 7 consultation via a letter dated August 25, 2017 that referenced the June 9, 2017 IDFG initiation email and biological assessment.

[2] Although the agencies determined that the Programs are likely to adversely affect the Snake River physa, based on the best available information, the Service concluded that the physa is not likely to be adversely affected by implementation of the Programs. We provide our rationale in the enclosed Opinion.

determined that the proposed actions are not likely to adversely affect Canada lynx (*Lynx canadensis*), northern Idaho ground squirrel (*Spermophilus brunneus brunneus*), or North American wolverine.

The agencies also determined that the proposed action will have no effect on critical habitat for the Canada lynx and will not jeopardize the continued existence of the North American wolverine (*Gulo gulo luscus*). The Service acknowledges these determinations.

The enclosed Opinion is based primarily on our review of the proposed action, as described in the 2017 Biological Assessment (Assessment)[3]; other associated documents; the Addendum to Assessment, received on October 12, 2017; and the anticipated effects of the action on listed species, and was prepared in accordance with section 7 of the Act. Our Opinion concludes that the proposed action will not jeopardize the survival and recovery of bull trout or the Bliss Rapids snail, and will not adversely modify bull trout critical habitat. A complete record of this consultation is on file at this office.

Thank you for your continued interest in the conservation of threatened and endangered species. Please contact Clay Fletcher at 971-701-1497 or Russ Holder at 208-378-5384 if you have questions concerning this Opinion.

Sincerely,

RUSSELL HOLDER
Digitally signed by RUSSELL HOLDER
Date: 2017.12.08 13:21:54 -07'00'

For Gregory M. Hughes
State Supervisor

Enclosure

cc: NMFS, Portland (Hurst, Meyers-Cherry)
BPA, Portland (Grange)
NPT, Lapwai (Johnson)
SBT, Fort Hall (Denny)
LSRCP, Boise (Collins, Robertson)
Corps, Walla Walla (Setter)
IDFG, Boise (Hebdon)
IPC, Boise (Rosenberger)

[3] The Assessment was prepared by HDR consultants and submitted for consultation on behalf of the federal action agencies by IDFG.

BIOLOGICAL OPINION
FOR THE
AUTHORIZATIONS AND FUNDING OF THE CONTINUED OPERATION, MAINTENANCE, MONITORING, AND EVALUATION OF THE HELLS CANYON AND SALMON RIVER STEELHEAD AND SPRING/SUMMER CHINOOK SALMON HATCHERY PROGRAMS

01EIFW00-2017-F-1079

U.S. FISH AND WILDLIFE SERVICE
IDAHO FISH AND WILDLIFE OFFICE
BOISE, IDAHO

Supervisor ___________________________________

RUSSELL HOLDER

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Date ___________________________________

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1. BACKGROUND AND INFORMAL CONSULTATION

1.1 Introduction

The U.S. Fish and Wildlife Service (Service) has prepared this Biological Opinion (Opinion) and concurrence on the National Marine Fisheries Service's (NMFS), the Bonneville Power Administration's (BPA), the Service's, the Service's Lower Snake River Compensation Plan's(LSRCP), and the Army Corps of Engineers' (Corps), collectively the federal action agencies (agencies), determinations of effects to species listed under the Endangered Species Act (Act) of 1973, as amended, from the authorization and funding of the continued operation of the Hells Canyon and Salmon River Steelhead and Spring/Summer Chinook Salmon Programs (Programs), which specifically included the following activities in Idaho and Oregon:

- The BPA is funding the operation; maintenance; and research, monitoring and evaluation (RM&E) of the Johnson Creek Artificial Enhancement Program[4].
- The Service through the LSRCP is funding the operation, maintenance, and RM&E for the South Fork Salmon River Summer Chinook Salmon Program, East Fork Salmon River Steelhead Program, Upper Salmon River A-run Steelhead Program, Upper Salmon River B-run Steelhead Program, Upper Salmon River Spring Chinook Salmon Program, and a portion of the a portion of the Little Salmon River Summer Steelhead Program.
- The NMFS is approving the Hatchery and Genetic Management Plans (HGMPs) under Section 4(d) or Section 10 of the Act associated with the Hells Canyon Summer Steelhead Program, Hells Canyon Spring Chinook Salmon Program, Little Salmon River Summer Steelhead Program, Little Salmon River Summer Steelhead Program, South Fork Salmon River Summer Chinook Salmon Program, Johnson Creek Artificial Enhancement Program, Cabin and Curtis Creeks Summer Chinook Salmon Egg Box Program, Pahsimeroi Summer Steelhead Program, Summer Steelhead Streamside Incubator Program, Pahsimeroi Summer Chinook Salmon Program, East Fork Salmon River Steelhead Program, Upper Salmon River A-run Steelhead Program, Upper Salmon River B-run Steelhead Program, Summer Steelhead Streamside Incubator Program and Upper Salmon River Spring Chinook Salmon Program. NMFS' 4(d) determinations and Section 10 permits would allow operation of hatchery related activities for these programs.
- The Corps authorizes the discharge of fill material into the waters of the U.S. under section 404 of the Clean Water Act (CWA). Such discharges (e.g., incidental fill related to scour hole fills at weir sites) or excavations that alter the streambed (e.g., dredging in front of intakes) may be required throughout the life of this consultation to maintain infrastructure at the subject hatchery facilities. The Corps regulates and authorizes the

[4] BPA funds the current production level of summer Chinook (up to 100,000 smolts) and M&E for the JCAPE program. BPA is analyzing NPT's proposed increase in production of 50,000 smolts (up to 150,000 smolts).

discharge of fill materials under the CWA for activities that are not specifically exempt from permitting requirements under Section 404(f)(1)(B) of the CWA.

In an email dated June 9, 2017 and received by the Service on the same day, Idaho Department of Fish and Game (IDFG), on behalf of the action agencies, requested formal consultation on the determination under section 7 of the Act that authorization and funding of the Programs is likely to adversely affect the Bliss Rapids snail (*Taylorconcha serpenticola*), Snake River physa (*Physa natricina*)[5], bull trout (*Salvelinus confluentus*), and bull trout critical habitat. The agencies determined that the proposed action is not likely to adversely affect Canada lynx (*Lynx canadensis*), northern Idaho ground squirrel (*Spermophilus brunneus brunneus*)[6], or the North American wolverine (*Gulo gulo luscus*).

The agencies also determined that the proposed action will have no effect on critical habitat for the Canada lynx and will not jeopardize the continued existence of the North American wolverine. The Service acknowledges these determinations.

This consultation addresses all aspects of the Programs as outlined in the HGMPs and other associated documents such as Proposed Actions (developed in coordination with NMFS) and Annual Operating Plans, and is intended to document compliance with the Act for all associated partners who authorize, fund, or carry out various components of the Programs. These partners include the federal action agencies and Idaho Department of Fish and Game (IDFG), the Nez Perce Tribe (NPT), the Shoshone-Bannock Tribes (SBT), and Idaho Power Company (IPC) as Program operators.

As described in this Opinion, and based on the Biological Assessment (Assessment; HDR 2017, entire), the Addendum to the Assessment (SBT 2017), and other information, the Service has concluded that the actions, as proposed, are not likely to jeopardize the continued existence of the Bliss Rapids snail or bull trout. The proposed actions are also not likely to destroy or adversely modify bull trout critical habitat. The Service has not designated critical habitat for the Bliss Rapids snail.

The federal action agencies have requested and are receiving coverage under section 7 of the Act for all elements of the Programs, including broodstock collection, smolt release/outplanting at existing access points and facilities, RM&E, and hatchery facility maintenance.

1.2 Consultation History

The Service and action agencies have had the following recent correspondence and coordination on the Programs.

[5] Although the agencies determined that the Programs are likely to adversely affect the Snake River physa, based on the best available information, the Service concluded that the physa is not likely to be adversely affected by implementation of the Programs. We provide our rationale in this Opinion.

[6] On August 25, 2017, the Service received a separate request for formal consultation from BPA to cover their funding of the NPT to operate, maintain, monitor, and evaluate the spring/summer Chinook salmon Johnson Creek Artificial Propagation (JCAPE) Program.

April 11, 2017: The Service received the draft Assessment from IDFG by email.

May 30, 2017: The Service sent comments on the draft Assessment to IDFG by email.

June 9, 2017: The Service received the final Assessment from IDFG by email.

August 25, 2017: The Service received a request for formal consultation from BPA by email for their action of funding the NPT to implement the Johnson Creek Artificial Propagation (JCAPE) Program.

October 23, 2017: The Service sent the draft Opinion to the federal action agencies and Program operators by email for their review.

October 31, 2017: The Service received comments on the draft Opinion from IPC by email.

November 6, 2017: The Service received comments on the draft Opinion from BPA and LSRCP by separate emails.

November 8, 2017: The Service received comments on the draft Opinion from IDFG and NMFS by separate emails.

November 16, 2017: The Service sent, by email, the draft Incidental Take Statement (ITS) to IDFG, NMFS, BPA, LSRCP, SBT, and Corps for review.

November 17, 2017: The Service received approval of the ITS from LSRCP by email.

November 20, 2017: The Service received comments on the draft ITS from IPC by email. The Service also received comments from the NPT on the draft Opinion, by email on this date.

November 21, 2017: The Service sent, by email, the draft ITS to the NPT for review. The Service also received comments on the draft ITS from IDFG by email on this date.

November 22, 2017: The Service received comments on the draft ITS from the NPT by email.

1.3 Informal Consultations

1.3.1 Canada Lynx

Service concurrence with the determination that the Programs are not likely to adversely affect the Canada lynx is based on the following rationales.

1. Although a very limited amount of lynx habitat may be present at some locations in the action area, the proposed action does not include any activities that would remove or disturb that habitat. The proposed action will have insignificant effects on lynx habitat.
2. Lynx occurrence near hatchery facilities is unlikely because of existing infrastructure development and regular human activity. No lynx or denning sites have been observed near any of the Programs' facilities. Therefore, the potential for the proposed action to disturb lynx is discountable.
3. Because it is not designated in the action area, the Programs will have no effect on lynx

critical habitat.

1.3.2 Northern Idaho Ground Squirrel

Service concurrence with the determination that the Programs are not likely to adversely affect the northern Idaho ground squirrel is based on the following rationale.

1. The McCall Hatchery is the only facility located within the historic range of this species. However, the closest squirrel population is located 2.5 miles from the hatchery and it is unlikely that suitable habitat is located in the immediate vicinity of the hatchery. No northern Idaho ground squirrels or burrows have been documented on facility grounds. For these reasons, the potential for activities at the McCall Hatchery to affect the northern Idaho ground squirrel is discountable.

1.3.3 Snake River Physa

Although the agencies determined that Programs may adversely affect the Snake River physa, after examining the best available information, the Service has determined that adverse effects to the physa are unlikely. Our conclusion that the Programs are not likely to adversely affect the physa is based on the following rationales.

1. The Snake River physa inhabits the mainstem of the Middle Snake River and potentially occurs in the vicinity of Hagerman National, Niagara Springs, and Magic Valley fish hatcheries. The species is rare and poorly documented, but in general, the locations of live, confirmed specimens have been most frequently recorded at depths of 0.3 – 1.9 feet, in free-flowing reaches of the Snake River where water velocities generally keep gravel and pebble beds free of fine sediments and subsequent macrophyte growth (USFWS 2014). No new construction or river alteration is proposed as part of the proposed action, and therefore, river substrate composition and channel characteristics would not be impacted.
2. The physa does not occur in the springs that provide water to the Hagerman National, Niagara Springs, and Magic Valley fish hatcheries and therefore will not be directly affected by water withdrawals or spring intake maintenance activities. However, spring inflows to the river would be reduced, which could limit the amount of cold water entering the river, thereby increasing temperature and reducing water quality. But, given the quantity of water diversions compared to Snake River flows, impacts to the snails are likely discountable.
3. No adult salmon collection or juvenile releases occur in areas potentially inhabited by Snake River physa, therefore these activities would have no effect on the physa.
4. Hatchery effluent entering the Snake River in the vicinity of the outlet facilities does have the potential to impact water quality in the mainstem and therefore potentially impact Snake River physa snails. However, the best available information indicates that the snails are not present near the hatcheries' discharge sites and would not be affected by hatchery effluent (Hopper 2017, *in litt*). In addition, the hatcheries operate under National Pollutant Discharge Elimination System (NPDES) permits to minimize impacts to water quality in the Snake River. The Service, in a previous hatchery consultation,

found that effluent from facilities regulated by NPDES permits is not noticeable or measurable over background conditions (USFWS 2016b).

1.3.4 North American Wolverine

Service concurrence with the determination that the Programs are not likely to adversely affect the North American wolverine is based on the following rationales.

1. It is unlikely that suitable wolverine denning habitat, which occurs at high elevations, is present at any facilities in the action area; therefore effects on that habitat would be discountable. In addition, the proposed action does not include any activities that would remove or disturb lower elevation habitat that might support transient wolverine; therefore effects to lower elevation habitat would be discountable.
2. Wolverine occurrence near hatchery facilities is unlikely because of existing infrastructure development and regular human activity. No wolverines have been observed near any of the Programs' facilities. Therefore the potential for the proposed action to disturb wolverines is discountable.
3. Because it is not designated in the action area, the Programs will have no effect on wolverine critical habitat.

2. BIOLOGICAL OPINION

2.1 Description of the Proposed/Ongoing Action

This section describes the proposed Federal action, including any measures that may avoid, minimize, or mitigate adverse effects to listed species or critical habitat, and the extent of the geographic area affected by the action (i.e., the action area). The term "action" is defined in the implementing regulations for section 7 as "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas." The term "action area" is defined in the regulations as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action."

The following sections are adapted from the description of the proposed action contained in the Assessment (HDR 2017, entire).

2.1.1 Background

Lower Snake River Compensation Plan (LSRCP)

The LSRCP Program was authorized by the Water Resources Development Act of 1976 (Public Law 94-587) to mitigate losses caused by the construction and operation of the four Lower Snake River dams (Ice Harbor, Lower Monumental, Little Goose, and Lower Granite). The combined LSRCP mitigation return goals for Idaho, Oregon, and Washington include 293,500 adult Chinook salmon and 165,300 adult steelhead annually. These return goals assume a 4:1 and 2:1 ratio of catch downstream of Lower Granite Dam to escapement upstream of Lower Granite Dam, for Chinook salmon and steelhead, respectively.

Chinook salmon hatchery programs operated by IDFG include a spring Chinook salmon program at Sawtooth Fish Hatchery, a summer Chinook salmon program at McCall Fish Hatchery, and a combination spring/summer Chinook salmon program at Clearwater Fish Hatchery. Current production targets for these hatcheries include 97,225 adults from Sawtooth Fish Hatchery, 40,000 adults from McCall Fish Hatchery, and 59,575 adults from Clearwater Fish Hatchery. These Chinook salmon programs operated by IDFG account for 67 percent of the total LSRCP program Chinook adult return goal.

Summer steelhead hatchery programs operated in Idaho at Clearwater, Hagerman National, and Magic Valley fish hatcheries are expected to contribute 117,780 adults annually. This accounts for 71 percent of the total LSRCP steelhead adult return goal.

Hells Canyon Settlement Agreement (HCSA)

The Hells Canyon Settlement Agreement (HCSA) is an agreement approved by the Federal Energy Regulatory Commission (FERC) defining mitigation requirements for Idaho Power Company (IPC) activities associated with construction and operation of the Hells Canyon Dam Complex (Hells Canyon, Oxbow, and Brownlee dams). Parties include IPC, the US Department of Commerce through the NMFS, the state of Idaho through IDFG, the state of Oregon through the Oregon Department of Fish and Wildlife (ODFW), and the state of Washington through the Washington Department of Fish and Wildlife (WDFW). Mitigation goals for the HCSA are in terms of smolts produced rather than adults.

The IPC Chinook salmon programs include a spring Chinook salmon program at Rapid River Fish Hatchery, a summer Chinook salmon program at Pahsimeroi Fish Hatchery, and a fall Chinook salmon program at Oxbow Fish Hatchery. Production goals for the HCSA include 3 million spring Chinook salmon yearling smolts at Rapid River Fish Hatchery, 1 million summer Chinook salmon yearling smolts at Pahsimeroi Fish Hatchery, and 1 million fall Chinook salmon subyearlings reared at Irrigon Fish Hatchery in Oregon. This Opinion does not address impacts to listed species or critical habitat caused by activities associated with the fall Chinook salmon program.

IPC also maintains a hatchery steelhead program. Mitigation goals established through the HCSA include an annual production target of approximately 1.8 million yearling smolts at 4.5 fish per pound (fpp) at Niagara Springs Fish Hatchery.

Bonneville Power Administration

Under the Pacific Northwest Power Planning and Conservation Act of 1980, 16 USC § 839 et seq. (Northwest Power Act), the BPA provides funding to protect, mitigate, and enhance fish and wildlife and their habitat affected by the development, operation, and management of federal hydroelectric facilities on the Columbia River and its tributaries. Under this authority, the BPA funds operation and maintenance and RM&E of the NPT's production of 100,000[7] spring/summer Chinook smolts under the Johnson Creek program, as described below in Section 2.1.3.

Hatchery and Genetic Management Plans (HGMP)

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 a Biological Opinion on the operation of the LSRCP program (File # 1024.0000, 1-4-99- F-2) on April 8, 1999.

IDFG and IPC submitted Hatchery and Genetic Management Plans (HGMPs) to the NMFS in 2011 requesting coverage under the programmatic Biological Opinion for LSRCP-funded and HCSA-mandated summer steelhead and spring/summer Chinook salmon programs in the Hells Canyon Reach of the Snake River and in the Salmon River Subbasin. IDFG submitted the first HGMPs for the LSRCP programs in 2002. The NPT and the SBT have also submitted HGMPs for their programs. Some HGMPs have since been updated. The HGMPs reflect the most up to date production numbers as captured in the production tables of the *US v. OR* management agreement (*U.S. v Oregon* 2008, entire).

Section 6 Cooperative Agreement for Bull Trout Take Associated with IDFG Wild Fish Research and Monitoring

IDFG annually prepares a Bull Trout Conservation Program Plan and Take Report that describes its management program to meet the provisions contained in section 6 of the Act and to comport with the spirit of section 10(a)1(A). The plan identifies the benefits to bull trout from

[7] BPA funds the current production level of spring/summer chinook (up to 100,000 smolts) and M&E. A funding source has not yet been identified for NPT's proposed increase in production of 50,000 smolts (up to 150,000 smolts).

conservation, management, and research conducted or authorized by the state, provides documentation of bull trout take by IDFG, and provides an estimate of take for the coming year. IDFG submits the plan to the Service, who makes a determination whether implementation of the program was conducted in accordance with the Act.

This section 7 consultation document is intended to consult on hatchery-related operational and RM&E effects on ESA-listed species and their critical habitat associated with the funding, permitting, or undertaking of the programs described herein by the Federal action agencies. RM&E undertaken by IDFG is appropriately addressed via their section 6 agreement with the Service. Unless explicitly identified as agents of the state, section 6 coverage does not extend to the federal action agencies.

Incidental take of bull trout has been estimated in Appendix A of the Assessment, and is addressed in this Opinion.

Nez Perce Tribe Department of Fisheries Resource Management Section 10 Permits

The NPT Department of Fisheries Resources Management (DFRM) operates research and evaluation studies for Chinook salmon and steelhead. In the course of those studies, researchers have incidentally taken bull trout. This take is currently covered by and through the Bureau of Indian Affairs under Robert Lothrop as the permit signatory. This coverage is administered under the USFWS Bull Trout Permit #TE 001598-6 which expires on April 9, 2022. The original application was submitted in 1998, with modifications and/or renewals occurring in 2000, 2002, 2005, 2008, 2012, 2013, and 2017.

The NPT research and evaluation activities associated with the subject hatchery programs, and currently covered by Permit #TE-001598-6, are part of the proposed action. Therefore, once section 7 consultation is completed, incidental take of bull trout associated with RM&E activities described herein will be covered in this Opinion; the section 7 consultation will replace and supersede (as applicable) RM&E-related take currently addressed via Permit #TE-001598-6.

2.1.2 Action Area

The aquatic portion of the action area for the Hells Canyon and Salmon River hatchery programs included under the proposed action focuses primarily on Idaho and Oregon where the Program's activities occur, including hatchery smolt releases. Therefore, the aquatic portion of the action area includes the middle Snake River from Magic Valley Fish Hatchery downstream to Upper Salmon Falls Dam; Niagara Springs; the lower Snake River from Hells Canyon Dam downstream to the confluence with the Clearwater River; the Salmon River (including Panther, Beaver, and Indian creeks); the South Fork Salmon River (including the East Fork of the South Fork, and Johnson, Cabin, and Curtis creeks); the Rapid River; the Pahsimeroi River; the East Fork Salmon River; the Yankee Fork River; Riley Creek; the North Fork Clearwater River downstream of Dworshak Dam to the confluence with the Clearwater River; the Clearwater River from the North Fork Clearwater River downstream to the confluence with the Snake River; and the North Fork Payette River. Because ecological interactions are possible between bull trout and outmigrating hatchery smolts or returning adults in the Snake and Columbia rivers, the action area also includes the mainstem Snake and Columbia Rivers.

Fish released from the hatchery programs under the proposed action are also likely to inhabit other portions of the Columbia River Basin and the Pacific Ocean. Because of the small proportion of fish from the proposed programs relative to the total numbers of fish in the non-action area of the Columbia River Basin and the ocean, it is not possible to meaningfully measure, detect, or evaluate the effects of any interactions due to the low likelihood or magnitude of such interactions in locations outside the action area (NMFS 2012).

The action area also includes terrestrial habitat within 0.25 mile of each existing hatchery facility (see Figures 1 and 2). The terrestrial portion of the action area is defined by the geographic extent of impacts from the following:

- Operation and maintenance of all Hells Canyon and Salmon River hatchery programs included under the proposed action.
- Use of existing haul roads and upland access sites for smolt releases, as well as upland areas surrounding proposed smolt release sites.

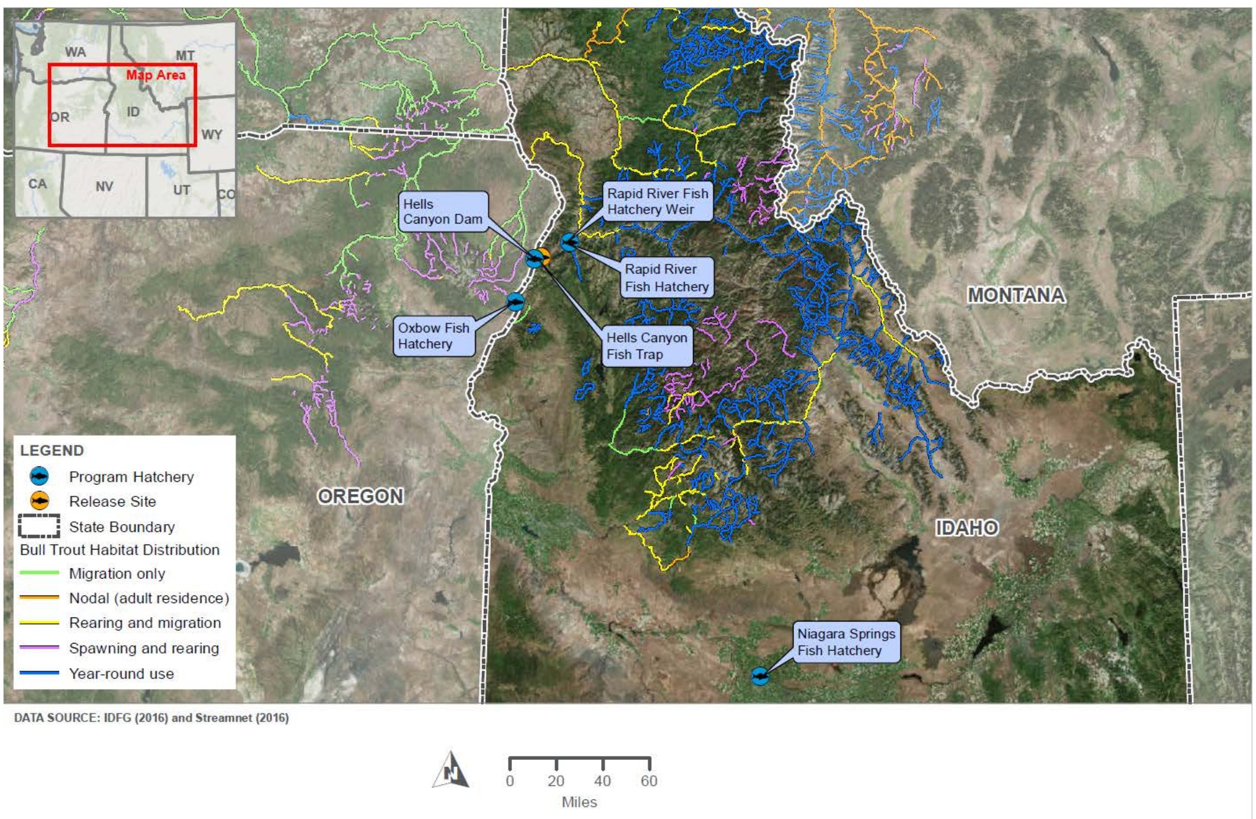

Figure 1. Facilities and release sites associated with Hells Canyon hatchery programs in relation to bull trout habitat (from Assessment Figure 1-1).

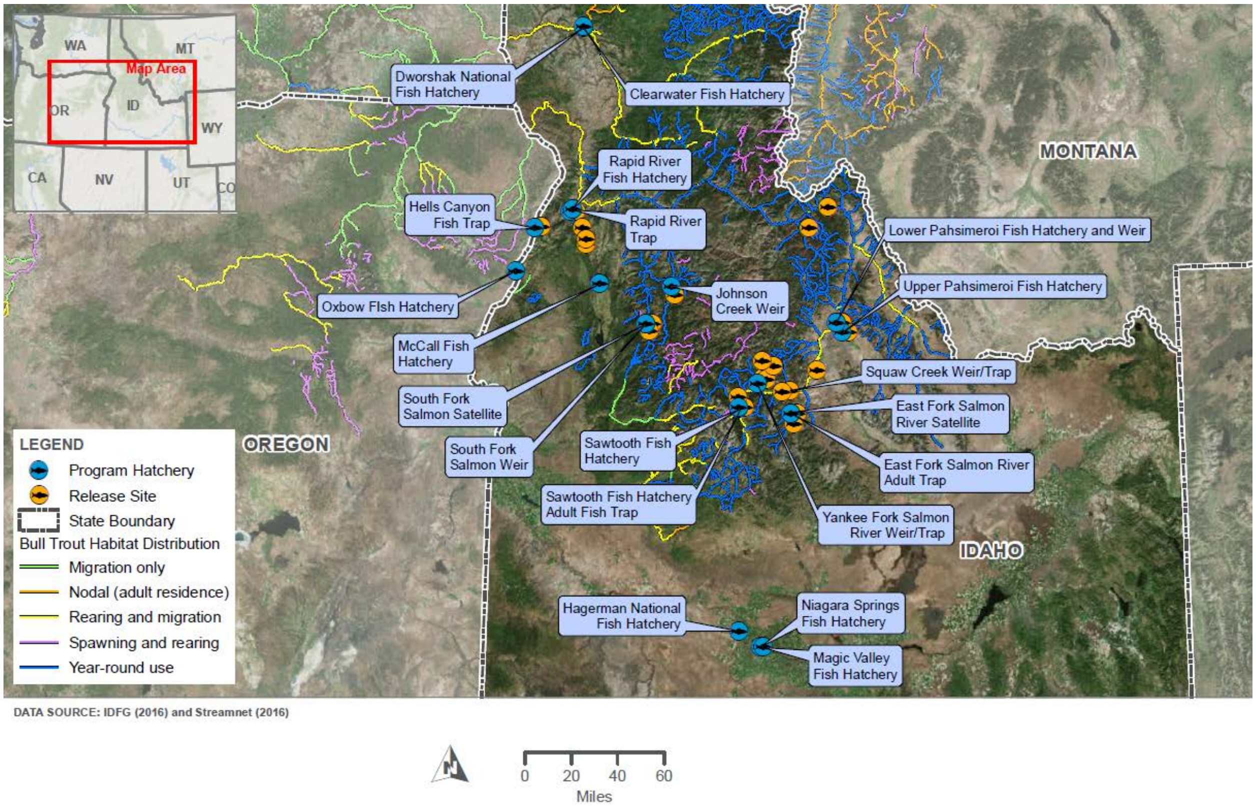

Figure 2. **Facilities and release sites associated with hatchery programs that release fish in the Salmon River Subbasin, in relation to bull trout habitat (from Assessment Figure 1-2).**

2.1.3 Proposed Action[8]

The NMFS proposes to authorize (through section 10(a)(1)(A) permits or 4(d) Limit 6 or Limit 5 authorities) the continued operation and maintenance of steelhead (*Oncorhynchus mykiss*) and spring/summer Chinook salmon (*O. tshawytscha*) hatchery facilities operated by IDFG in the Hells Canyon Reach of the Snake River, and by IDFG, the NPT, and the SBT in the Salmon River subbasin. A description of these facilities and activities follows.

2.1.3.1 Hells Canyon Programs

2.1.3.1.1 Description of the Programs

Two Hells Canyon hatchery programs are covered in this Opinion: Hells Canyon summer steelhead and Hells Canyon spring Chinook salmon (Table 1). Numerous facilities are used for

[8] This description of the ongoing action is excerpted (with minor modifications) from the Assessment (HDR 2017, pp. 6-21).

spawning, incubation, and rearing, however, fish are all released in the Snake River downstream from Hells Canyon Dam.

Table 1. Facilities and general locations used for the Hells Canyon Hatchery Programs (from Assessment Table 2-11).

Program	Fish Hatchery or Trap				Release
	Broodstock Collection	Spawning	Incubation	Rearing	
Hells Canyon Summer Steelhead	Hells Canyon Fish Trap	Oxbow	Oxbow; Niagara Springs	Niagara Springs	Hells Canyon Dam
Hells Canyon Spring Chinook salmon	Rapid River; Hells Canyon Fish Trap	Rapid River	Rapid River ; Oxbow	Rapid River	Hells Canyon Dam

Table 2. Specific locations of adult broodstock collection for Hells Canyon Hatchery Programs (Assessment Table 5-1)

Program	Fish Hatchery	Trap	GPS Coordinates	Collection Period
Hells Canyon Summer Steelhead	Oxbow	Hells Canyon Fish Trap	45.244314 -116.701116	Late October – late November; March - April
Hells Canyon Spring Chinook salmon	Rapid River	Rapid River	45.367050 -116.372054	Late April - early September
	Oxbow	Hells Canyon Fish Trap	45.244314 -116.701116	May-June

Table 3. Specific locations of smolt releases (all in spring) for Hells Canyon Hatchery Programs (Assessment Table 5-2).

Program	Release Site	GPS Coordinates	Target Number
Hells Canyon Summer Steelhead	Hells Canyon Dam (0.75 mile downstream)*	45.253733, -116.69629	550,000
Hells Canyon Spring Chinook	Hells Canyon Dam (0.75 mile downstream)	45.253733, -116.69629	350,000

*Pittsburgh Landing, downstream of Hells Canyon Dam may be used as an emergency release site (Hebdon 2017a, *in litt*).

Hells Canyon Summer Steelhead

The purpose of the Hells Canyon summer steelhead hatchery program is to mitigate for anadromous fish losses caused by the construction and continued operation of the Hells Canyon Complex. The 1.8-million release target for the HCSA includes approximately 550,000 smolts released downstream from Hells Canyon Dam in the mainstem Snake River in March or April.

Actual releases below Hells Canyon Dam have ranged from about 520,000 to about 580,000 fish in recent years.

Broodstock for the Hells Canyon summer steelhead program are collected at the Hells Canyon Fish Trap and transported to Oxbow Fish Hatchery for spawning and incubation. Final egg incubation and juvenile rearing occur at Niagara Springs Fish Hatchery. Smolts are released within the Hells Canyon reach of the Snake River downstream of Hells Canyon Dam.

Oxbow Fish Hatchery, funded by IPC and operated by IDFG, is located in eastern Oregon immediately upstream of the confluence of Pine Creek and the Snake River at the IPC village known as Oxbow, Oregon (Figure 1). The Hells Canyon Fish Trap is located on the Oregon side of the Snake River immediately below Hells Canyon Dam, approximately 22 miles downstream from Oxbow Fish Hatchery.

The Niagara Springs Fish Hatchery is located in southern Idaho along the Middle Snake River approximately 10 miles south of Wendell, Idaho.

Hells Canyon Spring Chinook salmon

Broodstock for the Hells Canyon spring Chinook salmon program are collected at a trap located approximately 1.5 miles downstream from Rapid River Fish Hatchery and at the Hells Canyon Fish Trap. Approximately 88 to 90 percent of the annual broodstock is collected at the Rapid River Fish Hatchery Trap. Rapid River Fish Hatchery is located on the Rapid River, a tributary to the Little Salmon River approximately 7 miles from the community of Riggins, Idaho.

Adults collected from both sites are managed as a single broodstock. All holding, spawning, and rearing occur at Rapid River Fish Hatchery, except that fish collected at the Hells Canyon Fish Trap are first transported to Oxbow Fish Hatchery for temporary holding before being transported to Rapid River Fish Hatchery. Smolts are released within the Hells Canyon reach of the Snake River downstream of Hells Canyon Dam.

2.1.3.1.2 Operations and Maintenance

Hells Canyon Fish Trap

The Hells Canyon Trap is located on the Oregon shore of the Snake River immediately below Hells Canyon Dam. The trap operates to collect steelhead from late October until the collection goal is reached (typically through November), and then again in April until the collection goal is reached (typically through May). The trap operates from May through June to collect spring Chinook salmon.

Operation

The trap consists of an attraction channel with approximately 250 feet of fish ladder, a trap (holding area), and a loading hopper. Vertical turbine pumps provide 18 cubic feet per second (cfs) of river water to operate the fish ladder. In addition, 112 cfs of pumped river water is provided in the form of attraction flow to encourage spring Chinook salmon and steelhead to enter the fish ladder. During processing, fish move from the trap into the loading hopper and are hoisted approximately 80 feet to a transport truck. Fish are then transported to Oxbow Fish Hatchery. Incidentally caught bull trout are transported and released bellow Hells Canyon Dam (IDFG et al. 2015, p. 16).

Routine Maintenance

Routine maintenance may include minor debris removal from inside the trap and minor annual flushing to remove debris. Due to the high water velocity in the area, the likelihood is low that increased turbidity would be measurable as flushed sediments move downstream.

Semi-routine Maintenance

Discharge from Hells Canyon Dam greater than 40,000 cfs has the potential to inundate the trap. High flow events of this nature and the associated need to remove debris from the trap occur on average, once every 5 years. Any woody debris present in the water during such high flow events has the potential to be deposited in the trap. Extreme high flows of this nature can also deposit cobble and rubble within the fish ladder, hampering trap operation. Immediate removal of all such debris is necessary to restore normal trapping operation.

Rock and woody debris removal is accomplished with a crane and clamshell bucket operated from the embankment above the Hells Canyon Trap. This work is typically done in April or May when Snake River discharge falls below 40,000 cfs. Work is usually completed by mid-May so that the trap may operate to collect spring Chinook salmon. No machinery is placed in or near the river channel, thus eliminating any risk of fuel or oil contamination. Woody debris and rock removed from the trap may be loaded onto trucks for offsite disposal or may be returned to the river channel for natural redistribution downstream. Due to the large size of the substrate removed from the trap and the high water velocity in the area, the likelihood of transporting fine sediments downstream is minimal.

Oxbow Fish Hatchery

Oxbow Fish Hatchery is located on the Oregon side of the Snake River approximately 23 miles upstream from Hells Canyon Dam. The hatchery was constructed in 1961 as an experimental facility for evaluating the feasibility of supplementing Snake River fall Chinook salmon populations through artificial propagation. In 1965 new concrete holding ponds were built to accommodate adult steelhead and the collection of broodstock for artificial propagation, which began in September 1965. The hatchery operates year-round and is currently used for holding, spawning, and incubation for Hells Canyon summer steelhead; for holding Hells Canyon spring Chinook salmon; and for holding, spawning, and incubation of Little Salmon River summer steelhead. Because of space limitations, some incubation of Rapid River spring Chinook salmon eggs also occurs. No fish from any programs included in this Opinion are collected or released at Oxbow Fish Hatchery.

Operation

Oxbow Fish Hatchery is supplied with both surface water pumped from the Snake River and groundwater pumped from two wells. The hatchery withdraws groundwater per IPC’s water rights granted in permit #G 15440 by the Oregon Water Resources Department (OWRD). Groundwater is used exclusively for egg incubation purposes. Water for adult holding is pumped from the Snake River by two 100-horsepower production pumps that each deliver 8,000 gallons per minute (gpm) and have separate power sources. Only one pump operates at a time, so the second pump acts as an emergency backup. Approximately 15.5 cfs are pumped year-round, except in August and September when no surface water is withdrawn. River water is pumped through a NMFS compliant T-screen and then passes over a wedge wire screen to filter out organic matter. Water then flows through two aeration pump platforms before entering four adult ponds. Snake River water temperatures at this site vary throughout the year from seasonal lows of 1.1degrees Celsius (ºC) (34 degrees Fahrenheit (°F)) in the winter to seasonal highs of 22.2ºC (72°F) in the late summer.

River water from the adult holding ponds and groundwater from the incubation room both discharge to the Snake River. The in-river distance between the hatchery intake and discharge is about 180 feet. Because the hatchery produces less than 20,000 pounds of fish per year and distributes less than 5,000 pounds of feed at any one time, no NPDES wastewater permit is required.

Routine Maintenance

Normal and preventative maintenance of hatchery facility structures and equipment is necessary for proper functionality. Normal activities include pond cleaning, pump maintenance, building maintenance, and ground maintenance. Debris removal from intake and outfall structures may be required annually. Work would likely be conducted in May, or from August through mid-November. This is conducted using machinery positioned along the bank. Operation of equipment in the active channel is not required for routine maintenance at this facility.

Semi-routine Maintenance

Semi-routine maintenance may include repairs to various wooden, steel, and concrete structures that are part of water source intakes, discharges, or other systems that may become compromised simply from age and exposure to changing weather conditions or from unique storm events. If such work cannot be accomplished from the riverbank, semi-routine maintenance activities may require the use of in-stream equipment for a few hours in the active channel. No in-stream isolation, coffer damming or dewatering is included under semi-routine maintenance activities. If the operation of in-stream equipment is required for a few hours, such activities would occur during the established in-water work window in coordination with the state resource agencies, and the Services. If a variance to this window is required, no activities would occur until agency approvals are obtained. Impact minimization measures including the use of vegetable based synthetic fuel oil for in-stream equipment (e.g., excavators), are described in Section 2.1.3.4.

Niagara Springs Fish Hatchery

Niagara Springs Fish Hatchery is located on the north bank of the Snake River Canyon in south central Idaho. The hatchery was constructed in 1966 with the expressed goal of producing 200,000 pounds of steelhead smolts annually. Following the signing of the HCSA in 1980, steelhead production goals at the hatchery increased from 200,000 to 400,000 pounds of fish annually. The hatchery operates year-round and is currently used for incubation and rearing for Hells Canyon summer steelhead, Little Salmon River summer steelhead, Salmon River B steelhead, and Pahsimeroi summer steelhead. No fish from any programs addressed in this Opinion are collected or released at Niagara Springs Fish Hatchery.

Operation

IPC holds a water right to divert a total of 120 cfs from Niagara Springs from three distinct diversion points for hatchery operation. The fire suppression system and irrigation system are all supplied with spring water diverted from high on the basalt talus slope above the hatchery and delivered via gravity flow to the hatchery in a 6-inch diameter pipe. Spring water is gravity fed from a second intake structure to the indoor egg incubators and nursery vats. A third intake structure directs spring water to the outdoor rearing raceways. Water from Niagara Springs is a constant 15°C (59°F). Current rearing operations at Niagara Springs Fish Hatchery are conducted under NPDES permit IDG130013.

Routine Maintenance

Due to the steepness of the slope, the natural downward movement of rock within the spring water source can occasionally obstruct the flow of water into the fire suppression/irrigation collection box. Once each spring, hatchery personnel must inspect the spring water source and remove any rocks or vegetation that are restricting the flow of water to the hatchery collection box. No equipment or machinery would be used to remove rocks or vegetation from the collection box area, thus there is no risk of contamination from petroleum products. Other routine activities include pond cleaning, pump maintenance, debris removal from intake and outfall structures, building maintenance, and ground maintenance. Periodic maintenance of the water intake structure including the trash rack, control gate, and discharge weir located within the spring pool is necessary to ensure adequate flow of water to the hatchery. Hatchery personnel must periodically complete a visual inspection of the structures by wading in the diversion pool. Minor repairs may be completed in place by workers using hand tools, whereas more extensive repairs may require certain structural components to be temporarily removed for repair or replacement. If equipment such as a crane or similar device is needed, it will be operated from the streambank and will not enter the spring water diversion pool. In some instances it may be necessary to construct a small coffer dam to isolate the work area from the river to facilitate repair work. Cofferdams would most likely be constructed from sheet piling to reduce the potential for sediment to escape and be transported downstream. Sediment liberated from in-water activity may also create a small sediment plume downstream of the work site for a limited time. Current rearing operations at Niagara Springs Fish Hatchery are conducted under NPDES permit IDG130013. The permit specifies waste discharge standards for net total suspended solids and net total phosphorus. All effluent water discharged to Niagara Springs Creek is monitored regularly for compliance with NPDES standards.

Semi-routine Maintenance

Semi-routine maintenance may include minor repairs to various wooden, steel, and concrete structures that are part of water source intakes, discharges, or other systems that may become compromised simply from age and exposure to changing weather conditions or from unique storm events. The operation of in-stream equipment is not required for semi-routine maintenance activities at this facility.

Rapid River Fish Hatchery and Trap

Rapid River Fish Hatchery is located on the Rapid River near Riggins, Idaho. The adult trap is located 1.5 miles downstream from the hatchery. Construction of the hatchery was completed in 1964 as an experimental facility for propagating spring Chinook salmon, summer steelhead, and to a lesser extent, fall Chinook salmon. Because cold water temperatures caused excessive pre-spawning mortality, abnormal maturation of female fall Chinook salmon, and reduced juvenile steelhead growth rates, efforts to rear fall Chinook salmon and steelhead at the hatchery were abandoned, and the facility was dedicated to spring Chinook salmon production. Following implementation of the HCSA in 1980, the role of the hatchery was formally defined as a production facility for 2 million Rapid River spring Chinook salmon smolts and 1 million Snake River spring Chinook salmon smolts annually. The hatchery operates year-round and is currently used for broodstock collection, spawning, incubation, and rearing of Hells Canyon spring Chinook salmon and Little Salmon River spring Chinook salmon. The trap operates from April through mid-September to collect spring Chinook salmon for the Hells Canyon program and the Little Salmon River program.

Operation

Spring Chinook salmon broodstock are primarily collected at the adult trap located downstream from the hatchery. The facility is designed to trap and hold all adult fish migrating upstream. The trap consists of a permanent concrete velocity barrier, a seven step fish ladder and a two-stage trap. Fish exit the trap via an Alaskan Steep Pass Ladder that terminates at a stainless steel tank. Fish are removed from the tank; inspected for marks, tags, and injuries; and measured for length. Hatchery fish are then loaded into a 500-gallon bucket that is lifted overhead by a hoist to a 1,000-gallon tank truck for transport to the hatchery. All natural-origin and non-target fish are released above the velocity barrier dam.

Trap operation usually begins in mid-March to interrogate wild steelhead and hatchery steelhead strays migrating up Rapid River. Spring Chinook salmon trapping generally begins in late April and lasts through August. The trap is checked daily during the major portion of the spring Chinook salmon run and is shut down after several weeks of no fish being trapped, usually in mid-September. When trapping operations are not in progress, the trap is lowered and allows unimpeded migration of anadromous and resident fish around the velocity barrier.

Both the hatchery and the adult trap are supplied with surface water diverted from the Rapid River. The surface water intake at the Rapid River Hatchery was renovated in the spring of 2017 and is compliant with current NMFS screening criteria (NMFS 2011, entire). Intake renovation impacts on bull trout and their habitat were consulted on in the Rapid River Fish Hatchery Intake Screening and Diversion Project Biological Opinion (USFWS 2016b).

Surface water is obtained through one 30-inch pipe and one 24-inch pipe. An inflatable pneumatic crest gate replaced the wooden dam upstream of the hatchery as part of the renovation in 2017. The hatchery has specific water rights of 28 cfs under Idaho Department of Water Resources (IDWR) water right number A78-02074 and 18.6 cfs of water rights under IDWR water right number A78-07013. Actual withdrawals range from a low of about 16 cfs in May to a high of about 35 cfs in February and December. Water is diverted from the river through the 30-inch pipe into a collection box where it is distributed to the early rearing raceways, incubation building (via one of two 7.5 horsepower electric pumps in the headrace of the raceways), the adult holding ponds, and one of the final rearing ponds. The second final rearing pond receives water through the 24-inch pipe.

Water discharges from the facility either to Rapid River or to Shingle Creek, a tributary to Rapid River, under NPDES permit IDG131009. The in-river distance between intake and discharge back to the river is about 1,700 feet.

Routine Maintenance

The Rapid River has the potential to move large amounts of bed load and woody debris seasonally with spring runoff and intense storm events. As a result, in-river maintenance of the hatchery diversion dam, intake diversion, adult fish trap, and fish ladder is common.

During high annual spring runoff events, gravel and sediment, along with woody debris ranging in size from small tree branches to 3-foot-diameter by 40-foot-long logs may be deposited in the vicinity of the hatchery diversion dam, fish ladder, and water supply intake structure. Large woody debris can damage or render water intake structures and the fish ladder inoperable if it becomes impinged on the diversion dam, ladder exit, or trash rack. As flows decline through the summer, accumulated sediment and debris limit the volume of water that can be diverted to the hatchery for normal operation. Materials must be removed promptly to ensure an uninterrupted supply of water to the hatchery for fish culture operations and fish passage. Similarly, gravel accumulation occasionally impedes the function of the trap during spring Chinook salmon trapping operations and also impedes the ability of bull trout and other resident fish to pass through the ladder as river flows decline later in the year.

Removal of accumulated sediment or woody debris may be accomplished using a variety of techniques ranging from a clamshell style excavation bucket mounted to a crane, to a tracked or rubber-tired excavator. In most cases, excavation equipment does not enter the stream channel and access within the wetted perimeter of the stream is typically limited to workers guiding the operations of the heavy equipment, operating chain saws, setting choker cables, or using hand tools. Using this approach, excavated material is typically loaded into a truck and hauled off site for disposal.

Although in-stream machinery is not typically placed in the active river channel during debris removal operations, at times the volume of in-stream debris may necessitate the use of in-stream equipment. Under such circumstances, the operation of in-stream equipment would occur over a matter of hours during the established in-water work window in coordination with the state resource agencies and the Services. If a variance to this window is required, no activities would occur until agency approvals are obtained. Impact minimization measures associated with the operation of equipment in the active channel include the use of vegetable-based synthetic fuel oil for in-stream equipment (e.g., excavators). Additional measures are described in Section 2.1.3.4. An additional routine maintenance action includes the removal of sediment from the Rapid River Trap. Fine sand and silts accumulate within the trap structure where water velocity is slow. Once or twice each spring Chinook salmon trapping season, hatchery personnel flush this material back to the river channel using high pressure water hoses. The process is completed in less than 1 day and the trap/ladder is returned to normal operation after completion.

Semi-routine Maintenance

The various wooden, steel, and concrete structures that constitute the adult trap, fish ladder, and water supply intake may become compromised simply from age and exposure to changing weather conditions. Hatchery personnel must periodically complete a visual inspection of the structures by entering the river channel with hip boots or waders. Minor repairs may be completed in place by workers using hand tools, whereas more extensive repairs may require portions of these structures to be temporarily removed for repair or replacement. Should removal of these structures be necessary, a crane or similar device operated from the streambank would be employed.

Although heavy equipment would not typically be operated in the wetted stream channel, if semi-routine maintenance can be accomplished in a matter of hours, equipment may be required to enter the wetted channel to conduct the work. If the operation of in-stream equipment is required, such activities would occur during the established in-water work window in coordination with the state resource agencies and the Service. If a variance to this window is required, no activities would occur until agency approvals are obtained. Impact minimization measures, including the use of vegetable-based synthetic fuel oil for in-stream equipment (e.g., excavators), are described in Section 2.1.3.4.

The main road servicing Rapid River Fish Hatchery parallels a drainage ditch that discharges water from the adult holding ponds to Rapid River. Once every 5-10 years, the filled slope of this road requires additional material to maintain the stability of the road bed. The road is sufficiently separated from the drainage ditch so that the movement of any sediment generated from this action can be effectively controlled through the use of fiber wattles and silt fencing placed at the toe of the fill slope. However, it may be necessary for a tracked or rubber-tired excavator to cross the drainage ditch in order to access the work site, causing a minimal amount of disturbance to riparian vegetarian. A small sediment plume of short duration is likely to occur, however, it most likely would not extend downstream to the confluence with Rapid River. Placing machinery within the drainage ditch introduces the potential for fuel or oil contamination.

2.1.3.2 Salmon River Programs

2.1.3.2.1 Description of the Programs

Thirteen Salmon River hatchery programs are covered in this Opinion, seven steelhead programs, and six Chinook salmon programs (Table 4). The Salmon River hatchery programs use facilities both within and outside of the Salmon River Subbasin to collect, spawn, incubate, and rear steelhead and Chinook salmon. Facilities also used by Hells Canyon programs are described in Section 2.1.3.1.

Little Salmon River

<u>Little Salmon River Summer Steelhead</u>

Broodstock for the Little Salmon River summer steelhead program are collected at the Hells Canyon Fish Trap, Lower Pahsimeroi Fish Hatchery, and Dworshak National Fish Hatchery. Fish culture is performed at Oxbow, Niagara Springs, Pahsimeroi, Clearwater, and Magic Valley fish hatcheries. Final egg incubation and juvenile rearing occur at Niagara Springs and Magic Valley fish hatcheries. Smolts are released into the Little Salmon River.

Pahsimeroi Fish Hatchery includes two separate facilities – the Lower Pahsimeroi Fish Hatchery and the Upper Pahsimeroi Fish Hatchery. The Lower Pahsimeroi Fish Hatchery is located on the Pahsimeroi River, approximately 1 mile above its confluence with the mainstem Salmon River near Ellis, Idaho. The Upper Pahsimeroi Fish Hatchery is located approximately 7 miles further upstream on the Pahsimeroi River.

Dworshak National Fish Hatchery and Clearwater Fish Hatchery are located at the confluence of the North Fork and mainstem Clearwater rivers at river mile (RM) 40.4 in the Snake River Basin, Idaho. The Magic Valley Fish Hatchery is located adjacent to the Snake River, approximately 7 miles northwest of Filer, Idaho

<u>Little Salmon River Spring Chinook salmon</u>

Broodstock for the Little Salmon River spring Chinook salmon program are collected at the adult trap located on the Rapid River, approximately 1.5 miles downstream of Rapid River Fish Hatchery, and at the Hells Canyon Fish Trap. All holding, spawning, and rearing occur at Rapid River Fish Hatchery. Some green eggs are transferred from Rapid River fish hatchery to Oxbow fish hatchery for incubation to the eyed stage and then returned to Rapid River for final incubation and rearing.

Table 4. Facilities and general locations utilized for Salmon River Hatchery Programs (Assessment Table 2-2)

Program	Fish Hatchery or Trap				Release
	Broodstock Collection	Spawning	Incubation	Rearing	
Little Salmon River Summer Steelhead	Hells Canyon Fish Trap; Lower Pahsimeroi; Dworshak National[b]	Oxbow;Lower Pahsimeroi; Dworshak National	Niagara Springs; Magic Valley; Clearwater; Oxbow	Niagara Springs; Magic Valley	Little Salmon River
Little Salmon River Spring Chinook salmon	Hells Canyon Fish Trap; Rapid River	Rapid River	Rapid River;Oxbow	Rapid River	Rapid River Ponds; Little Salmon River at Pinehurst
South Fork Salmon River Summer Chinook salmon	South Fork Salmon River Weir	South Fork Salmon River Weir	McCall	McCall	South Fork Salmon River – Knox Bridge
Johnson Creek Spring/Summer Chinook salmon	Johnson Creek Weir	South Fork Salmon River Weir	McCall	McCall	Johnson Creek at Moose Creek
Cabin and Curtis Creeks Summer Chinook salmon Egg Box[a]	South Fork Salmon River Weir	South Fork Salmon River Weir	McCall; Cabin and Curtis Creek Egg Boxes	Cabin Creek; Curtis Creek	Cabin Creek; Curtis Creek
Pahsimeroi A-run Summer Steelhead	Lower Pahsimeroi	Lower Pahsimeroi	Upper Pahsimeroi; Niagara Springs	Niagara Springs	Lower Pahsimeroi Weir
Summer Steelhead Streamside Incubator – Indian and Beaver Creeks	Lower Pahsimeroi	Lower Pahsimeroi	Upper Pahsimeroi; Indian and Beaver Creek Streamside Incubators	Indian Creek; Beaver Creek (Panther Creek)	Indian Creek; Beaver Creek (Panther Creek)
Pahsimeroi Summer Chinook salmon	Lower Pahsimeroi	Lower Pahsimeroi	Upper Pahsimeroi	Upper Pahsimeroi	Upper Pahsimeroi
East Fork Salmon River Natural Steelhead	East Fork Salmon River Weir	East Fork Salmon River Weir	Sawtooth; Hagerman National	Hagerman	East Fork Salmon River Weir
Upper Salmon River A-run Steelhead	Sawtooth	Sawtooth	Sawtooth; Hagerman National; Magic Valley; Upper Pahsimeroi	Hagerman National; Magic Valley	Sawtooth Weir;

Program	Fish Hatchery or Trap				Release
	Broodstock Collection	Spawning	Incubation	Rearing	
Salmon River B-run Steelhead	Lower Pahsimeroi; Dworshak National[b]; Yankee Fork[b]	Lower Pahsimeroi; Dworshak National[b]; Yankee Fork[b]	Clearwater; Magic Valley	Magic Valley,	Yankee Fork; Lower Pahsimeroi Weir, Little Salmon River
Summer Steelhead Streamside Incubator – Yankee Fork	Pahsimeroi; Yankee Fork; Dworshak National	Sawtooth; Pahsimeroi; Dworshak	Sawtooth,;Pahsimeroi;Yankee Fork;Streamside Incubators	Yankee Fork: Ramey Creek; Cearly Creek; Jordan Creek; Swift Gulch; Greylock Creek	Yankee Fork: Ramey Creek; Cearly Creek; Jordan Creek; Swift Gulch; Greylock Creek
Upper Salmon River Spring Chinook salmon	Sawtooth	Sawtooth	Sawtooth	Sawtooth	Sawtooth Weir Yankee Fork

[a] Dollar Creek program through 2016.

[b]Long-term goal is to phase out use of Dworshak stock in the Salmon River

South Fork Salmon River

South Fork Salmon River Summer Chinook salmon

Broodstock for the South Fork Salmon River summer Chinook salmon program are collected at the South Fork Salmon weir located on the South Fork Salmon River, approximately 70.2 miles upstream from the mouth. Fish are held at the South Fork Salmon weir holding facility (South Fork Salmon satellite) for spawning. Eggs are transferred to McCall Fish Hatchery for incubation, and the portion of production destined for the South Fork Salmon River is also reared to smolts at McCall Fish Hatchery. Smolts are released in the South Fork Salmon River at Knox Bridge, approximately 1 mile upstream from the weir.

McCall Fish Hatchery is located approximately 0.4 miles south of State Highway 55 in the city limits of McCall, Idaho. The adult weir and trap located on the South Fork Salmon River are considered a satellite facility of the hatchery.

Johnson Creek Summer Chinook salmon

Broodstock for the Johnson Creek spring/summer Chinook salmon program are collected at a temporary picket weir and trap located approximately 5 miles above the confluence of Johnson Creek and the East Fork of the South Fork of the Salmon River. Fish are transported to and held at the South Fork Salmon satellite for spawning. Eggs are transferred to McCall Fish Hatchery for incubation, and the portion of production destined for Johnson Creek is also reared to smolts at McCall Fish Hatchery. Smolts are direct released in Johnson Creek at Moose Creek.

Unlike the other hatchery programs described in this Opinion, the Johnson Creek Spring/Summer Chinook salmon program includes a directly-related RM&E component. A rotary drum screw trap is operated throughout the annual migratory period to capture natural origin juveniles. The trap is located 3.8 miles above the confluence of Johnson Creek and the East Fork of the South Fork of the Salmon River. Adult monitoring activities in Johnson Creek near the weir include multiple-pass pre-spawning mortality, spawning ground (i.e., redd), and carcass surveys (see section 2.1.3.3).

Cabin and Curtis Creeks Summer Chinook salmon Egg Box

This program was located in Dollar Creek through 2016, but is now located in Cabin and Curtis Creeks. Eggs for the summer Chinook salmon egg box program are sourced from production at McCall Fish Hatchery. Adult broodstock are collected at the South Fork Salmon weir. Eggs are placed in six egg boxes located in lower Cabin Creek and six boxes located in lower Curtis; both creeks are in the South Fork Salmon River watershed upstream of the South Fork Salmon weir. After hatching, fry volitionally migrate from egg boxes to the stream.

Pahsimeroi River

Pahsimeroi River Summer Steelhead

Broodstock for the Pahsimeroi summer steelhead program are collected at the Lower Pahsimeroi Fish Hatchery through use of a weir that spans the Pahsimeroi River and diverts adults through an attraction canal and a fish ladder. Egg incubation is conducted at Upper Pahsimeroi Fish Hatchery, and final incubation and rearing are conducted at Niagara Springs Fish Hatchery. Smolts for the program are released directly into the Pahsimeroi River below the weir[9].

Summer Steelhead Streamside Incubator – Indian and Beaver Creeks

Eggs for the Indian and Beaver creeks summer steelhead streamside incubator program are sourced from production at Pahsimeroi Fish Hatchery. Eggs are placed in incubators located in Indian Creek, a direct tributary of the Salmon River, and at the confluence of Beaver Creek and Panther Creek (Panther Creek is a direct tributary of the Salmon River). In Indian Creek, two streamside incubators are located approximately 0.6 mile upstream from the confluence with the Salmon River. Four streamside incubators are located at the confluence of Beaver Creek and Panther Creek. After hatching, fry volitionally migrate from egg boxes to the stream.

Pahsimeroi River Summer Chinook salmon

Broodstock for the Pahsimeroi summer Chinook salmon program are collected at the Lower Pahsimeroi Fish Hatchery through use of the adult weir. Adults are held and spawned at the lower facility. Incubation and rearing is conducted at Upper Pahsimeroi Fish Hatchery. Hatchery-origin yearling smolts are volitionally released from two holding ponds at the Upper Pahsimeroi Fish Hatchery in mid- to late-April.

[9] The Yankee Fork steelhead eggbox program may use eggs from Salmon River B run steelhead broodstock collected at Pahsimeroi (Hebdon 2017b, *in litt*).

East Fork Salmon River

East Fork Salmon River Natural Steelhead

Broodstock for the East Fork Salmon River steelhead program are collected at an adult trapping facility on the East Fork Salmon River located 18 miles upstream of the river's mouth. The facility includes a velocity barrier, an associated adult trap, and raceways for limited temporary adult holding. It is located upstream of significant components of natural spawning habitat; therefore, success of the program may require that the weir be relocated to an area closer to the river mouth. However, potential future relocation of the trapping facility is not part of the proposed action in this Opinion; operation of the existing velocity barrier is part of the proposed action.

Fish are spawned at the East Fork Salmon River satellite facility. Green eggs collected at the satellite facility are transported to Sawtooth Fish Hatchery located near the headwaters of the Salmon River approximately 400 miles upstream from the mouth of the Salmon River. At Sawtooth Fish Hatchery, the eggs are incubated to the eyed stage of development. Eyed eggs are then transported to Hagerman National Fish Hatchery where incubation and rearing to smolts occur. Smolts are transported back to the East Fork Salmon River satellite and released near the adult trap.

Upper Salmon River

Upper Salmon A-Run Steelhead

Broodstock for the Upper Salmon River A-run steelhead program are collected at the Sawtooth Fish Hatchery. Eggs are incubated at the Sawtooth Fish Hatchery until the eyed stage and then are transferred to Hagerman National Fish Hatchery and Magic Valley Fish Hatchery for final incubation and rearing. Juveniles are transported to the release site at the Sawtooth Fish Hatchery weir.

Salmon River B-Run Steelhead

The Salmon River B-run steelhead program includes collecting Upper Salmon B-Run steelhead broodstock on the Yankee Fork Salmon River. Current broodstock collection is conducted using temporary weirs installed into the outlet of off-channel ponds on the Yankee Fork Salmon River (Yankee Fork). A permanent weir facility to be constructed in conjunction with the SBT Crystal Springs Hatchery Facility is in the planning stage. The SBT propose to construct a weir and spawning facility near the site of the Pole Creek Campground on the Yankee Fork. The SBT would operate the weir to collect broodstock and spawn the adults. Construction of the proposed weir on Yankee Fork is not part of the proposed action, but operations related to the collection of Salmon River B-Run steelhead are part of the proposed action.

During the transition phase of the program, broodstock may be collected in the Yankee Fork at either the temporary picket weir or permanent SBT weir, the Pahsimeroi Weir, or sourced at Dworshak National Fish Hatchery. Smolts from Dworshak origin-spawning would continue to be included in the program and would be released in the Pahsimeroi River. Eggs collected at Dworshak National Fish Hatchery are incubated to the eyed stage at Clearwater Fish Hatchery and then transferred to Magic Valley Fish Hatchery for final incubation and rearing. Release of yearling smolts from Magic Valley Fish Hatchery occurs in the Yankee Fork Salmon River, the Pahsimeroi River immediately downstream of the adult weir, and in the Little Salmon River.

Release into acclimation ponds located on Squaw Creek, a tributary to the Upper Salmon River, was discontinued in 2016.

Summer Steelhead Streamside Incubator – Yankee Fork

Eggs for the Yankee Fork summer steelhead streamside incubator program are sourced from production at Yankee Fork, Pahsimeroi, or Dworshak fish hatcheries. Eggs are placed in incubators located in five tributaries of the Yankee Fork: Ramey, Cearly, Jordan, Swift Gulch, and Greylock Creeks. Two incubators are placed at each location. After hatching, fry volitionally migrate from egg boxes to the stream.

Upper Salmon River Spring Chinook salmon

Broodstock for the Upper Salmon River spring Chinook salmon program are collected at the Sawtooth Fish Hatchery. All adult trapping, spawning, incubation, and rearing occur at the Sawtooth Fish Hatchery. Smolts are released into the Salmon River immediately upstream of the hatchery weir and into the Yankee Fork.

2.1.3.2.2 Operations and Maintenance

Clearwater Fish Hatchery

Clearwater Fish Hatchery is located at Ahsahka, Idaho, approximately 45 miles east of Lewiston, Idaho. Construction was completed in 1991. The hatchery operates year-round and is currently used for initial incubation of Dworshak B run steelhead eggs transferred for the Salmon River B-run steelhead program. No fish from any programs included in this Opinion are collected or released at Clearwater Fish Hatchery. Because the hatchery is used for multiple programs in the Clearwater River Subbasin, activities will be described in more detail in a separate Opinion currently being developed for hatchery programs in the Clearwater River Subbasin.

Operation

Clearwater Fish Hatchery receives water through two supply pipelines from Dworshak Reservoir. The warm water intake is attached to a floating platform and can be adjusted from 5 feet to 40 feet below the surface. The cool water intake is stationary at 245 feet below the top of the dam. An estimated 10 cfs is provided by the cool water supply and 70 cfs by the warm water supply. The cool water supply has remained fairly constant between 40°F and 45°F. The warm water can reach 80°F, but is adjusted regularly to maintain 56°F for as long as possible throughout the year. When water temperatures drop in the fall, the intake is moved to the warmest water available until water temperatures rise in the spring. All water is gravity fed to the hatchery. Current, on-going hatchery review will determine if the intakes are in compliance with current (2011) NMFS screening criteria and whether future upgrades may be required.

Maintenance

Because of the limited utility of the Clearwater Fish Hatchery to support Hells Canyon and Salmon River programs under the proposed action, routine and semi-routine maintenance activities at this facility are not part of the proposed action. These activities will be included in a separate Assessment and Opinion currently being developed for hatchery programs in the Clearwater River Subbasin.

Dworshak National Fish Hatchery

Dworshak National Fish Hatchery is located at the confluence of the North Fork and mainstem Clearwater River in Ahsahka, Idaho, 3 miles west of Orofino, Idaho. The broodstock collection system at the hatchery includes a volitional ladder that does not span the entire channel. The hatchery operates year-round and is currently used for the collection of adult broodstock and spawning for Salmon River B-run steelhead, however, the long-term goal is to phase out the use of Dworshak stock in the Salmon River and replace them with B-run steelhead that are locally adapted to the Salmon River. Dworshak B-run steelhead are collected from mid-October through December and from February through April. Because the hatchery is used for multiple programs in the Clearwater River Subbasin, activities are described in more detail in a separate Assessment and Opinion being developed for hatchery programs in the Clearwater River Subbasin.

Operation

The main supply for the Dworshak National Fish Hatchery is river water pumped from the North Fork of the Clearwater River. Six pumps are rated at 15,500 gpm each for a total flow of 93,000 gpm, or 207 cfs. A supply source from Dworshak Reservoir provides water for incubation and nursery rearing. It consists of a 24-inch, warm water supply line and a 14-inch, cold water supply line from the distribution box for the Clearwater Fish Hatchery. The reservoir supply was designed to convey 6,400 gpm, or 14 cfs. Broodstock are held in three 15-foot by 75-foot by 88-foot concrete ponds. Adults in these ponds are crowded into a 370-gallon anesthetic tank. From the ponds, they are lifted to an examining table and are checked for ripeness and either spawned or returned to the holding pond for later examination or outplanting.

Maintenance

Because of the limited utility of the Dworshak National Fish Hatchery to support Hells Canyon and Salmon River programs under the proposed action, routine and semi-routine maintenance activities at this facility are not part of the proposed action. These activities will be included in a separate Assessment and Opinion currently being developed for hatchery programs in the Clearwater River Subbasin.

Magic Valley Fish Hatchery

Magic Valley Fish Hatchery is located 7 miles northwest of Filer, Idaho in the Snake River Canyon. The hatchery has been in operation since 1983, and a new facility was constructed in 1988. The hatchery operates year-round and is currently used for incubation and rearing of Little Salmon River summer steelhead, and for incubation and rearing of upper Salmon River A-run steelhead and Salmon River B-run steelhead. No fish from any programs included in this Opinion are collected or released at Magic Valley Fish Hatchery.

Operation

The hatchery receives water from a spring on the north wall of the Snake River Canyon. The spring (Crystal Springs) is covered to prevent contamination. Water is delivered to the hatchery (87.2 cfs as of 2009) through a 42-inch pipe that crosses the Snake River. The hatchery receives only gravity flow water, and as such, no generator backup system is in place or needed.

Incubation facilities at the Magic Valley Fish Hatchery consist primarily of forty 12-gallon upwelling incubators. Each incubator is capable of incubating and hatching 50,000 to 75,000 eyed steelhead eggs. The hatchery has 32 outside raceways available for juvenile steelhead rearing. Each raceway measures 200 feet long by 10 feet wide by 3 feet deep, and each has the capacity to rear approximately 62,000 fish to release size. A movable bridge, equipped with 16 automatic Nielsen fish feeders spans the raceway complex. Two 30,000 bulk feed bins equipped with fish feed fines shakers and a feed conveyor complete the outside feeding system.

Routine Maintenance

Normal and preventative maintenance of hatchery facility structures and equipment is necessary for proper functionality. Normal activities include pond cleaning, pump maintenance, debris removal from intake and outfall structures, building maintenance, and ground maintenance.

Semi-routine Maintenance

Semi-routine maintenance may include repairs to various wooden, steel, and concrete structures that are part of water source intakes, discharges, or other systems that may become compromised simply from age and exposure to changing weather conditions or from unique storm events. Hatchery personnel must periodically complete a visual inspection of intake and outfall structures, which may require wading. Minor repairs may be completed in place by workers using hand tools, whereas more extensive repairs may require certain structural components to be temporarily removed for repair or replacement. If equipment such as a crane or similar device is needed, it will not enter water.

<u>South Fork Salmon Satellite</u>

The adult weir, trap, and facility located on the South Fork Salmon River are considered a satellite of McCall Fish Hatchery. The satellite is located approximately 70 RM upstream from the mouth of the South Fork Salmon River, about 26 miles east of Cascade, Idaho. The satellite currently operates from mid-June through mid- September for broodstock collection and spawning of South Fork Salmon River summer Chinook salmon; however, on-shore maintenance activities to prepare for facility start-up begin as early as April. Eggs are transferred to McCall Fish Hatchery for incubation and rearing. The weir spans the entire river channel when in operation.

Operation

The satellite facility consists of the bridge/weir, fish ladder, trap, three adult holding ponds (10 feet by 90 feet each), a covered spawning area, and a crew dormitory trailer. Holding capacity for the trap is 400 adults. Holding capacity for the holding ponds is 1,000 adults total. Adults are collected, held, and spawned at the satellite facility. The weir receives water directly from the South Fork Salmon River. About 8 cfs to 11 cfs are supplied through a 33-inch underground pipeline that extends approximately 200 yards from a concrete intake structure upstream of the compound. Facility infrastructure is undergoing review and will be upgraded in the future, as necessary and determined by NMFS and managers, if not compliant with NMFS (2011, entire) criteria. Major upgrades are not considered part of the proposed action and would require a separate section 7 consultation with the Service. The in-river distance between intake and discharge back to the river is about 2,750 feet.

Routine Maintenance

About three to five times each winter, personnel snowmobile into the trap compound to shovel off snow from the crew quarters and from the outhouse/power room. At the end of each trapping/spawning season, domestic water is turned off, all lines are drained/ blown out, and the gas to the crew quarters is turned off.

In April or May each year, prior to opening the control valve of the intake structure, boards in the structure are removed and any woody debris is cleared from grating in the river. When initially opened, water is first bypassed from entering the holding ponds back into the river below the trap's bridge/weir. A pressure nozzle is used to remove sand in the pipeline as well as sand that has deposited in the intake structure. This sediment is discharged back to the river from the intake structure, or returned through the facility and into the river through the facility discharge pipe. Water is typically allowed to flow in this manner for 12-24 hours before being channeled through the ponds.

Upon facility opening in April or May of each year, the ponds are dry and sand accumulations are shoveled out of the ponds and deposited in uplands away from the river channel. Following manual removal, remaining sand deposits are flushed out of the ponds/trap using a pressure nozzle. Once cleaned, dam boards are added to the holding ponds/trap and wedged into place. Prior to passing water through the holding ponds, ladder boards must be inspected and wedged into place as needed. At the end of the season, boards in the holding ponds/trap are removed and walls are inspected for any damage/concrete erosion. Water lines are blown out to prevent damage due to freezing, including those leading to the sorting areas in the spawn area. Occasionally juvenile Chinook salmon are collected when the adult holding ponds are dewatered at the end of the season. Hatchery staff net any stranded fish and release them back to the river.

From about May through September, up to 4 to 5 times per season, hatchery operators use excavators, chainsaws, and winches to remove or pass debris from the weir structure that have been deposited during periods of flooding or high water. In addition, as required (varies from up to two times per season to once every 5 years), operators typically use a long-reach excavator from the existing access road on the bank to remove silt, sand, and/or debris from above and in-front of the intake structure. This debris removal ensures adequate flow can enter the facility unobstructed.

<u>Johnson Creek Weir</u>

The adult weir and trap are located in Johnson Creek approximately 5.1 river miles upstream from the confluence with the East Fork of the South Fork of the Salmon River. The weir is V-shaped and operates from approximately mid-June through mid-September for collection of spring/summer Chinook salmon broodstock. Fish are transferred to the South Fork Salmon satellite for holding and spawning, and eggs are then transferred to McCall Fish Hatchery for incubation. The picket weir spans the entire river channel when in operation, and funnels upstream migrating fish into a trap box at the point of the V.

Operation

To minimize fish holding time, the weir is checked daily. Adults are processed as the weirs are checked. Non-target species are immediately released with minimal handling.

Routine Maintenance

Routine maintenance may include the removal of sediment and debris from the weir or trap. Personnel must periodically complete a visual inspection of the structures by entering the river channel with hip boots or waders. Minor repairs may be completed in place by workers using hand tools, whereas more extensive repairs may require individual weir panels to be temporarily removed for repair or replacement. Although in-stream machinery is not typically placed in the active river channel during panel removal operations, if circumstances necessitate it, equipment may enter the active channel. Under such circumstances, the operation of in-stream equipment would occur over a matter of hours during the established in-water work window in coordination with the state resource agencies and the Service. If a variance to this window is required, no activities would occur until agency authorizations are obtained. Impact minimization measures associated with the operation of equipment in the active channel include the use of vegetable-based synthetic fuel oil for in-stream equipment (e.g., excavators). Additional measures are described in Section 2.1.3.4.

Semi-routine Maintenance

Semi-routine maintenance activities may include the fill of minor scour holes that develop over the course of several seasons under the weir panels. Such fill placement would be accomplished by personnel working in the stream during periods of low flow.

Johnson Creek Screw Trap

A floating rotary screw trap is used to capture emigrating juvenile salmonids in Johnson Creek. The trap is placed downstream of the weir, approximately 4 miles upstream from the confluence with the East Fork of the South Fork of the Salmon River. Trap operation is planned to be continuous; however, there are times when traps cannot be operated due to low flow, freezing conditions, excessive debris, or mechanical breakdowns.

Operation

The screw trap is attached to a cable suspension system anchored by gabion baskets, which allow side to side and upstream/downstream movement of the trap. This permits the trap to be fished in the optimum position during most flow conditions. The trap consists of a trapping cone (1.5 m diameter) supported by a metal A-frame, live box, two 6-meter by 1-meter pontoons for flotation, and a clean-out drum.

The live box of the screw trap is checked every morning (several times throughout each night and day during high water, storms, or ice-up events). Piscivorous fish and large numbers of incidentally captured fish are removed from the live box and scanned for PIT tags. Mortality due to trapping is noted and recorded. Processing procedures are similar to those used by Ashe et al. (1995, entire) and Prentice et al. (1990, entire).

Maintenance

Routine maintenance includes minor repairs, anchor relocation or modification, and sediment and debris removal. Maintenance is typically accomplished by personnel in the river channel and does not require the use of heavy equipment.

Cabin and Curtis Creeks Egg Boxes

Summer Chinook salmon eggs are placed in six egg boxes located in lower Cabin Creek and in six egg boxes located in lower Curtis Creek. Both creeks are tributaries to the South Fork Salmon River. Boxes are placed in mid-October and removed in mid-May.

Operation

Eggs are loaded into Rubbermaid in-stream boxes configured with 1/8 inch mesh sides for flow and 1/4 inch mesh tops for volitional emigration. Egg boxes are placed at sites that were selected and configured with adequate flow to maintain rearing throughout the season. Each box contains approximately 25,000 eggs; therefore approximately 12 boxes are placed each year. Because of the relatively large volumetric size of the boxes, most are placed in pool habitat. Boxes are anchored to the streambed using a combination of rebar and tie wire.

Maintenance

Egg boxes are monitored monthly. Staff records water condition, temperature, dissolved oxygen, conductivity, pH, and embryo stage. Staff also cleans and removes debris from screens as needed.

McCall Fish Hatchery

McCall Fish Hatchery is located approximately 0.4 mile south of State Highway 55 in the city limits of McCall, Idaho. The hatchery was constructed in 1979 as the first LSRCP hatchery built in Idaho. The facility was built to rear summer Chinook salmon. The hatchery operates year-round and is currently used for incubation and rearing of South Fork Salmon River summer Chinook salmon. No fish from any programs included in this Opinion are collected or released at McCall Fish Hatchery.

Operation

McCall Fish Hatchery receives water through an underground, 36-inch gravity line from Payette Lake. Water may be withdrawn from the surface or up to a depth of 50 feet. IDFG has an agreement with the Payette Lake Reservoir Company to withdraw up to 20 cfs. All water used for fish culture passes through the hatcheries outdoor settling basin to remove settable solids prior to being discharged into the North Fork Payette River.

Incubation plumbing allows for the placement of 26 eight-tray, vertical incubation stacks (Heath type) along the south wall of the hatchery building and removable pipes between three sets of early rearing vats may be lowered into place to provide additional incubation capacity. Rearing facilities include 14 concrete vats (4 feet wide by 40 feet long by 2 feet deep) used for early rearing, two concrete ponds (40.5 feet wide by 196 feet long by 4 feet deep) used for final rearing, and one concrete collection basin (101 feet wide by 15 feet long by 4 feet deep).

Routine Maintenance

Normal and preventative maintenance of hatchery facility structures and equipment is necessary for proper functionality. Normal activities include pond cleaning, pump maintenance, debris removal from intake and outfall structures, building maintenance, and ground maintenance. Annual maintenance includes visual inspection of the intake surface, pressure washing of the intake screen, inspection of water control valves, and applying grease as needed to ensure smooth operation. Woody debris and other materials may need to be removed prior to opening the surface intake valve.

Semi-routine Maintenance

Semi-routine maintenance may include repairs to various wooden, steel and concrete structures that are part of water source intakes, discharges, or other systems that may become compromised simply from age and exposure to changing weather conditions or from unique storm events. Although in-stream machinery is not typically placed in the active river channel during repairs, if circumstances necessitate it, equipment may enter the active channel. Under such circumstances, the operation of in-stream equipment would occur over a matter of hours during the established in-water work window in coordination with the state resource agencies and the Service. If a variance to this window is required, no activities would occur until agency authorizations are obtained. Impact minimization measures associated with the operation of equipment in the active channel include the use of vegetable-based synthetic fuel oil for in-stream equipment (e.g., excavators). Additional measures are described in Section 2.1.3.4.

Periodic inspection of the deep intake by professional divers and video inspection of water pipelines should be performed on a 25-30 year cycle. The last such inspection took place in August 2014.

<u>Lower Pahsimeroi Fish Hatchery and Weir</u>

The Lower Pahsimeroi Fish Hatchery is located along the Pahsimeroi River about 20 miles north of Challis, Idaho. The lower hatchery is located about 1 mile upstream from the Salmon River confluence near Ellis, Idaho. The facility includes a channel spanning weir to aid in broodstock collection. The adult fish trap and fish ladder are located within the migration corridor of summer Chinook salmon, steelhead, and bull trout. The lower hatchery originally served as a trapping and spawning facility for summer steelhead. Following implementation of the HCSA in 1980, the role of the hatchery was expanded to include the annual production of 1 million summer Chinook salmon smolts. Currently, the weir operates from mid-February through May to collect Little Salmon River A-run summer steelhead, Pahsimeroi River A-run summer steelhead, and Salmon River B-run steelhead. The weir also operates from June through September to collect Pahsimeroi summer Chinook salmon. Broodstock are spawned at the Lower Pahsimeroi Fish Hatchery and then eggs are transferred for incubation at the Upper Pahsimeroi Hatchery or at other facilities.

Operation

The removable weir, renovated in 2017, diverts adults through an attraction canal and a fish ladder supplied with up to 40 cfs of river water during the collection period. The adult trap consists of a concrete pond measuring 70 feet long by 16 feet wide by 6 feet deep. The trap is situated between two additional concrete ponds (each measuring 70 feet long by 16 feet wide by 6 feet deep) that are used as the adult holding ponds. Fish volitionally migrate into the adult trap where they are manually sorted into the adult holding ponds. The trap is checked daily. Fish are examined for fin clips, measured to the nearest centimeter for fork length, and identified by sex. Adults retained for artificial propagation are placed in the holding pond to wait for spawning. Other fish are released upstream.

Water from the Pahsimeroi River is supplied to the Lower Pahsimeroi Fish Hatchery through a 0.25-mile earthen intake canal. The intake diversion and fish bypass were renovated in 2017. Water from the canal is also used to supply the four early rearing raceways. The intake canal is equipped with NMFS-approved, rotating drum screens designed to prevent entrainment of wild anadromous and resident fish in the hatchery facility. The in-river distance between intake and discharge back to the river is about 1,980 feet. A small, pathogen–free, spring water source supplies water to the spawning building and hatchery building for rinsing and water hardening green eggs.

Routine Maintenance

Following periods of high flow, typically two-five times per year, sand, gravel, and woody debris accumulates in front of the adult fish weir and entrance to the fish ladder and trap. This accumulation of material restricts river flow and may encourage bank erosion, resulting in further sedimentation or damage to hatchery structures and equipment. Removal of accumulated sediment or woody debris may be accomplished using a variety of techniques ranging from a clamshell style excavation bucket mounted to a crane, to a tracked or rubber-tired excavator. In most cases, the excavator bucket enters the stream channel, but equipment does not. Access within the wetted perimeter of the stream is limited to workers guiding the operation of the crane or excavator. However, if the volume or location of in-stream debris necessitates the use of in-stream equipment, such operations would occur during the established in-water work window in coordination with the state resource agencies and the Service. If a variance to this window is required, no activities would occur until agency approvals are obtained. Impact minimization measures associated with the operation of equipment in the active channel include the use of vegetable-based synthetic fuel oil for in-stream equipment (e.g., excavators). Additional measures are described in Section 2.1.3.4. In all cases, excavated materials or removed debris would be loaded into a truck and hauled off site for disposal.

Semi-routine Maintenance

Aside from damages or loss of functionality related to high water events, the integrity of the adult weir should not be compromised as renovation was completed fall of 2017. Hatchery personnel must periodically complete a visual inspection of the structures by entering the river channel with hip boots or waders. Minor repairs may be completed in place by workers using hand tools, while more extensive repairs may require individual weir panels to be temporarily removed for repair or replacement. Should removal of these structures exceed the lifting capability of hatchery personnel, a crane or similar device operated from the streambank would be employed. If in-stream repairs are required in lieu of full panel replacement, and if necessitated by circumstances, equipment (e.g., small excavator) may enter the active channel. Under such circumstances, the operation of in-stream equipment would occur over a matter of hours during the established in-water work window in coordination with the state resource agencies and the Service. If a variance to this window is required or if a longer duration of in-stream work is necessary, no activities would occur until agency authorizations are obtained. Impact minimization measures associated with the operation of equipment in the active channel include the use of vegetable-based synthetic fuel oil for in-stream equipment (e.g., excavators). Additional measures are described in Section 2.1.3.4.

Upper Pahsimeroi Fish Hatchery

The Upper Pahsimeroi Fish Hatchery is the primary facility on the Pahsimeroi River and is located in May, Idaho, approximately 8 miles upstream from the lower facility. The hatchery was constructed in 1967 as an acclimation facility for summer steelhead smolts that were transported from Niagara Springs Fish Hatchery and eventually released into the Pahsimeroi River. Following implementation of the HCSA in 1980, the role of the Pahsimeroi Fish Hatchery was expanded to include the production of 1 million summer Chinook salmon smolts annually. The upper hatchery operates year-round and is currently used for initial incubation of Pahsimeroi summer steelhead and upper Salmon River A-run steelhead, and all incubation and rearing of Pahsimeroi summer Chinook salmon. No fish from any programs included in this Opinion are collected at the facility.

Operation

The Upper Pahsimeroi Fish Hatchery operates on a combination of well water and river water. The intake diversion and fish bypass ladder were renovated in 2017. Summer steelhead eggs are incubated solely on well water pumped from three on-site wells. Summer Chinook salmon eggs are incubated until swim-up in this location and then are transferred to nearby early rearing vats. Up to 14 cfs of well water is pumped to an elevated aeration tank for gas abatement before flowing via gravitational force to egg incubators and rearing vats located within the hatchery building.

Final rearing of Pahsimeroi summer Chinook salmon occurs in the two concrete rearing ponds supplied with surface water from a diversion in the Pahsimeroi River. Water is diverted down an open concrete canal before entering a buried pipe for delivery to the rearing ponds. NMFS-approved rotating drum screens are installed at the intake canal to prevent entrainment of wild fish into the hatchery facility. IPC holds a water right to divert 20 cfs of river water at the Upper Pahsimeroi Fish Hatchery, allowing approximately 10 cfs of flow to each rearing pond. Incubation, early rearing, and outdoor rearing are managed within available water rights. The in-river distance from intake to discharge back to the river is about 800 feet. Current rearing operations at the upper hatchery are conducted under NPDES permit IDG130039. The permit specifies waste discharge standards for net total suspended solids (TSS) and net total phosphorus (TP). Yearling summer Chinook salmon smolts are volitionally released from these ponds directly to the Pahsimeroi River in late-March to mid-April.

Routine Maintenance

Sediment and small woody debris are annually (or more frequently) deposited in the vicinity of river water intake structure. Similar material is deposited within the canals that deliver surface water to the various fish culture containers. This accumulation of sediment and debris has the potential to restrict the flow of water diverted to the hatchery and interfere with the operation of fish bypass screens and pipes designed to protect natural-origin salmon and steelhead from entrainment into the hatchery. Materials must be removed annually to ensure an uninterrupted supply of water for fish culture operation. Removal of accumulated sediment or woody debris is accomplished using a bulldozer to move material to an excavator positioned on the canal bank. The excavator removes material from the canals and deposits it onsite or places it in transport vehicles for offsite, upland disposal. This activity typically occurs in the last week of April or first week of May, on an annual basis. A silt fence is deployed inward from the intake to limit downstream sedimentation. Gravel-filled bags are placed on the bottom of the silt fence to maintain the in-stream position of the fencing.

The two fish bypass screens and associated pipes located within the river water intake canals also require annual maintenance. This involves removing the screens for inspection and repair of seals, drive sprockets, chains and bearings, as well as lubrication of moving parts.

These maintenance activities can be completed when the hatchery facility is out of operation. Therefore, to limit potential impact to listed species, slide gates are closed and the intake canal is dewatered and isolated from the river channel before any maintenance work commences. Further, sediment generated from this activity cannot be discharged to the river.

Should the bypass pipes that return entrained fish to the river become plugged with sediment or woody debris, they may require cleaning with high pressure water nozzles. Unlike other maintenance activities, this does result in some sediment and woody debris being flushed directly into the river. A small sediment plume is created, but the volume of material flushed from the pipe is expected to be less than 0.25 cubic yards.

Semi-routine Maintenance

Once every 5 to 10 years, minor streambank armoring areas must be repaired, entailing the replacement of lost rock. In most cases, any machinery used for rock replacement would be operated from outside the wetted perimeter of the stream to avoid the possibility of fuel or oil entering the water. However, if the operation of in-stream equipment is required, such activities would occur over a matter of hours during the established in-water work window in coordination with the state resource agencies, and the Services. Impact minimization measures including the use of vegetable based synthetic fuel oil for in-stream equipment (e.g., excavators), are described in Section 2.1.3.4.

Indian and Beaver Creek Streamside Incubators

Summer steelhead eggs are placed in streamside incubators in Indian Creek and at the confluence of Beaver and Panther creeks. Incubators are placed in May and removed in early- to mid-July.

Operation

One incubator is placed in Indian Creek and four are placed in Beaver Creek. The incubators (and catch tanks) are gravity fed with constant flow river water. Incubators are standardized with 2-inch PVC pipe with a 3-inch head pipe to collect additional flow from the stream. Each head pipe is fitted with ¼-inch mesh screen to minimize sediment and debris collection. Each incubator consisted of a 50-gallon polyurethane cylinder with a sediment tray, gravel, saddles, six egg trays, and one cover tray to contain eggs until hatching. Each catch tank is a 30-gallon Rubbermaid polyurethane tub with a custom fit cover.

Eyed eggs are reared in the incubator and hatch as alevins. Once hatching occurs, personnel enumerate dead eggs and remove trays from the incubators. Fry volitionally migrate from the upweller to the catch tank, and upon swim-up, volitionally leave the catch tank to the natural stream.

Maintenance

Incubators are monitored monthly. Staff record water condition, temperature, dissolved oxygen, conductivity, pH, and embryo stage. Staff also clean and remove debris from screens as needed.

East Fork Salmon River Satellite

The East Fork Salmon River satellite, including the adult weir and trap, is located on the East Fork Salmon River. It is a satellite facility of the Sawtooth Fish Hatchery. The satellite is located approximately 18 miles upstream of the confluence of the East Fork with the mainstem Salmon River. The weir spans the entire channel, and is currently operated from March through May to collect East Fork Salmon River steelhead broodstock. Broodstock are spawned at the facility and then eggs are transferred to other facilities for rearing.

Operation

The facility is generally staffed with one full-time employee during the trapping season. Adult fish not selected for broodstock purposes are released upstream of the facility. In addition, natural males may be held temporarily, partially stripped of milt, and released upstream to spawn.

The satellite receives water from the East Fork Salmon River. Approximately 15 cfs are delivered to the facility during the collection period through a gravity line and routed to adult holding raceways. Facility infrastructure is undergoing review and will be upgraded in the future, as necessary and determined by NMFS and managers, if not compliant with NMFS (2011, entire) criteria. The in-river distance between intake and discharge back to the river is about 200 feet. A well provides domestic water and a pathogen-free supply for egg water hardening in the spawning process. Protocols are also in place to guide the disinfection of equipment and gear to minimize risks associated with the transfer of potential disease agents.

Routine Maintenance

Following periods of high flow (up to five times) per operational period, large woody debris accumulates in front of the radial gates and intake screen for the trap. This large woody debris accumulation restricts river flow and may encourage bank erosion, resulting in further sedimentation or damage to hatchery structures and equipment. Removal of accumulated sediment or woody debris may be accomplished using a variety of techniques ranging from a clamshell style excavation bucket mounted to a crane, to a tracked or rubber-tired excavator. In most cases, excavation equipment enters the stream channel to remove debris over a matter of a few hours. Excavated material is loaded into a truck and hauled off site for upland disposal. A small, short duration sediment plume is anticipated during the excavation process.

Semi-routine Maintenance

Once every 5 to 10 years, minor streambank armoring areas must be repaired, entailing the replacement of lost rock. In most cases, any machinery used for rock replacement would be operated from outside the wetted perimeter of the stream to avoid the possibility of fuel or oil entering the water. However, if the operation of in-stream equipment is required, such activities would occur over a matter of hours during the established in-water work window in coordination with the state resource agencies and the Service. Impact minimization measures including the use of vegetable based synthetic fuel oil for in-stream equipment (e.g., excavators), are described in Section 2.1.3.4.

All LSCRP facilities, including East Fork Satellite Facility, are currently being reviewed to determine compliance needs related to NMFS screening and passage criteria (NMFS 2011, entire). If upgrades are determined necessary to achieve compliance, in-stream activities would be considered non-routine maintenance and would be covered under a separate, project-specific section 7 consultation.

Sawtooth Fish Hatchery and Weir

Sawtooth Fish Hatchery is located on the upper Salmon River about 5 miles south of Stanley, Idaho. The hatchery was constructed in 1985 to rear spring Chinook salmon and collect eggs from steelhead. IDFG receives funding from the LSRCP to operate and maintain the Sawtooth Fish Hatchery.

The hatchery currently operates year-round and is used for incubation of East Fork Salmon River steelhead; broodstock collection, spawning, and incubation of upper Salmon River A-run steelhead; and broodstock collection, spawning, incubation, and rearing of upper Salmon River spring Chinook salmon. The adult collection weir is channel spanning and operates from March through April to collect upper Salmon River A-run steelhead, and from June through September to collect upper Salmon River spring Chinook salmon.

Operation

Adult collection at the hatchery is conducted at a permanent weir that spans the Salmon River. Weir panels are installed to prevent the upstream migration of adult Chinook salmon. Fish volitionally migrate into the adult trap where they are manually sorted into adult holding raceways. The hatchery has three 167 feet long by 16 feet wide by 5 feet deep holding raceways and an enclosed spawning building. Each raceway has the capacity to hold approximately 1,300 adults.

The hatchery receives water from the Salmon River and from five wells. The hatchery surface water right is approximately 60 cfs and the groundwater right is approximately 9 cfs. The amount of water actually withdrawn from the river ranges from about 22 cfs in winter to about 33 cfs in fall. Surface water enters an intake structure upstream of the hatchery and is diverted through intake screens. Facility infrastructure is undergoing review and will be upgraded in the future, as necessary and determined by NMFS and managers, if not compliant with NMFS (2011, entire) criteria. River water flows from the collection site to a control box located in the hatchery building where it is screened to remove fine debris. The in-river distance between intake and discharge is about 4,850 feet.

Incubation and early rearing water needs are met by three primary wells. A fourth well provides tempered water to control the build-up of ice on the river water intake during winter months. The fifth well provides domestic water for the facility. The hatchery is staffed around the clock and equipped with an alarm system. The hatchery well water supply system is backed up by generator power. The inside vat room can be switched to gravity flow with river water in the event of a generator failure. Protocols are in place to guide emergency situations during periods of time when the hatchery well water supply is interrupted. Protocols are also in place to guide the disinfection of equipment and gear to minimize risks associated with the transfer of potential disease agents.

Routine Maintenance

Hatchery operators typically remove in-stream debris from the area in front of the intake structure in July and August, annually. In addition, following periods of high flow, sand, gravel, and small woody debris may accumulate in front of the adult fish weir, entrance to the fish ladder and trap, and water supply intake structures. This accumulation restricts river flow and may encourage bank erosion, resulting in further sedimentation or damage to hatchery structures and equipment. Removal of accumulated sediment or woody debris may be accomplished using a variety of techniques ranging from a clamshell style excavation bucket mounted to a crane, to a tracked or rubber-tired excavator. In most cases, excavation equipment will need to enter the stream channel for a matter of a few hours. Under such circumstances when in-stream equipment use is required, such activities would occur during the established in-water work window or an approved variance in coordination with the state resource agencies and the Service. Impact minimization measures, including the use of vegetable-based synthetic fuel oil for in-stream equipment (e.g., excavators), are described in Section 2.1.3.4. Excavated material would be loaded into a truck and hauled off site for upland disposal. A small, short duration sediment plume is anticipated during the excavation process.

The removal of materials as described herein may occur as frequently as once each year, depending upon the magnitude of spring runoff. To minimize impacts on in-stream habitat and aquatic species, some maintenance activities are completed when the hatchery is out of operation. In these cases, hatchery operators close the slide gates and dewater the intake before any maintenance work commences. Just as gravel, sediment, and small woody debris is deposited in the vicinity of river water intake structures, similar material is deposited within the canal that delivers surface water to the hatchery irrigation ditch. This accumulation of sediment and debris has the potential to restrict the flow of water diverted to the ditch. Materials must be removed annually to ensure an uninterrupted supply of water for irrigation. Removal of accumulated sediment or woody debris is accomplished using a bulldozer to move material to an excavator positioned on the canal bank. The excavator can remove material from the canal and deposit it on site or in transport vehicles for offsite upland disposal.

Should the bypass pipes that return entrained fish to the river become plugged with sediment or woody debris, they may require cleaning with high pressure water nozzles. This activity results in some sediment and woody debris being flushed directly into the river channel. A small sediment plume will likely be created. The volume of material flushed from the pipe is expected to be less than 0.25 cubic yards. A sediment plume will persist for a short distance downstream. Flushing activities occur at low frequency (once every 5-10 years) and duration (1 hour), and discharge less than 0.25 cubic yards of material, resulting in a sediment plume persisting for less than 50 yards downstream.

Semi-routine Maintenance

Aside from damages or loss of functionality related to high water events, the integrity of the adult weir and other hatchery facilities may be compromised simply by age and exposure to changing weather conditions. Hatchery personnel must periodically complete a visual inspection of the structures by entering the river channel with hip boots or waders. Minor repairs may be completed in place by workers using hand tools, whereas more extensive repairs may require individual weir panels to be temporarily removed for repair or replacement. Should removal of these structures exceed the lifting capability of hatchery personnel, a crane or similar device operated from the streambank would be typically employed.

Once every 5 to 10 years, minor streambank armoring areas must be repaired, entailing the replacement of lost rock. In most cases, any machinery used for rock replacement would be operated from outside the wetted perimeter of the stream to avoid the possibility of fuel or oil entering the water. However, if the operation of in-stream equipment is required, such activities would occur over a matter of hours during the established in-water work window in coordination with the state resource agencies and the Service. Impact minimization measures, including the use of vegetable based synthetic fuel oil for in-stream equipment (e.g., excavators), are described in Section 2.1.3.4.

All LSCRP facilities, including Sawtooth Fish Hatchery, are currently being reviewed to determine compliance needs related to NMFS screening and passage criteria (NMFS 2011, entire). If upgrades are determined necessary to achieve compliance, in-stream activities would be considered non-routine and would be covered under a separate, project-specific section 7 consultation.

Hagerman National Fish Hatchery

Hagerman National Fish Hatchery is located near Hagerman, Idaho, about 30 miles west of Twin Falls at the Thousand Springs Reach of the Snake River. Facility construction of the hatchery commenced in 1932, and fish production began in 1933. The primary goal of the hatchery at that time was the production of rainbow trout for stocking in Idaho, eastern Oregon, and northern Nevada. In the late 1970s the hatchery became part of the LSRCP and was rebuilt and expanded from 1982-1984. The hatchery operates year-round and currently serves as an incubation and rearing facility for East Fork Salmon River steelhead and for upper Salmon River A-run steelhead. No fish from any programs included in this Opinion are collected or released at Hagerman National Fish Hatchery.

Operation

The hatchery is staffed around the clock. Eyed eggs are incubated in 60 upwelling incubators. Each incubator is capable of incubating and hatching 20,000 to 30,000 steelhead eggs. Early rearing occurs in fiberglass troughs inside the hatchery building. As fish outgrow fiberglass troughs, they are transferred to a series of outside raceways, where they remain until transfer for release. Raceways measure 100 feet long by 10 feet wide.

The hatchery receives only gravity flow water, and as such, no generator backup system is in place or needed. Hatchery staff perform nightly maintenance checks of water intakes and rearing facilities. Disinfection protocols are in place to reduce the likelihood of fish pathogen transfer.

The hatchery receives water from several springs emanating from the Eastern Snake River Aquifer. The water in the springs is diminishing as a result of the overall decline of the aquifer. In recent years the decline has been about 1 cfs per year. The water supply is a constant 59ºF with a flow rate of approximately 30,000 gallons per minute (80 cfs). A total of 17 spring sources are identified on the property.

Routine Maintenance

Normal and preventative maintenance of hatchery facility structures and equipment is necessary for proper functionality. No work in wetted channels or springs is required. Normal activities include pond cleaning, pump maintenance, debris removal from intake and outfall structures, building maintenance, and ground maintenance.

Semi-routine Maintenance

Semi-routine maintenance may include repairs to various wooden, steel and concrete structures that are part of water source intakes, discharges, or other systems that may become compromised simply from age and exposure to changing weather conditions or from unique storm events. Annual maintenance includes visual inspection of the intake surface, pressure washing of the intake screen, inspection of water control valves, and applying grease as needed to ensure smooth operation.

Yankee Fork Facilities

The Yankee Fork River is currently utilized only as a release location for Salmon River B-run steelhead and Upper Salmon River spring Chinook salmon. The construction of proposed facilities to collect broodstock is not part of the proposed action and will be consulted on separately under the Act. However, because the weir would collect adults from the Upper Salmon River spring Chinook salmon and summer B-Run steelhead programs, impacts on listed species from future program-related broodstock collection are considered part of the proposed action and are included in this Opinion. Adult steelhead broodstock would be collected from April through mid-May; Chinook salmon would be collected from June through September. Once operational, maintenance activities would be the responsibility of the SBT and are therefore not part of the proposed action.

Yankee Fork Streamside Incubators

Summer steelhead eggs[10] are placed in streamside incubators in five tributaries of the Yankee Fork from late May through late June. Two incubators are placed in each of the five tributaries. Incubators are removed in early to mid-July.

Operation

The incubators and catch tanks are gravity fed with constant flow river water. Incubators are standardized with 2-inch PVC pipe with a 3-inch head pipe to collect additional flow from the stream. Each head pipe is fitted with ¼-inch mesh screen to minimize sediment and debris collection. Each incubator consisted of a 50-gallon polyurethane cylinder with a sediment tray, gravel, saddles, six egg trays, and one cover tray to contain eggs until hatching. Each catch tank is a 30-gallon Rubbermaid polyurethane tub with a custom fit cover.

Eyed eggs are reared in the incubator and hatch as alevins. Once hatching occurs, personnel enumerate dead eggs and remove trays from the incubators. Fry volitionally migrate from the upweller to the catch tank, and upon swim-up, volitionally leave the catch tank to the natural stream.

[10] The Yankee Fork steelhead eggbox program may use Salmon River B run broodstock collected at Pahsimeroi.

Maintenance

Incubators are monitored monthly. Staff records embryo stage and water condition, temperature, dissolved oxygen, conductivity, and pH. Staff also clean and remove debris from screens as needed.

A description follows for each of these elements. Additionally, conservation measures that are broadly applied to minimize effects of the program elements to bull trout and bull trout critical habitat are described in section 2.1.3.4.

2.1.3.3 Research, Monitoring and Evaluation

Section 7 of the Act identifies agency responsibilities to further the purposes of the Act, and ensures that otherwise lawful activities do not limit the recovery/survival of listed species; RM&E can fulfill both of these requirements.

The Johnson Creek Spring/Summer Chinook salmon program includes a directly-related monitoring and evaluation component. A rotary drum screw trap is operated by the NPT throughout the annual migratory period to capture natural origin juveniles. The trap is located 3.8 miles above the confluence of Johnson Creek and the East Fork of the South Fork of the Salmon River (Figure 2).

The NPT also conducts annual spawning surveys for spring/summer Chinook salmon in Johnson Creek. Surveys consist of walking stream margins to count and record the spatial distribution of Chinook salmon redds in these areas. Creek surveys are conducted on foot. Data, including length, sex, and scales for age analysis, are collected from spawned-out carcasses.

The SBT Fish and Wildlife Department conducts extensive RM&E programs in the Yankee Fork Salmon River basin. These RM&E activities include juvenile salmonid production monitoring using a rotary screw trap, adult Chinook salmon enumeration using a portable picket weir, nutrient supplementation using Chinook carcasses from the Sawtooth hatchery, and long-term population trend monitoring using electrofishing. For more information on these activities see section 2.5.2.1.3.

2.1.3.4 Impact Minimization Measures

As part of ongoing and proposed facility operations, IDFG, the NPT, and the SBT undertake a number of measures at all facilities, as applicable, to minimize impacts of the programs on aquatic species, including listed species, and their habitat.

Operations and Maintenance

Measures applied to minimize the likelihood of effects from routine and semi-routine operations and maintenance include the following:

- Operate facilities within water rights with respect to maximum withdrawal from surface and ground water sources, and the timing of such withdrawals.
- Locate, design, and operate all withdrawal structures to prevent barriers to fish passage.
- Monitor hatchery effluent to ensure compliance with NPDES permits, as applicable.

- Use pollution abatement structures for all pond cleaning activities to reduce suspended sediment.
- Perform all hatchery maintenance on watered or in-water facilities to minimize potential effects on hatchery effluent, i.e., sediment disturbance, water temperature, and chemical composition.
- Install silt barriers at the site during ground disturbing work to prevent/reduce sediment from entering the river.
- Herbicide application to control noxious weeds is small in scale, follows manufacturer's label guidelines, and occurs only during dry weather conditions (i.e., not raining) to prevent runoff into surface waters. Roundup® may be used around buildings and landscapes that are more than 300 feet from the river. Rodeo®, or a similar aquatic-approved herbicide, may be used around rearing ponds, adult collection ponds, and surface water intakes, which are in closer proximity to the water. All application of herbicides utilize the following risk reduction measures:
    - Only selective spot treatment of aquatic-approved formulations of glyphosate or imazapyr will be made within 15 feet of live waters (e.g., flowing ditches, streams, ponds, springs, etc., and will only be applied when wind speeds are less than or equal to 5 mph. No live water will be directly sprayed with herbicides, although some limited drift may occur when spot spraying.
    - Only ground based spot/selective applications of herbicides rated as having a low level of concern for aquatic species will be authorized from 15 to 100 feet from live waters and within riparian areas (whichever is greater), and will only be applied when wind speeds are less than or equal to 8 mph.
    - A spill cleanup kit will be available whenever herbicides are transported or stored.
    - A spill contingency plan will be developed prior to all herbicide applications. Individuals involved in herbicide handling or application will be instructed on the spill contingency plan and spill control, containment, and cleanup procedures.
    - Herbicide applications will only treat the minimum area necessary for the control of noxious weeds.
    - No herbicide mixing will be authorized within 100 feet of any live waters. Mixing and loading operations must take place in an area where an accidental spill would not contaminate a stream or body of water before it could be contained.
    - Authorized spray equipment will include pick-up- and 4-wheeler-mounted spray rigs (hand spot-gun only), backpack sprayers, hand pump sprayers, hand-spreading granular formulations, and wicking (also includes wiping, dipping, painting, or injecting target species).
    - Equipment used for transportation, storage, or application of chemicals shall be maintained in a leak-proof condition.
    - Only the quantity of herbicides needed for one day's operation will be transported from the storage area.

- Apply specific measures to minimize disease risk from effluent as described in program-specific HGMPs. These measures include the following:
    - Operate programs in accordance with the policies and procedures developed by the Integrated Hatchery Operations Team (IHOT) for Columbia Basin anadromous salmonid hatcheries.
    - Continue fish health practices to minimize the incidence of infectious disease agents. Follow IHOT (1995, entire) and Pacific Northwest Fish Health Protection Committee (2007, entire) guidelines.
    - Test pre-release and broodstock to ensure that fish are not diseased. Conduct tests in accordance to protocols in the American Fisheries Society Fish Health section Blue Book and Office International des Epizooties (OIE) standards.
    - Administer therapeutic drugs and chemicals to fish and eggs at program facilities only when necessary to effectively prevent, control, or treat disease conditions.
    - Administer all treatments according to label directions in compliance with Food and Drug Administration (FDA) and Environmental Protection Agency (EPA) regulations for the use of aquatic animal drugs and chemicals. The 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 6 weeks prior to a release or transfer of fish. Collect tissue samples on 60 fish of a stock being transferred or released. Pathogens screened for include infectious pancreatic necrosis virus, viral hemorrhagic septicemia virus, *Renibacterium salmoninarum* (bacterial kidney disease), *Aeromonas salmonicida* (furunculosis), *Yersina ruckeri* (enteric redmouth disease), and when applicable, other pathogens such as *Myxobolus cerebralis* (whirling disease) and *Ceratomyxa shasta*.

In-Water or Streambank Maintenance

Measures applied to minimize the likelihood of effects from routine or semi-routine maintenance (excluding emergency actions or major new in-river hatchery structures) involving in-water work or work along the streambank include the following:

- With the exception of the in-water work periods provided below, complete all work during the allowable freshwater work times established for each location, unless a variance is approved in writing by the appropriate state agency (IDFG or ODFW) and the Service.
- Upper Pahsimeroi Hatchery intake debris removal occurs annually in late April – early May
- South Fork Salmon River intake clean out
    - Annual intake debris removal – April/May each year
    - As necessary to enable weir and intake operations (up to 4-5 times per year) – conduct debris removal from intake and weir resulting from high flow events during operational period – May through September

        - Prior to work, IDFG personnel will wade through the excavation area to haze fish from area downstream of dredging. Hazing would include the use of seine nets to guide fish away from work areas. No fish salvage, capture, or relocation would occur. In-stream work, inclusive of hazing, is expected to occur over a matter of hours in a single day for routine and semi-routine repairs and debris removal.

    - Sawtooth Fish Hatchery intake dredging occurs annually in July or August. In 2013, intake cleaning occurred in December, and this window may be used as necessary.

- 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 mark (OHWM). Absorbent materials will be available onsite to collect such lubricants in case of a pressurized line failure to prevent entry of materials into river.

- In the case of maintenance of bank stabilizations, conduct repairs using materials similar in size and character to previous materials. If non-similar materials are used, coordinate with the Service.

- Straw waddles or similar materials will be placed on the streambank between excavators and the river to minimize the amount of fine sediments entering the river during work conducted along riverbanks.

- Operate all equipment above the OHWM or in the dry whenever possible to reduce impacts. If the operation of in-stream equipment is required, the following measures would be applied:

    - All activities would occur during the established in-water work window for each stream, or as approved via project-specific variance in coordination with applicable state resource agencies and the Service.

    - For activities proposed "in the wet" (e.g., intake debris removal), fish would be hazed from the in-water work area by personnel or by equipment operating in and adjacent to the area (see USFWS 2015e). Hazing would include the use of seine nets to guide fish away from work areas. No fish salvage, capture, or relocation would occur. In-stream work, inclusive of hazing, is expected to occur over a matter of hours in a single day for routine and semi-routine repairs and debris removal.

    - All equipment operated in-stream would be retrofitted with vegetable-based synthetic fuel oil.

- All fueling will occur more than 100 feet from each riverbank.

- Follow a pollution and erosion control plan that addresses equipment and materials storage sites, fueling operations, staging areas, cement mortars and bonding agents, hazardous materials, spill containment and notification, and debris management

- 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 upland areas above the OHWM.
- 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.
- 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 or similar at the site during work to prevent/reduce sediment from entering the river.
- Dispose of all discharge water created by operations and maintenance tasks (e.g., debris removal operations, vehicle wash water, etc.) at an adjacent upland location. No discharge water will be allowed to return to the adjacent water bodies unless specifically approved by the Service.
- Obtain all appropriate State and Federal permits before work is initiated.
- Clean all materials used prior to placement below the OHWM.
- Install straw bales and/or geotextile filtration traps to the outlet channel when dredging to catch any sediment exiting the subject water body.
- Filter pumped water through straw bales or other sediment traps to remove any sediment prior to reentering the water bodies.

Broodstock Collection

Measures applied to minimize the likelihood of effects on listed resources during broodstock collection activities include the following:

- Continue to use broodstock that exhibit life history characteristics similar to locally evolved stocks for general production and supplementation research.
- Direct and coordinate all program adult collection activities through annual planning meetings.
- 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 daily, and more often during peak steelhead and Chinook salmon returns and during bull trout migration periods. Remove fish quickly from the trap and return all non-target fish to the stream immediately with minimal holding and handling.
- Ensure that fish ladders receive sufficient flow in all seasons to attract and effectively pass fish of all life stages.
- Handle all fish in accordance with adult handling criteria (NMFS 2008, entire; USFWS 2012, entire).

Incubation and Rearing

Measures applied to minimize likelihood of effects on listed resources from incubation and rearing operations include the following:

- Apply fish health maintenance and hatchery facility sanitation guidelines that are established and monitored by IDFG's Eagle Fish Health Laboratory.
- Use pathogen-free well water, where possible, to eliminate exposure of eggs and fry to disease pathogens.
- Apply strict biosecurity protocols to minimize horizontal and vertical disease transmission.
- Ensure proper disinfection protocols are in place for equipment used during rearing and that indoor rearing vats/outdoor ponds are disinfected following use.

Acclimation and Release

The following measures are recommended to minimize potential resource competition and predation effects during juvenile release activities, while also acknowledging potential benefits to bull trout from these releases:

- Release hatchery juveniles that are physiologically ready to migrate or when flows and hydropower system operations would enhance outmigration success to reduce the likelihood of residualism and ecological interactions with nontarget fish.
- Continue development of culling and rearing segregation guidelines and practices relative to bacterial kidney disease and other pathogens.
- Continue marking hatchery-produced summer steelhead and Chinook salmon for harvest management.
- Attempt to time smolt releases to mimic natural fish emigration or when flows and hydropower system operations would enhance outmigration success.
- Continue spreading annual releases over a number of days to reduce the effect of releasing large numbers of hatchery steelhead or Chinook salmon at a single site.
- Minimize the number of steelhead smolts released that are larger than 225 mm (or about 4 fish per pound).
- Where appropriate and consistent with the final bull trout recovery plan, evaluate potential benefits to bull trout from intentional early life stage releases and other releases of surplus hatchery parr and presmolts.

Research, Monitoring, and Evaluation

Research, monitoring, and evaluation activities under the proposed action are those directly related to hatchery operations. These activities are limited to those associated with NPT RM&E in Johnson Creek and SBT RM&E in the Yankee Fork of the Salmon River (see Section 2.1.3.3) Impact minimizations associated with these activities include the following:

- RM&E activities will be conducted in accordance with the approved study plans.

- If sampling is done in multiple subbasins (4th field hydrologic unit code [HUC] watersheds), boots and sampling equipment intended for use in the water shall be disinfected and air-dried prior to use in each location. Water containing chemicals used in handling fish and water that was used for disinfecting equipment must not be allowed to enter the water body being sampled.

- Investigators may observe fish using snorkeling methods but shall avoid displacing individuals from the original encounter site during observations.

- Where angling is included as a fish collection or sampling method, such angling will be conducted in a manner consistent with State rules and regulations.

- Bull trout will not be used for rotary screw trap “trapping catch efficiency” or “containment” studies. Bull trout will be released on the appropriate side of the trap to accommodate the apparent direction of travel of individual fish.

- All survey, capture, retention, handling, and observation activities will be implemented at times that avoid temperature stress to fish being sampled. At locations that have potential to contain bull trout, sampling will not be done if water temperature exceeds 18°C (64°F). Where possible, sampling will be done at water temperatures less than 15°C (59°F). However, some rivers and lakes may be warmer than this, particularly on hot summer days. In these circumstances, it may be necessary to conduct the activities listed above in the morning or evening to avoid temperature stress to captured fish.

- All sampling and observation methods will be implemented at times that will avoid disturbance of spawning fish. Any purposeful take of bull trout that are actively spawning or are near bull trout spawning sites is prohibited. Surveyors will minimize collection, survey, and sampling activities near spawning areas and will not physically disturb bull trout redds during these activities.

- Disturbance of or impacts to bull trout habitat will be minimized during project activities. Since redds of resident and small fluvial bull trout may be difficult to see due to their small size, surveyors will take precautions to avoid stepping in areas that may be potential redd locations (i.e., small gravel deposits behind boulders; under overhanging vegetation; near wood debris or logs; or areas of hydraulic influence such as confluences of tributaries, springs, seeps, pool tail crests, or edges of pools).

- If bull trout are captured or handled, the following impact minimization measures will be followed:
    - Authorized personnel will ensure that their hands are free of sunscreen, lotion, or insect repellent prior to conducting activities that may involve handling bull trout.
    - Any captured bull trout that appears healthy and able to maintain itself will be released as soon as possible, and as close as possible, to the point of capture.
    - Any captured bull trout that shows signs of stress or injury will only be released when it is able to maintain itself. It may be necessary to nurture the fish in a holding tank until it has recovered. The holding tank water will be conducive to bull trout health (i.e., clean, cool water with ample dissolved oxygen).

- Because bull trout are aggressive predators and are known to be cannibalistic, investigators will attempt to partition captured fish individually or by size class and should avoid holding numerous bull trout in the same live-well.
- A healthy environment must be provided for bull trout held in holding tanks, and the holding time must be minimized. Water-to-water transfers, the use of shaded or dark containers, and supplemental oxygen will all be considered in the design of fish handling operations. Bull trout may be held for up to 1 hour during electrofishing operations.
- Bull trout shall be closely monitored in holding tanks if the ambient water temperature in these tanks is greater than 15°C (59°F). All operations will cease if fish show signs of stress or if ambient water temperatures rise above 18°C (64°F).
- Holding tanks will be non-toxic plastic, aluminum, or stainless steel containers. Do not use metal containers that have lead or zinc coatings.
- Fish statistics (e.g., length, weight, sex, ripeness, scale sample, mark, condition/health, angling injury) may be collected from captured bull trout. Handling and measurement of captured fish shall follow commonly accepted techniques for salmonid field sampling. If stream temperatures are greater than 15°C(59°F), the collection of fish statistics will be limited to fish length only, to avoid over-stressing captured fish.
- If a non-lethal bio-sample (i.e., fin clip or punch) is taken for genetic analyses, it will not exceed 0.75 square centimeters in size.
- Bull trout may be marked via a non-lethal fin clip during mark-recapture population surveys. This fin clip may be used as a bio-sample as indicated above.
- To reduce stress on captured bull trout, handling of the same individual multiple times during permitted activities will be avoided to the extent possible.
- A colored fish key with all char, trout, and salmon species that are known to, or may possibly, be in the system will be on hand when identifying fish. Captured bull trout and unidentified fish that may be bull trout shall be photographed for verification in areas where bull trout occur infrequently or if identification of the fish is difficult.
- For electrofishing activities, electrofishing will be conducted using the methods outlined in NMFS guidelines (available at http://www.westcoast.fisheries.noaa.gov/publications/reference_documents/esa_refs/section4d/electro2000.pdf). Electrofishing equipment will be operated at the lowest possible effective equipment settings to minimize injury or death to bull trout.
- Electrofishing will be avoided in areas such as the mouths of rivers when adult bull trout may be staging as part of their spawning migration.
- Electrofishing will not be conducted when the water conditions are turbid and visibility is poor (i.e., when the sampler cannot see the stream bottom in 1 foot of water).

  - Any electrofishing conducted during the bull trout spawning season (typically August 15 to December 1) will only be performed in areas where adult bull trout (305 millimeters total length or larger for fluvial bull trout or 160 millimeters total length or larger for resident bull trout) or their redds have not been observed.
  - Outside the bull trout spawning season, visual or snorkel surveys for bull trout will be conducted prior to electrofishing, where conditions allow. If bull trout are documented in visual surveys, moving to a new sample location should be considered if possible. However, electrofishing is permitted in areas where bull trout are present if there is no alternative that is consistent with the study plan.
  - Because electrofishing during the spring in bull trout habitat runs the risk of injuring or killing alevins or fry that remain in or near the gravels, if salmonid alevins or fry are seen during spring electrofishing, the electrofishing activity shall immediately cease until the alevins or fry can be identified. If they are determined to be bull trout, electrofishing will be terminated at the site until after fry have fully emerged.
- PIT tagging bull trout will adhere to the following impact minimization measures:
  - Before inserting a PIT tag into a captured bull trout, the fish must be scanned for the presence of an existing functional PIT tag. If a PIT tag is detected, the fish will not be tagged with an additional tag.
  - All PIT tagging activities will cease when stream water temperature exceeds 18°C (64°F).
  - Any captured bull trout showing signs of injury or considerable stress prior to tagging will not be tagged with a PIT tag. The fish will be placed in a holding tank and released upon showing signs of adequate recovery.
  - Overcrowding of fish in holding and recovery tanks must not occur during PIT tagging operations. Additional tanks will be set up as needed, or tagging operations will cease until the fish can be safely released back to the stream and overcrowding conditions are no longer a concern.
  - If PIT tag injectors are used, the needles and pushrods shall be disinfected between fish in a 70 to 80 percent ethyl alcohol or 60 to 80 percent isopropyl alcohol solution for a minimum of 10 minutes. All PIT tags will also be disinfected in this same manner before insertion into bull trout.
- If bull trout are anesthetized during PIT tag insertions, the following impact minimization measures will be followed:
  - Tricaine methanesulfonate (MS-222) or another anesthetic approved for use on fish (e.g., electronarcosis) may be used to anesthetize bull trout during PIT tag insertions.
  - Bull trout will only be anesthetized if they can be processed within several minutes of capture. The period of time bull trout are anesthetized will be minimized to the extent possible, and will not exceed 5 minutes.

  - It is advisable to monitor the effect of anesthesia on a few fish to determine how individual fish will react under local ambient conditions (e.g., water temperature, water pH, etc.). Use the lowest dose/level needed to affect the level of anesthesia required to complete tagging.
  - All fish placed under anesthesia must have recovered sufficiently from the anesthesia to avoid predation before they are released back to the stream at the point of capture. Anesthetized fish shall be allowed to recover in a recovery tank for a time sufficient to ensure full recovery based on observations in the recovery tank. If electronarcosis is used, fish may be released immediately and not held longer than necessary.
  - Surgical equipment will be sanitized with a betadine solution or appropriate substitute between each insertion.

- When conducting macroinvertebrate, water, and sediment sampling, investigators shall take precautions in known or potential bull trout spawning areas. If salmonid alevins or fry are seen or captured, the activity shall cease immediately until the alevins or fry can be identified. If they are determined to be bull trout, the activity shall be moved to an alternate site or suspended until alevins and fry are no longer present.
- Investigators may collect fish statistics (length, weight, sex, ripeness, scale sample, mark, condition/health, angling injury, etc.) from captured bull trout, consistent with above identified measures.
- All in-river spawner surveys are conducted in known spawning reaches of target species.
- Fish trapping, trap maintenance, fish handling, fish anesthesia, and fish PIT tagging protocols are followed explicitly and all staff are trained in their use and application before working under field conditions.
- Active weirs and traps will be monitored at least once daily. Traps will be checked more frequently when crowding produced by an increased catch rate or high debris loading results in a higher probability of injury or mortality to bull trout being held in a weir or trap.
  - Field-staff conduct regular checks of the traps and live boxes to ensure that traps are maintained and that no mortalities occur. Trap check intervals are determined based on the stream conditions and numbers of fish being trapped.
  - Smolt trap cones and debris drums are also regularly checked to ensure that traps are not causing fish impingement or descaling, and that fine debris is removed from the traps.
  - Water temperatures and stream discharge are regularly monitored to ensure safe capture and handling of all fish.

Additional Actions Focusing on Bliss Rapids Snails

Actions taken to minimize adverse effects on Snake River Physa and Bliss Rapids snails at Niagara Springs, Magic Valley, and Hagerman National fish hatcheries include the following:

- Inspection of removed material from intake maintenance by personnel trained in snail identification.

- Replacing material in spring habitat where snails are detected.
- Initiate coordination with the Service and conduct consultation or re-initiate consultation, as required, for program related actions not considered in this Opinion that may affect the Bliss Rapids snail.
- As determined during pre-maintenance coordination with the Service, the following actions will be taken during future maintenance of the water supply systems, as applicable:
  - Remove sections of intake pipe and inspect for snails; return any snails encountered to springs.
  - Use hand excavation to minimize disturbance.
  - Remove any in-water rocks and relocate to a similar part of the spring.
  - Remove all construction materials from the site.
  - Disinfect boots and equipment in contact with spring water prior to use.
  - Use erosion control measures, such as straw wattles along the downhill slope, during pipeline replacement to prevent sediment from entering Niagara Springs.
  - Stabilize excavated areas after construction to further prevent erosion and sedimentation.

Additional Actions Focusing on Bull Trout

Additional actions taken to minimize adverse effects on bull trout include the following:

- Continue efforts to reduce steelhead residualism by releasing smolts that are physiologically ready to outmigrate or when flows and hydropower system operations would enhance outmigration success.
- Continue to monitor hatchery steelhead population survival and productivity to maximize benefits from the program.
- Continue to modify broodstock collection infrastructure and operations (e.g., weirs, ladders, traps) to minimize bull trout impacts (e.g., delayed passage, inter-specific interactions, mortality), as necessary. Follow accepted standard operating procedures (IDFG et al. 2015) for handling bull trout.

2.2 Analytical Framework for the Jeopardy and Adverse Modification Determinations

2.2.1 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 species' rangewide condition, the factors responsible for that condition, and its survival and recovery needs.
2. The *Environmental Baseline*, which evaluates the condition of the species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species.
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 species.
4. *Cumulative Effects*, which evaluates the effects of future, non-Federal activities reasonably certain to occur in the action area on the species.

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, taken together with 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 places an emphasis on consideration of the rangewide survival and recovery needs of the species and the role of the action area in the survival and recovery of the species 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 jeopardy determination.

2.2.2 Adverse Modification Determination

Section 7(a)(2) of the Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to destroy or to adversely modify designated critical habitat. A final rule revising the regulatory definition of "destruction or adverse modification of critical habitat" was published on February 11, 2016 (USFWS and NMFS 2016, 81 FR 7214). The final rule became effective on March 14, 2016. The revised definition states: "Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features."

The destruction or adverse modification analysis in this Biological Opinion relies on four components:

1. The *Status of Critical Habitat*, which describes the range-wide condition of designated critical habitat for the bull trout in terms of the key components of the critical habitat that provide for the conservation of the bull trout, the factors responsible for that condition, and the intended value of the critical habitat overall for the conservation/recovery of the bull trout.
2. The *Environmental Baseline*, which analyzes the condition of the critical habitat in the action area, the factors responsible for that condition, and the value of the critical habitat in the action area for the conservation/recovery of the listed species.

3. The *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated and interdependent activities on the key components of critical habitat that provide for the conservation of the listed species, and how those impacts are likely to influence the value of the affected critical habitat units for the conservation/recovery of the listed species.
4. The *Cumulative Effects*, which evaluate the effects of future non-Federal activities that are reasonably certain to occur in the action area on the key components of critical habitat that provide for the conservation of the listed species and how those impacts are likely to influence the value of the affected critical habitat units for the conservation/recovery of the listed species.

For purposes of making the destruction or adverse modification determination, the effects of the proposed Federal action, together with any cumulative effects, are evaluated to determine if the value of the critical habitat rangewide for the conservation/recovery of the listed species would remain functional or would retain the current ability for the key components of the critical habitat that provide for the conservation of the listed species to be functionally re-established in areas of currently unsuitable but capable habitat.

Note: Past designations of critical habitat have used the terms "primary constituent elements" (PCEs), “physical or biological features” (PBFs) or "essential features" to characterize the key components of critical habitat that provide for the conservation of the listed species. The new critical habitat regulations (USFWS and NMFS 2016, 81 FR 7214) discontinue use of the terms “PCEs” or “essential features” and rely exclusively on use of the term PBFs for that purpose because that term is contained in the statute. To be consistent with that shift in terminology and in recognition that the terms PBFs, PCEs, and essential habit features are synonymous in meaning, we are only referring to PBFs herein. Therefore, if a past critical habitat designation defined essential habitat features or PCEs, they will be referred to as PBFs in this document. This does not change the approach outlined above for conducting the ‘‘destruction or adverse modification’’ analysis, which is the same regardless of whether the original designation identified PCEs, PBFs or essential features.

2.3 Status of the Species and Critical Habitat

This section presents information about the regulatory, biological and ecological status of the bull trout and its critical habitat that provides context for evaluating the significance of probable effects caused by the proposed action.

2.3.1 Bliss Rapids Snail

2.3.1.1 Listing Status

The Bliss Rapids snail was listed as a threatened species on December 14, 1992 (57 FR 59244). Critical habitat for this species has not been designated. The recovery area for this species includes the Snake River and tributary cold-water spring complexes between river kilometer (RKM) 880 to 942 (RM 547 to 585) (USFWS 1995, p. ii).

On December 26, 2006, the state of Idaho and IPC petitioned the Service to delist the Bliss Rapids snail from the Federal list of threatened and endangered species, based on new information that the species was more widespread and abundant than determined at the time of its listing. The Service reviewed the information provided in the petition and initiated a 12-month review of the species' status. After compilation and review of new information, the Service hosted an expert panel of scientists and a panel of Service managers to reevaluate the species' status. On September 16, 2009, based on the findings of these expert panels, the Service posted a notice in the Federal Register stating the Bliss Rapids snail still warranted protection as a threatened species given its restricted range and the persistence of threats (USFWS 2008a, pp. 19-37).

2.3.1.2 Species Description

The shells of adult Bliss Rapids snails are 2.0 to 4.1 mm (0.08 to 0.16 in) long with 3.5 to 4.5 whorls, and are clear to white when empty (Hershler et al. 1994, p. 235). The species can occur in two different color morphs, the white or pale form, and the red form (Hershler et al. 1994, p. 240). It is not known what controls these color forms, but some populations do contain more than one color form.

2.3.1.3 Life History

The Bliss Rapids snail is dioecious (has separate sexes). Fertilization is internal and eggs are laid within capsules on rock or other hard substrates (Hershler et al. 1994, p. 239). Individual, life-time fecundity is not known, but deposition of 5 to 12 eggs per cluster have been observed in laboratory conditions (Richards et al. 2009c, p. 26). Reproductive phenology probably differs between habitats and has not been rigorously studied in the wild. Hershler et al. (1994, p. 239) stated that reproduction occurred from December through March. However, a more thorough investigation by Richards (2004, p. 135) suggested a bimodal phenology with spring and fall reproductive peaks, but with some recruitment occurring throughout the year.

The seasonal and inter-annual population densities of Bliss Rapids snails can be highly variable. The greatest abundance values for Bliss Rapids snails are in spring habitats, where they frequently reach localized densities in the tens to thousands per square meter (Richards 2004, p. 129; Richards and Arrington 2009, Figures 1-6, pp. 23-24). This is most likely due to the stable environmental conditions of these aquifer springs, which provide steady flows of consistent temperatures and relatively good water quality throughout the year. Despite the high densities reached within springs, Bliss Rapids snails may be absent from springs or absent from portions of springs with otherwise uniform water quality conditions. The reasons for this patchy distribution are uncertain but may be attributable to factors such as habitat quality (USFWS 2008a, pp. 11-13), competition from species such as the New Zealand mudsnail (Richards 2004, pp. 89-91), elevated water velocity, or historical events that had eliminated Bliss Rapids snails in the past (e.g., construction of fish farms at spring sources, spring diversion, etc.).

By contrast, river-dwelling populations are subjected to highly variable river dynamics where flows and temperatures can vary greatly over the course of the year. Compared to springs in which water temperatures range between 14° to 17°C (57.2 to 62.6°F), river temperatures typically fluctuate between 5° to 23°C (41 to 78.8°F), and river flows within the species' range can vary from less than 4,000 cfs to greater than 30,000 cfs throughout the course of a year. These river processes likely play a major role in structuring and/or limiting snail populations within the Snake River (Dodds 2002, pp. 418-425; EPA 2002, pp. 9-10–9-12). While Bliss Rapids snails may reach moderate densities (tens to hundreds per m^2) at some river locations, they are more frequently found at low densities (≤10 per m^2) (Richards and Arrington 2009, Figures 1-6, pp. 23-24; Richards et al. 2009b, pp. 35-39) if they are present. It is likely that annual river processes play a major role in the distribution and abundance of the Bliss Rapids snail throughout its range within the Snake River by killing or relocating snails, and by greatly altering the benthic habitat (Palmer and Poff 1997, p. 171; Dodds 2002, pp. 418-425; Liu and Hershler 2009, p. 1296). While declines in river volume due to a natural hydrograph are typically less abrupt than load-following, they are of much greater magnitude, and hence it is logical to assume these natural events play an important role in limiting snail populations within the river.

A genetic analysis of the Bliss Rapids snail based on specimens collected from throughout its range (Liu and Hershler 2009, p. 1294) indicated that spring populations were largely or entirely sedentary, with little to no movement between springs or between springs and river populations. Most spring populations were highly differentiated from one another as determined by DNA microsatellite groupings. By contrast, river populations exhibited no clear groupings, suggesting that they are genetically mixed (Liu and Hershler 2009, p. 1295) and without genetic barriers, or they have not been isolated long enough to establish unique genetic differentiation. This pattern supports the suggestion made by other biologists that the river-dwelling population(s) of the Bliss Rapids snail exist in either a continuous river population (Liu and Hershler 2009, pp. 1295-1297) or as a metapopulation(s) (Richards et al. 2009b, entire) in which small, semi-isolated populations (within the river) provide and/or receive recruits from one another to maintain a loosely connected population.

Habitat

The Bliss Rapids snail is typically found on the lateral and undersides of clean cobbles in pools, eddies, runs, and riffles, though it may occasionally be found on submerged woody debris (Hershler et al. 1994, p. 239) where it is a periphyton (benthic diatom mats) grazer (Richards et al. 2006, p. 59). This species is restricted to spring-influenced bodies of water within and associated with the Snake River from King Hill RKM 879 (RM 546) to Elison Springs RKM 972 (RM 604). The snail's distribution within the Snake River is within reaches that are unimpounded and receive significant quantities (ca. 5,000 cfs) of recharge from the Snake River Plain Aquifer (Clark and Ott 1996, p. 555; Clark et al. 1998, p. 9). It has not been recovered from impounded reaches of the Snake River, but can be found in spring pools or pools with evident spring influence (Hopper 2006, *in litt*). With few exceptions, the Bliss Rapids snail has not been found in sediment-laden habitats. It's typically found, and reaches its highest densities, on clean, gravel to boulder substrates in habitats with low to moderately swift currents, and is typically absent from whitewater habitats (Hershler et al. 1994, p. 237).

Previous observations have suggested that the Bliss Rapids snail is more abundant in shallower habitats, but most sampling has been in shallow habitat since deeper river habitat is more difficult to access. Clark (2009, pp. 24-25) used a quantile regression model that modeled a 50 percent decline in snail abundance for each 3 m (10 ft) of depth (e.g., snail density at 3 m was approximately 50 percent less than that at shoreline (p. 24)). Richards et al. (2009a, pp. 6-7) used an analysis of variance (ANOVA) to assess snail densities at 1-meter intervals and only found a statistical difference (increase) in densities in the first meter of depth, with no declining trends with increasing depth. Nonetheless, these authors suggest that greater than 50 percent of the river population could reside in the first 1.5 m (5 ft) depth zone of the Snake River (Richards et al. 2009a, Appendix 1).

Diet

Richards (2004, pp. 112-120) looked at periphyton (benthic diatoms) consumption by the Bliss Rapids snail and the New Zealand mudsnail (*Potamopyrgus antipodarum*) in competition experiments. He described the Bliss Rapids snail as a "bulldozer" type grazer, moving slowly over substrates and consuming most, if not all, available diatoms. The dominant diatoms identified in his controlled field experiments consisted of the bacilliariophyt genera *Achananthus* sp., *Cocconeis* sp., *Navicula* sp., *Gomphonema* sp., and *Rhoicospheni*a sp., although the species composition of these and others varied greatly between seasons and location. At least one species of periphytic green algae was also present (*Oocystis* sp.). Richards (2004, p. 121) suggested that the Bliss Rapids snail appeared to be a better competitor relative to the New Zealand mudsnail in late successional diatom communities, such as the stable spring habitats where they are often found in greater abundance than the mudsnail.

2.3.1.4 Status and Distribution

In the 1995 Recovery Plan for the Snake River snails, the Service reported that the Bliss Rapids snails' range extends along the Snake River from Indian Cove Bridge (RKM 845.4 (RM 525.4)) to Twin Falls (RKM 982.3 (RM 610.5)) and that it likely occurred upstream of American Falls in a disjunct population where it had been reported from springs (RKM 1207 (RM 750)) (USFWS 1995, p. 10). The current documented range of extant populations is more restricted; this species has been identified from the Snake River near King Hill (RKM 878.5 (RM 546)) to below Lower Salmon Falls Dam (RKM 922 (RM 573)), and from spring tributaries as far upstream as Ellison Springs (RKM 972 (RM 604)) (Bates et al. 2009, p. 100). The "American Falls" occurrence was later discounted after multiple surveys failed to relocate the species (USFWS 2008a, pp. 5-6). There is an isolated river population that occupies a limited bypass reach (Dolman Rapids) between the Upper and Lower Salmon Falls reservoirs (Stephenson 2006, p. 6).

Studies by IPC found the species to be more common and abundant within the Snake River (RKM 879 to 920 (RM 546 to 572)) than previously thought, although typically in a patchy distribution with highly variable abundance (Bean 2006, pp. 2-3; Richards and Arrington 2009, Figures 1-6, pp. 23-24). Most, if not all, of the river range of the species is in reaches (Lower Salmon Falls and Bliss) where recent records show an estimated 5,000 cfs of water entering the Snake River from numerous cold springs from the Snake River Plain Aquifer (Clark and Ott 1996, p. 555; Clark et al. 1998, p. 9). This large spring influence, along with the steep, unimpounded character of the river in these reaches, improves water quality (temperature, dissolved oxygen, and other parameters) and helps maintain suitable habitat (low-sediment cobble) for the snail that likely contributes to the species' presence in these reaches (Hershler et al. 1994, p. 237). It is noteworthy that the species becomes absent below King Hill, where the river loses gradient, begins to meander, and becomes more sediment-laden and lake-like. Although Bliss Rapids snail numbers are typically lower within the Snake River than in adjacent spring habitats, the large amount of potential habitat within the river suggests that the population(s) within the river is/are low-density but large compared to the smaller, isolated, typically high-density spring populations (Richards and Arrington 2009, Figures 1-6, pp. 23-24). These river reaches comprise the majority of the species' designated recovery area.

The species' range upstream of Upper Salmon Falls Reservoir RKM 941 to 972 (RM 585-604)) is restricted to aquifer-fed spring tributaries where water quality is relatively high and human disturbance is less direct. Within these springs, populations of snails may occupy substantial portions of a tributary (e.g., Box Canyon Springs Creek, where they are scattered throughout the 1.8 km (1.1 mi) of stream habitat) or may be restricted to habitats of only several square meters (e.g., Crystal Springs). Spring development for domestic and agricultural use has altered or degraded a large amount of these habitats in this portion of the species' range (Hershler et al. 1994, p. 241; Clark et al. 1998, p. 7), often restricting populations of the Bliss Rapids snail to spring source areas (Hershler et al. 1994, p. 241).

It is difficult to estimate the density and relative abundance of Bliss Rapids snail colonies. The species is documented to reach high densities in cold-water springs and tributaries in the Hagerman reach of the middle Snake River (Stephenson and Bean 2003, pp. 12, 18; Stephenson et al. 2004, p. 24), whereas colonies in the mainstem Snake River (Stephenson and Bean 2003, p. 27; Stephenson et al. 2004, p. 24) tend to have lower densities (Richards et al. 2006, p. 37). Bliss Rapids snail densities in Banbury Springs averaged approximately 32.53 snails per square foot (350 snails per square meter) on three habitat types (vegetation, edge, and run habitat as defined by Richards et al. 2001, p. 379). Densities greater than 5,800 snails per m^2 (790 snails per ft^2) have been documented at the outlet of Banbury Springs (Morgan Lake outlet) (Richards et al. 2006, p. 99). In an effort to account for the high variability in snail densities and their patchy distribution, researchers have used predictive models to give more accurate estimates of population size in a given area (Richards 2004, p. 58). In the most robust study to date, predictive models estimated between 200,000 and 240,000 Bliss Rapids snails in a study area measuring 625 m^2 (58.1 ft^2) in Banbury Springs, the largest known colony (Richards 2004, p. 59). Due to data limitations, this model has not been used to extrapolate population estimates to other spring complexes, tributary streams, or mainstem Snake River colonies. However, with few exceptions (i.e., Thousand Springs and Box Canyon), Bliss Rapids snail colonies in these areas are much smaller in areal extent than the colony at Banbury Springs, occupying only a few square feet.

2.3.1.5 Conservation Needs

Survival and recovery of the federally listed snails in and adjacent to the Snake River, Idaho, is considered contingent on "conserving and restoring essential mainstem Snake River and cold-water spring tributary habitats" (USFWS 1995, p. 27). Given the Bliss Rapids snail's habit of utilizing both river and spring habitats, the above stated recovery goal is critical. The generalized priority tasks for all of the listed Snake River snails, including the Bliss Rapids snail, consist of the following. For more information on threats to the Bliss Rapids snail see section 2.4.1.2, *Factors Affecting the Bliss Rapids Snail in the Action Area.*

Priority 1

- Securing, restoring, and maintaining free-flowing main-stem habitats between the C.J. Strike Reservoir and American Falls Dam, and securing, restoring, and maintaining existing cold-water spring habitats.

- Rehabilitating, restoring, and maintaining watershed conditions (specifically: cold, unpolluted, well-oxygenated flowing water with low turbidity. (*ibid.*, p. 1).

- Monitoring populations and habitat to further define life history, population dynamics, and habitat requirements (USFWS 1995, pp. 27-28).

Priority 2

- Updating and revising recovery plan criteria and objectives as more information becomes available, recovery tasks are completed, or as environmental conditions change (USFWS 1995, p. 28).

Given the known limited distribution of the Bliss Rapids snail and its specific habitat requirements, maintaining or improving spring and river habitat conditions within its range is the primary need for this species' survival and recovery. The Bliss Rapids snail reaches its highest densities in cold-water springs dominated by cobble substrates and free, or relatively free, of fine sediments, and with good water quality. Protecting these habitats that contain Bliss Rapids snail populations is critical to their survival and recovery.

Ensuring that water quality within the Snake River is not degraded is important for sustaining the species' river-dwelling populations. Since water quality appears to be of crucial importance to the species, protection of the Snake River Plain Aquifer is a priority. The aquifer is the source of water for the springs occupied by the snail and serves a major role in maintaining river water quality within the species' range. More information regarding water quality is found in section 2.4.1.2, *Factors Affecting Bliss Rapids Snail in the Action Area*.

2.3.2 Bull Trout

2.3.2.1 Listing Status

The coterminous United States population of the bull trout was listed as threatened on November 1, 1999 (USFWS 1999, 64 FR 58910-58933). The threatened bull trout 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; Howell and Buchanan 1992, entire; Leary and Allendorf 1997, pp. 716-719; USFWS 1999, 64 FR 58910).

The final listing rule for the United States coterminous population of the bull trout discusses the consolidation of five Distinct Population Segments (DPSs) into one listed taxon and the application of the jeopardy standard under section 7 of the Endangered Species Act (Act) relative to this species, and established five interim recovery units for each of these DPSs for the purposes of Consultation and Recovery (USFWS 1999, 64 FR 58930).

The 2010 final bull trout critical habitat rule (USFWS 2010a, 75 FR 63898-64070) identified six draft recovery units based on new information that confirmed they were needed to ensure a resilient, redundant, and representative distribution of bull trout populations throughout the range of the listed entity. The final bull trout recovery plan (RP) (USFWS 2015a, pp. 36-43) formalized these six recovery units: Coastal, Klamath, Mid-Columbia, Columbia Headwaters, Saint Mary, and Upper Snake. The final recovery units replace the previous five interim recovery units and will be used in the application of the jeopardy standard for section 7 consultation procedures.

2.3.2.2 Reasons for Listing and Emerging Threats

Throughout its range, the bull trout is 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; incidental angler harvest; entrainment (a process by which aquatic organisms are pulled through a diversion or other device) into diversion channels; and introduced non-native species (USFWS 1999, 64 FR 58910).

Since the time of coterminous listing the species (64 FR 58910) and designation of its critical habitat (USFWS 2004a, 69 FR 59996; USFWS 2005a, 70 FR 56212; USFWS 2010a, 75 FR 63898) a great deal of new information has been collected on the status of bull trout. The Service's Science Team Report (Whitesel et al. 2004, entire), the bull trout core areas templates (USFWS 2005a, entire; 2009, entire), Conservation Status Assessment (USFWS 2005c, entire), and 5-year Reviews (USFWS 2008b, entire; 2015h, entire) have provided additional information about threats and status. The final RP lists many other documents and meetings that compiled information about the status of bull trout (USFWS 2015a, p. 3). As did the prior 5-year review (2008), the 2015 5-year status review maintains the listing status as threatened based on the information compiled in the final bull trout RP (USFWS 2015a, entire) and the Recovery Unit Implementation Plans (RUIPs) (USFWS 2015b-g, entire).

When first listed, the status of bull trout and its threats were reported by the Service at subpopulation scales. In 2002 and 2004, the draft recovery plans (USFWS 2002a, entire; 2004a, entire; 2004b, entire) included detailed information on threats at the recovery unit scale (i.e., similar to subbasin or regional watersheds), thus incorporating the metapopulation concept with core areas and local populations. In the 5-year Reviews, the Service established threats categories (i.e., dams, forest management, grazing, agricultural practices, transportation networks, mining, development and urbanization, fisheries management, small populations, limited habitat, and wild fire) (USFWS 2008b, pp. 39-42; USFWS 2015h, p. 3). In the final RP, threats and recovery actions are described for 109 core areas, forage/migration and overwintering areas, historical core areas, and research needs areas in each of the six recovery units (USFWS 2015a, p 10). Primary threats are described in three broad categories: Habitat, Demographic, and Nonnative Fish for all recovery areas within the coterminously listed range of the species.

The 2015 5-year status review references the final RP and the RUIPs and incorporates by reference the threats described therein (USFWS 2015h, pp. 2-3). Although significant recovery actions have been implemented since the time of listing, the 5-year review concluded that the listing status should remain as "threatened" (USFWS 2015h, p. 3).

New or Emerging Threats

The 2015 RP (USFWS 2015a, entire) describes new or emerging threats such as climate change and other threats. Climate change was not addressed as a known threat when bull trout was listed. The 2015 bull trout RP and RUIPs summarize the threat of climate change and acknowledge that some bull trout local populations and core areas may not persist into the future due to anthropogenic effects such as climate change. The RP further states that use of best available information will ensure future conservation efforts that offer the greatest long-term benefit to sustain bull trout and their required coldwater habitats (USFWS 2015a, pp. vii, 17-20).

Mote et al. (2014, pp. 487-513) summarized climate change effects in the Pacific Northwest to include rising air temperature, changes in the timing of streamflow related to changing snowmelt, increases in extreme precipitation events, lower summer stream flows, and other changes. A warming trend in the mountains of western North America is expected to decrease snowpack, hasten spring runoff, reduce summer stream flows, and increase summer water temperatures (Poff et al. 2002, p. 34; Koopman et al. 2009, entire; Point Reyes Bird Observatory (PRBO) Conservation Science 2011, p. 13). Lower flows as a result of smaller snowpack could reduce habitat, which might adversely affect bull trout reproduction and survival. Warmer water temperatures could lead to physiological stress and could also benefit nonnative fishes that prey on or compete with bull trout. Increases in the number and size of forest fires could also result from climate change (Westerling et al. 2006, p. 940) and could adversely affect watershed function by resulting in faster runoff, lower base flows during the summer and fall, and increased sedimentation rates. Lower flows also may result in increased groundwater withdrawal for agricultural purposes and resultant reduced water availability in certain stream reaches occupied by bull trout (USFWS 2015c, p. B-10).

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 (Rieman et al. 2007, p. 1552). Climate change is expected to reduce the extent of cold water habitat (Isaak et al. 2015, p. 2549, Figure 7), and increase competition with other fish species (lake trout, brown trout, brook trout, and northern pike) for resources in remaining suitable habitat. Several authors project that brook trout, a fish species that competes for resources with and predates on the bull trout, will continue increasing their range in several areas (an upward shift in elevation) due to the effects from climate change (e.g., warmer water temperatures) (Wenger et al. 2011, p. 998, Figure 2a, Isaak et al. 2014, p. 114).

2.3.2.3 Species Description

Bull trout, member of the family Salmonidae, are char native to the Pacific Northwest and western Canada. The bull trout and the closely related Dolly Varden (*Salvelinus malma*) were not officially recognized as separate species until 1980 (Robins et al. 1980, p. 19). Bull trout historically occurred in major river drainages in the Pacific Northwest from the southern limits in the McCloud River in northern California (now extirpated (Rode 1990, p. 1)), Klamath River basin of south central Oregon, and the Jarbidge River in Nevada to the headwaters of the Yukon River in the Northwest Territories, Canada (Cavender 1978, pp. 165-169; Bond 1992, pp. 2-3). To the west, the bull trout's current range includes Puget Sound, coastal rivers of British Columbia, Canada, and southeast Alaska (Bond 1992, p. 2-3). East of the Continental Divide bull trout are found in the headwaters of the Saskatchewan River in Alberta and the MacKenzie River system in Alberta and British Columbia (Cavender 1978, p. 165-169; Brewin and Brewin 1997, pp. 209-216). Bull trout are wide spread throughout the Columbia River basin, including its headwaters in Montana and Canada.

2.3.2.4 Life History

Bull trout exhibit resident and migratory life history strategies throughout much of the current range (Rieman and McIntyre 1993, p. 2). Resident bull trout complete their entire life cycle in the streams where they spawn and rear. Migratory bull trout spawn and rear in streams for 1 to 4 years before migrating to either a lake (adfluvial), river (fluvial), or, in certain coastal areas, to saltwater (anadromous) where they reach maturity (Fraley and Shepard 1989, p. 1; Goetz 1989, pp. 15-16). Resident and migratory forms often occur together and it is suspected that individual bull trout may give rise to offspring exhibiting both resident and migratory behavior (Rieman and McIntyre 1993, p. 2).

Bull trout have more specific habitat requirements than other salmonids (Rieman and McIntyre 1993, p. 4). Watson and Hillman (1997, p. 248) concluded that watersheds must have specific physical characteristics to provide habitat requirements for bull trout to successfully spawn and rear. It was also concluded that these characteristics are not necessarily ubiquitous throughout these watersheds, thus resulting in patchy distributions even in pristine habitats.

Bull trout are found primarily in colder streams, although individual fish are migratory in larger, warmer river systems throughout the range (Fraley and Shepard 1989, pp. 135-137; Rieman and McIntyre 1993, p. 2 and 1995, p. 288; Buchanan and Gregory 1997, pp. 121-122; Rieman et al. 1997, p. 1114). Water temperature above 15°C (59°F) is believed to limit bull trout distribution, which may partially explain the patchy distribution within a watershed (Fraley and Shepard 1989, p. 133; Rieman and McIntyre 1995, pp. 255-296). Spawning areas are often associated with cold water springs, groundwater infiltration, and the coldest streams in a given watershed (Pratt 1992, p. 6; Rieman and McIntyre 1993, p. 7; Rieman et al. 1997, p. 1117). Goetz (1989, pp. 22, 24) suggested optimum water temperatures for rearing of less than 10°C (50°F) and optimum water temperatures for egg incubation of 2 to 4°C (35 to 39°F).

All life history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Goetz 1989, pp. 22-25; Pratt 1992, p. 6; Thomas 1992, pp. 4-5; Rich 1996, pp. 35-38; Sexauer and James 1997, pp. 367-369; Watson and Hillman 1997, pp. 247-249). Jakober (1995, p. 42) observed bull trout overwintering in deep beaver ponds or pools containing large woody debris in the Bitterroot River drainage, Montana, and suggested that suitable winter habitat may be more restrictive than summer habitat. Bull trout prefer relatively stable channel and water flow conditions (Rieman and McIntyre 1993, p. 6). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997, pp. 368-369).

The size and age of bull trout at maturity depend upon life history strategy. Growth of resident fish is generally slower than migratory fish; resident fish tend to be smaller at maturity and less fecund (Goetz 1989, p. 15). Bull trout normally reach sexual maturity in 4 to 7 years and live as long as 12 years. Bull trout are iteroparous (they spawn more than once in a lifetime), and both repeat- and alternate-year spawning has been reported, although repeat-spawning frequency and post-spawning mortality are not well documented (Leathe and Graham 1982, p. 95; Fraley and Shepard 1989, p. 135; Pratt 1992, p. 8; Rieman and McIntyre 1996, p. 133).

Bull trout typically spawn from August to November during periods of decreasing water temperatures. Migratory bull trout frequently begin spawning migrations as early as April, and have been known to move upstream as far as 250 kilometers (km) (155 miles (mi)) to spawning grounds (Fraley and Shepard 1989, p. 135). Depending on water temperature, incubation is normally 100 to 145 days (Pratt 1992, p.1) and, after hatching, fry remain in the substrate. Time from egg deposition to emergence may exceed 200 days. Fry normally emerge from early April through May depending upon water temperatures and increasing stream flows (Pratt 1992, p. 1).

The iteroparous reproductive system of bull trout has important repercussions for the management of this species. Bull trout require two-way passage up and downstream, not only for repeat spawning, but also for foraging. Most fish ladders, however, were designed specifically for anadromous semelparous (fishes that spawn once and then die, and therefore require only one-way passage upstream) salmonids. 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.

Bull trout are opportunistic feeders with food habits primarily a function of size and life history strategy. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macro zooplankton and small fish (Boag 1987, p. 58; Goetz 1989, pp. 33-34; Donald and Alger 1993, pp. 239-243). Adult migratory bull trout are primarily piscivores, known to feed on various fish species (Fraley and Shepard 1989, p. 135; Donald and Alger 1993, p. 242).

2.3.2.5 Population Dynamics

Population Structure

As indicated above, 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, p. 2). 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 (Goetz 1989, p. 15). 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, p. 138; Goetz 1989, p. 24), or saltwater (anadromous form) to rear as subadults and to live as adults (Brenkman and Corbett 2005, entire; McPhail and Baxter 1996, p. i). Bull trout normally reach sexual maturity in 4 to 7 years and may live longer than 12 years. Repeat- and alternate-year spawning has been reported, although repeat-spawning frequency and post-spawning mortality are not well documented (Fraley and Shepard 1989, p. 135; Leathe and Graham 1982, p. 95; Pratt 1992, p. 8; Rieman and McIntyre 1996, p. 133).

Bull trout are naturally migratory, which allows them to capitalize on temporally abundant food resources and larger downstream habitats. Resident forms may develop where barriers (either natural or manmade) occur or where foraging, migrating, or overwintering habitats for migratory fish are minimized (Brenkman and Corbett 2005, pp. 1075-1076; Goetz et al. 2004, p. 105; Starcevich et al. 2012, p. 10; Barrows et al. 2016, p. 98). 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, pp. 96, 98-106) and Wenatchee River (Ringel et al. 2014, pp. 61-64). Parts of these river systems have retained habitat conditions that allow free movement between spawning and rearing areas and the mainstem rivers. Such multiple life history strategies help to maintain the stability and persistence of bull trout populations to environmental changes.

Benefits of connected habitat 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. 861-863; MBTSG 1998, p. 13; Rieman and McIntyre 1993, pp. 2-3). 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 size fish with higher fecundity is lost (Rieman and McIntyre 1993, p. 2).

Whitesel et al. (2004, p. 2) noted that although there are multiple resources that contribute to the subject, Spruell et al. (2003, entire) best summarized genetic information on bull trout population structure. Spruell et al. (2003, entire) analyzed 1,847 bull trout from 65 sampling locations, four located in three coastal drainages (Klamath, Queets, and Skagit Rivers), one in the Saskatchewan River drainage (Belly River), and 60 scattered throughout the Columbia River Basin. They concluded that there is a consistent pattern among genetic studies of bull trout, regardless of whether examining allozymes, mitochondrial DNA, or most recently microsatellite loci. Typically, the genetic pattern shows relatively little genetic variation within populations, but substantial divergence among populations. Microsatellite loci analysis supports the existence of at least three major genetically differentiated groups (or evolutionary lineages) of bull trout (Spruell et al. 2003, p. 17). They were characterized as:

i. “Coastal”, including the Deschutes River and all of the Columbia River drainage downstream, as well as most coastal streams in Washington, Oregon, and British Columbia. A compelling case also exists that the Klamath Basin represents a unique evolutionary lineage within the coastal group.

ii. “Snake River”, which also included the John Day, Umatilla, and Walla Walla rivers. Despite close proximity of the John Day and Deschutes Rivers, a striking level of divergence between bull trout in these two systems was observed.

iii. “Upper Columbia River” which includes the entire basin in Montana and northern Idaho. A tentative assignment was made by Spruell et al. (2003, p. 25) of the Saskatchewan River drainage populations (east of the continental divide), grouping them with the upper Columbia River group.

Spruell et al. (2003, p. 17) noted that within the major assemblages, populations were further subdivided, primarily at the level of major river basins. Taylor et al. (1999, entire) surveyed bull trout populations, primarily from Canada, and found a major divergence between inland and coastal populations. Costello et al. (2003, p. 328) suggested the patterns reflected the existence of two glacial refugia, consistent with the conclusions of Spruell et al. (2003, p. 26) and the biogeographic analysis of Haas and McPhail (2001, entire). Both Taylor et al. (1999, p. 1166) and Spruell et al. (2003, p. 21) concluded that the Deschutes River represented the most upstream limit of the coastal lineage in the Columbia River Basin.

More recently, the Service identified additional genetic units within the coastal and interior lineages (Ardren et al. 2011, pp. 519-523). Based on a recommendation in the USFWS’s 5-year review of the species’ status (USFWS 2008b, p. 45), the Service reanalyzed the 27 recovery units identified in the 2002 draft bull trout recovery plan (USFWS 2002a, p. 48) by utilizing, in part, information from previous genetic studies and new information from additional analysis (Ardren et al. 2011, entire). In this examination, the Service applied relevant factors from the joint USFWS and NMFS Distinct Population Segment (DPS) policy (USFWS and NMFS 1996, 61 FR 4722-4725) and subsequently identified six draft recovery units that contain assemblages of core areas that retain genetic and ecological integrity across the range of bull trout in the coterminous United States. These six recovery units were used to inform designation of critical habitat for bull trout by providing a context for deciding what habitats are essential for recovery (USFWS 2010a, 75 FR 63898). These six recovery units, which were identified in the final bull trout recovery plan (USFWS 2015a) and described further in the RUIPs (USFWS 2015b-g) include: Coastal, Klamath, Mid-Columbia, Columbia Headwaters, Saint Mary, and Upper Snake.

Population Dynamics

Although bull trout are widely distributed over a large geographic area, they exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993, p. 4). Increased habitat fragmentation reduces the amount of available habitat and increases isolation from other populations of the same species (Saunders et al. 1991, entire). Burkey (1989, entire) concluded that when species are isolated by fragmented habitats, low rates of population growth are typical in local populations and their probability of extinction is directly related to the degree of isolation and fragmentation. Without sufficient immigration, growth for local populations may be low and probability of extinction high (Burkey 1989, entire).

A metapopulation is an interacting network of local populations with varying frequencies of migration and gene flow among them (Meefe and Carroll 1994, pp. 189-190). For inland bull trout, metapopulation theory is likely most applicable at the watershed scale where habitat consists of discrete patches or collections of habitat capable of supporting local populations; local populations are for the most part independent and represent discrete reproductive units; and long-term, low-rate dispersal patterns among component populations influences the persistence of at least some of the local populations (Rieman and Dunham 2000, entire). Ideally, multiple local populations distributed throughout a watershed provide a mechanism for spreading risk because the simultaneous loss of all local populations is unlikely. However, habitat alteration, primarily through the construction of impoundments, dams, and water diversions has fragmented habitats, eliminated migratory corridors, and in many cases isolated bull trout in the headwaters of tributaries (Rieman and Clayton 1997, pp. 10-12; Dunham and Rieman 1999, p. 645; Spruell et al. 1999, pp. 118-120; Rieman and Dunham 2000, p. 55).

Human-induced factors as well as natural factors affecting bull trout distribution have likely limited the expression of the metapopulation concept for bull trout to patches of habitat within the overall distribution of the species (Dunham and Rieman 1999, entire). However, despite the theoretical fit, the relatively recent and brief time period during which bull trout investigations have taken place does not provide certainty as to whether a metapopulation dynamic is occurring (e.g., a balance between local extirpations and recolonizations) across the range of the bull trout or whether the persistence of bull trout in large or closely interconnected habitat patches (Dunham and Rieman 1999, entire) is simply reflective of a general deterministic trend towards extinction of the species where the larger or interconnected patches are relics of historically wider distribution (Rieman and Dunham 2000, pp. 56-57). Research does, however, provide genetic evidence for the presence of a metapopulation process for bull trout, at least in the Boise River Basin of Idaho (Whiteley et al. 2003, entire). Whitesel et al. (2004 pp. 14-23) summarizes metapopulation models and their applicability to bull trout).

2.3.2.6 Status and Distribution

The following is a summary of the description and current status of the bull trout within the six recovery units (RUs) (shown in Figure 3, below). A comprehensive discussion is found in the Service's 2015 RP for the bull trout (USFWS 2015a, entire) and the 2015 RUIPs (USFWS 2015b-g, entire). Each of these RUs is necessary to maintain the bull trout's distribution, as well as its genetic and phenotypic diversity, all of which are important to ensure the species' resilience to changing environmental conditions.

Coastal Recovery Unit

The Coastal RUIP describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015b, entire). The Coastal RU is located within western Oregon and Washington. The RU is divided into three regions: Puget Sound, Olympic Peninsula, and the Lower Columbia River Regions. This RU contains 20 core areas comprising 84 local populations and a single potential local population in the historic 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 (USFWS 2015a, p. 47; USFWS 2015b, p. A-2). 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 foraging, migrating, and overwintering (FMO) habitats which are outside core areas and allows for the continued natural population dynamics in which the core areas have evolved (USFWS 2015b, p. A-5).

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 (USFWS 2015a, p.79). These are the most stable and abundant bull trout populations in the RU.

Most core areas in the Puget Sound region support a mix of anadromous and fluvial life history forms, with at least two core areas containing a natural adfluvial life history (Chilliwack River core area [Chilliwack Lake] and Chester Morse Lake core area). Overall demographic status of core areas generally improves as you move from south Puget Sound to north Puget Sound. Although comprehensive trend data are lacking, the current condition of core areas within the Puget Sound region are likely stable overall, although some at depressed abundances. Most core areas in this region still have significant amounts of headwater habitat within protected and relatively pristine areas (e.g., North Cascades National Park, Mount Rainier National Park, Skagit Valley Provincial Park, Manning Provincial Park, and various wilderness or recreation areas).

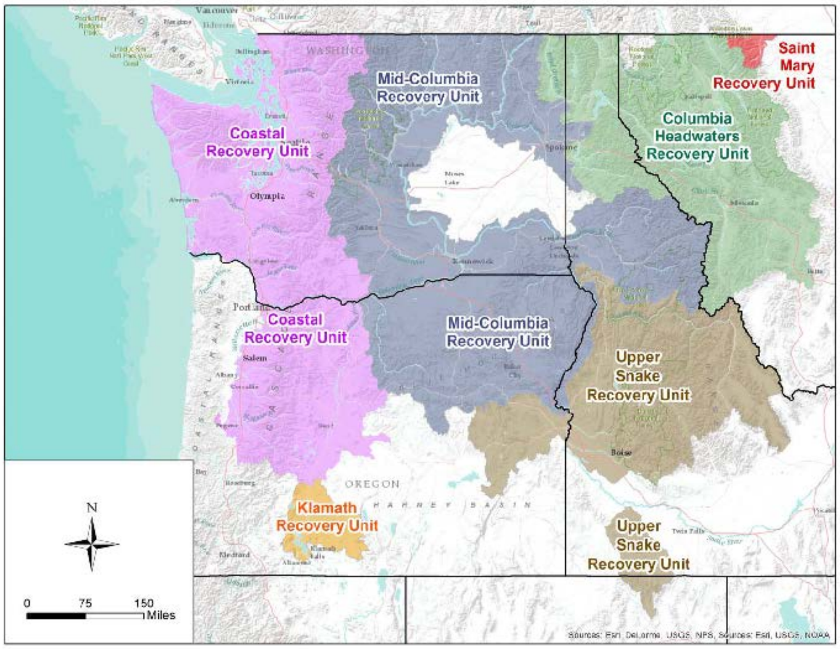

Figure 3. Map showing the location of the six bull trout Recovery Units.

Within the Olympic Peninsula region, demographic status of core areas is poorest in Hood Canal and Strait of Juan de Fuca, while core areas along the Pacific Coast of Washington likely have the best demographic status in this region. The connectivity between core areas in these disjunct regions is believed to be naturally low due to the geographic distance between them. Internal connectivity is currently poor within the Skokomish River core area (Hood Canal) and is being restored in the Elwha River core area (Strait of Juan de Fuca). Most core areas in this region still have their headwater habitats within relatively protected areas (Olympic National Park and wilderness areas).

Across the Lower Columbia River region, status is highly variable, with one relative stronghold (Lower Deschutes core area) existing on the Oregon side of the Columbia River. The Lower Columbia River region also contains three watersheds (North Santiam River, Upper Deschutes River, and White Salmon River) that could potentially become re-established core areas within the Coastal Recovery Unit. Adult abundances within the majority of core areas in this region are relatively low, generally 300 or fewer individuals.

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 in-stream 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, in-stream 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.

The RP identifies three categories of primary threats[11]: Habitat (upland/riparian land management, in-stream impacts, water quality), demographic (connectivity impairment, fisheries

[11] Primary Threats are factors known or likely (i.e., non-speculative) to negatively impact bull trout populations at

management, small population size), and nonnatives (nonnative fishes). Of the 20 core areas in the Coastal RU, only one (5 percent), the Lower Deschutes River, has no primary threats identified (USFWS 2015b, Table A-1).

Conservation measures or recovery actions implemented in this RU 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 revegetation, levee setbacks, road removal, and projects to protect and restore important nearshore marine habitats. For more information on conservation actions see section 2.3.2.7 below.

Klamath Recovery Unit

The Klamath RUIP describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015c, entire). This RU is located in southern Oregon and northwestern California. The Klamath RU is the most significantly imperiled RU, 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 2015a, p. 39). This RU currently contains three core areas and eight local populations (USFWS 2015a, p. 47; USFWS 2015c, p. B-1). Nine historic local populations of bull trout have become extirpated (USFWS 2015c, p. B-1). All three core areas have been isolated from other bull trout populations for the past 10,000 years (USFWS 2015c, p. B-3).

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. Identified primary threats for all three core areas include upland/ riparian land management, connectivity impairment, small population size, and nonnative fishes (USFWS 2015c, Table B-1).

Conservation measures or recovery actions implemented include removal of nonnative fish (e.g., brook trout, brown trout, and hybrids), acquiring water rights for in-stream flows, replacing diversion structures, installing fish screens, constructing bypass channels, installing riparian fencing, culvert replacement, and habitat restoration. For more information on conservation actions see section 2.3.2.7 below.

Mid-Columbia Recovery Unit

The Mid-Columbia RUIP describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015d, entire). 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 24 occupied core areas comprising 142 local populations, two historically occupied core areas, one research needs area, and seven FMO habitats (USFWS 2015a, p. 47; USFWS 2015d, p. C-1 – C4).

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the core area level, and accordingly require actions to assure bull trout persistence to a degree necessary that bull trout will not be at risk of extirpation within that core area in the foreseeable future (4 to 10 bull trout generations, approximately 50 years).

The current demographic status of bull trout in the Mid-Columbia Recovery Unit is highly variable at both the RU and geographic region scale. Some core areas, such as the Umatilla, Asotin, and Powder Rivers, contain populations so depressed they are likely suffering from the deleterious effects of small population size. Conversely, strongholds do exist within the RU, predominantly in the Lower Snake geographic area. Populations in the Imnaha, Little Minam, Clearwater, and Wenaha Rivers are likely some of the most abundant. These populations are all completely or partially within the bounds of protected wilderness areas and have some of the most intact habitat in the recovery unit. Status in some core areas is relatively unknown, but all indications in these core areas suggest population trends are declining, particularly in the core areas of the John Day Basin. More detailed description of bull trout distribution, trends, and survey data within individual core areas is provided in Appendix II of the RUIP (USFWS 2015d).

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. Of the 24 occupied core areas, six (25 percent) have no identified primary threats (USFWS 2015d, Table C-2).

Conservation measures or recovery actions implemented include road removal, channel restoration, mine reclamation, improved grazing management, removal of fish barriers, and in-stream flow requirements. For more information on conservation actions see section 2.3.2.7 below.

Columbia Headwaters Recovery Unit

The Columbia Headwaters RUIP describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015e, entire). The Columbia Headwaters RU is located in western Montana, northern Idaho, and the northeastern corner of Washington. The RU is divided into five geographic regions: Upper Clark Fork, Lower Clark Fork, Flathead, Kootenai, and Coeur d'Alene Geographic Regions (USFWS 2015e, pp. D-2 – D-4). 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 simple 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 2015e, p. D-1). Fish passage improvements within the RU have reconnected some previously fragmented habitats (USFWS 2015e, p. D-1), while others remain fragmented. Unlike the other RUs in Washington, Idaho and Oregon, 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 2015e, p. D-41).

Conclusions from the 2008 5-year review (USFWS 2008b, Table 1) were that 13 of the Columbia Headwaters RU core areas were at High Risk (37.1 percent), 12 were considered At Risk (34.3 percent), 9 were considered at Potential Risk (25.7 percent), and only 1 core area (Lake Koocanusa; 2.9 percent) was considered at Low Risk. Simple core areas, due to limited demographic capacity and single local populations were generally more inherently at risk than complex core areas under the model. While this assessment was conducted nearly a decade ago, little has changed in regard to individual core area status in the interim (USFWS 2015e, p. D-7).

The current condition of the bull trout in this RU is attributed to the adverse effects of climate change, mostly historical mining and contamination by heavy metals, expanding populations of nonnative fish predators and competitors, modified in-stream flows, migratory barriers (e.g., dams), habitat fragmentation, forest practices (e.g., logging, roads), agriculture practices (e.g. irrigation, livestock grazing), and residential development. Of the 34 occupied core areas, nine (26 percent) have no identified primary threats (USFWS 2015e, Table D-2).

Conservation measures or recovery actions implemented include habitat improvement, fish passage, and removal of nonnative species. For more information on conservation actions see section 2.3.2.7 below.

Upper Snake Recovery Unit

The Upper Snake RUIP describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015f, entire). 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 207 local populations (USFWS 2015a, p. 47), with almost 60 percent being present in the Salmon River Region.

The population trends for the 22 core areas in the Upper Snake RU are summarized in Table E-2 of the Upper Snake RUIP (USFWS 2015f, pp. E-5 – E-7): six are classified as increasing, two are stable; two are likely stable; three are unknown, but likely stable; two are unknown, but likely decreasing; and, seven are unknown.

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). Of the 22 occupied core areas, 13 (59 percent) have no identified primary threats (USFWS 2015f, Table E-3).

Conservation measures or recovery actions implemented include in-stream habitat restoration, in-stream flow requirements, screening of irrigation diversions, and riparian restoration. For more details on conservation actions in this unit see section 2.3.2.7 below.

St. Mary Recovery Unit

The St. Mary RUIP describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015g). The Saint Mary RU is located in Montana but is heavily linked to downstream resources in southern Alberta, Canada. Most of the Saskatchewan River watershed which the St. Mary flows into 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 (St. Mary River, Slide Lake, Cracker Lake, and Red Eagle Lake), and seven local populations (USFWS 2015g, p. F-1) in the U.S. headwaters.

Current status of bull trout in the Saint Mary River complex core area (U.S.) is considered strong. The three simple core areas (Slide Lake, Cracker Lake, and Red Eagle Lake) appear to be self-sustaining and fluctuating within known historical population demographic bounds. Note: the NatureServe status assessment tool ranks this RU as imperiled (Figure 4).

The current condition of the bull trout in this RU is attributed primarily to the outdated design and operations of the Saint Mary Diversion operated by the Bureau of Reclamation (e.g., entrainment, fish passage, in-stream flows), and, to a lesser extent habitat impacts from development and nonnative species. Of the four core areas, the three simple core areas (all lakes) have no identified primary threats (USFWS 2015g, Table F-1).

For more information on conservation actions see section 2.3.2.7 below.

Status Summary

The Service applied the NatureServe status assessment tool[12] to evaluate the tentative status of the six RUs. The tool rated the Klamath RU as the least robust, most vulnerable RU and the Upper Snake RU the most robust and least vulnerable recovery unit, with others at intermediate values (Figure 4).

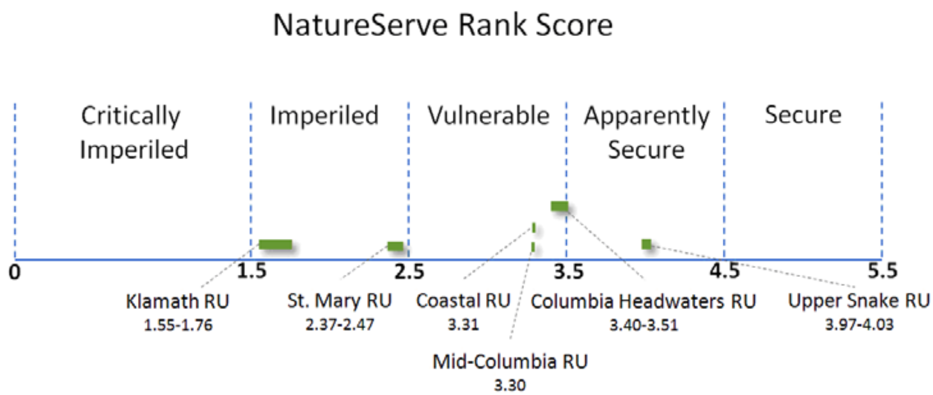

Figure 4. NatureServe status assessment tool scores for each of the six bull trout recovery units. The Klamath RU is considered the least robust and most vulnerable, and the Upper Snake RU the most robust and least vulnerable (from USFWS 2015a, Figure 2).

2.3.2.7 Conservation Needs

The 2015 RP for bull trout established the primary strategy for recovery of bull trout in the coterminous United States: (1) conserve bull trout so that they are geographically widespread across representative habitats and demographically stable in six RUs; (2) effectively manage and ameliorate the primary threats in each of six RUs at the core area scale such that bull trout are not likely to become endangered in the foreseeable future; (3) build upon the numerous and ongoing conservation actions implemented on behalf of bull trout since their listing in 1999, and improve our understanding of how various threat factors potentially affect the species; (4) use that information to work cooperatively with our partners to design, fund, prioritize, and implement effective conservation actions in those areas that offer the greatest long-term benefit to sustain bull trout and where recovery can be achieved; and (5) apply adaptive management

[12] This tool consists of a spreadsheet that generates conservation status rank scores for species or other biodiversity elements (e.g. bull trout Recovery Units) based on various user inputs of status and threats (see USFWS 2015, p. 8 and Faber-Langendoen et al. 2012, entire, for more details on this status assessment tool).

principles to implementing the bull trout recovery program to account for new information (USFWS 2015a, p. 24.).

Information presented in prior draft recovery plans published in 2002 and 2004 (USFWS 2002a, entire; 2004b, entire; 2004c, entire) provided information that identified 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. Many recovery actions were completed prior to finalizing the RP in 2015.

The 2015 RP (USFWS 2015a, entire) integrates new information collected since the 1999 listing regarding bull trout life history, distribution, demographics, conservation successes, etc., and integrates and updates previous bull trout recovery planning efforts across the coterminous range of the bull trout.

The Service has developed a recovery approach that: (1) focuses on the identification of and effective management of known and remaining threat factors to bull trout in each core area; (2) acknowledges that some extant bull trout core area habitats will likely change (and may be lost) over time; and (3) identifies and focuses recovery actions in those areas where success is likely to meet our goal of ensuring the certainty of conservation of genetic diversity, life history features, and broad geographical representation of remaining bull trout populations so that the protections of the Act are no longer necessary (USFWS 2015a, p. 45-46).

To implement the recovery strategy, the 2015 RP establishes three categories of recovery actions for each of the six RUs (USFWS 2015a, pp. 50-51):

1. Protect, restore, and maintain suitable habitat conditions for bull trout.
2. Minimize demographic threats to bull trout by restoring connectivity or populations where appropriate to promote diverse life history strategies and conserve genetic diversity.
3. Prevent and reduce negative effects of nonnative fishes and other nonnative taxa on bull trout.
4. 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 tasks, and considering the effects of climate change.

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 biological-based recovery units: (1) Coastal Recovery Unit; (2) Klamath Recovery Unit; (3) Mid-Columbia Recovery Unit; (4) Columbia Headwaters Recovery Unit (5) Upper Snake Recovery Unit; and (6) Saint Mary Recovery Unit (USFWS 2015a, p. 23). 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 2015a, p. 33).

Each of the six recovery units contain multiple bull trout core areas, 109 total, which are non-overlapping watershed-based polygons, and each core area includes one or more local populations. Currently there are 109 occupied core areas, which comprise 611 local populations (USFWS 2015a, pp. 3, 47, Appendix F). There are also six core areas where bull trout historically occurred but are now extirpated, and one research needs area where bull trout were known to occur historically, but their current presence and use of the area are uncertain (USFWS 2015a, p. 3). Core areas can be further described as complex or simple (USFWS 2015a, p. 3-4). 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 FMO habitat. 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 core area is a combination of core habitat (i.e., habitat that could supply all elements for the long-term security of bull trout) and a core population (a group of one or more local bull trout populations that exist within core habitat) and constitutes the basic unit on which to gauge recovery within a recovery unit. Core areas require both habitat and bull trout to function, and the number (replication) and characteristics of local populations inhabiting a core area provide a relative indication of the core area's likelihood to persist. A core area represents the closest approximation of a biologically functioning unit for bull trout. Core areas are presumed to reflect the metapopulation structure of bull trout.

A local population is a group of bull trout that spawn within a particular stream or portion of a stream system (USFWS 2015a, p. 73). 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.

2.3.2.8 Federal, State, and Tribal Conservation Actions Since Listing

Since our listing of bull trout in 1999, numerous conservation measures that contribute to the conservation and recovery of bull trout have been and continue to be implemented across its range in the coterminous United States. These measures are being undertaken by a wide variety of local and regional partnerships, including State fish and game agencies, State and Federal land management and water resource agencies, Tribal governments, power companies, watershed working groups, water users, ranchers, and landowners.

In many cases, these bull trout conservation measures incorporate or are closely interrelated with work being done for recovery of salmon and steelhead, which are limited by many of the same threats. These include removal of migration barriers (culvert removal or redesign at stream crossings, fish ladder construction, dam removal, etc.) to allow access to spawning or FMO habitat; screening of water diversions to prevent entrainment into unsuitable habitat in irrigation systems; habitat improvement (riparian revegetation or fencing, placement of coarse woody debris in streams) to improve spawning suitability, habitat complexity, and water temperature; in-stream flow enhancement to allow effective passage at appropriate seasonal times and prevent channel dewatering; and water quality improvement (decommissioning roads, implementing best management practices for grazing or logging, setting pesticide use guidelines) to minimize impacts from sedimentation, agricultural chemicals, or warm temperatures.

At sites that are vulnerable to development, protection of land through fee title acquisition or conservation easements is important to prevent adverse impacts or allow conservation actions to be implemented. In several bull trout core areas, fisheries management to manage or suppress non-native species (particularly brown trout, brook trout, lake trout, and northern pike) is ongoing and has been identified as important in addressing effects of non-native fish competition, predation, or hybridization.

A more comprehensive overview of conservation successes since 1999, described for each recovery unit, is found in the Summary of Bull Trout Conservation Successes and Actions since 1999 (Available at: (http://www.fws.gov/pacific/ecoservices/endangered/recovery/documents/USFWS_2013_summary_of_conservation_successes.pdf).

2.3.2.9 Consulted-on Effects

Consulted-on effects are those effects that have been analyzed through Section 7 consultation as reported in a Biological Opinion. These effects are an important component of objectively characterizing the current condition status of the species.

Projects subject to section 7 consultation under the Act have occurred throughout the range of bull trout. Singly or in aggregate, these projects could affect the species' status. The Service reviewed 137 opinions produced by the Service from the time of listing in June 1998 until August 2003 (Nuss 2003, entire). The Service analyzed 24 different activity types (e.g., grazing, road maintenance, habitat restoration, timber sales, hydropower, etc.). Twenty opinions involved multiple projects, including restorative actions for bull trout.

The geographic scale of projects analyzed in these opinions varied from individual actions (e.g., construction of a bridge or pipeline) within one basin, to multiple-project actions, occurring across several basins. Some large-scale projects affected more than one recovery unit.

The Service's assessment of opinions from the time of listing until August 2003 (137 opinions), confirmed that no actions that had undergone section 7 consultation during this period, considered either singly or cumulatively, would appreciably reduce the likelihood of survival and recovery of the bull trout or result in the loss of any (sub) populations (USFWS 2006, pp. B-36 – B-37).

Between August 2003 and July 2006, the Service issued 198 additional opinions that included analyses of effects on bull trout (USFWS 2006). These opinions also reached "no-jeopardy" determinations, and the Service concluded that the continued long-term survival and existence of the species had not been appreciably reduced range-wide due to these actions (USFWS 2006).

Since July 2006, a review of the data in our national Tracking and Integrated Logging System (TAILS) reveal this trend has changed. One biological opinion, the Idaho Water Quality Standards for Numeric Water Quality Criteria for Toxic Pollutants completed in 2015 (USFWS 2014c) resulted in a "Jeopardy" determination and issued Reasonable and Prudent Alternatives.

2.3.3 Bull Trout Critical Habitat

2.3.3.1 Legal Status

Ongoing litigation resulted in the U.S. District Court for the District of Oregon granting the Service a voluntary remand of the 2005 critical habitat designation. Subsequently the Service published a proposed critical habitat rule on January 14, 2010 (USFWS 2010b, 75 FR 2260) and a final rule on October 18, 2010 (USFWS 2010a, 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 designation involved the species' coterminous range within the Coastal, Klamath, Mid-Columbia, Columbia Headwaters, Upper Snake, and St. Mary recovery units[13].

Rangewide, the Service designated reservoirs/lakes and stream/shoreline miles in 32 critical habitat units (CHU) as bull trout critical habitat (see Table 5). Designated bull trout critical habitat is of two primary use types: spawning and rearing (SR) and FMO.

Table 5. 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**

Compared to the 2005 designation, the final rule increases the amount of designated bull trout critical habitat by approximately 76 percent for miles of stream/shoreline and by approximately 71 percent for acres of lakes and reservoirs.

[13] Note: the adverse modification analysis does not rely on recovery units.

This rule also identifies and designates as critical habitat approximately 1,323.7 km (822.5 miles) of streams/shorelines and 6,758.8 ha (16,701.3 acres) of lakes/reservoirs of unoccupied habitat to address bull trout conservation needs in specific geographic areas in several areas not occupied at the time of listing. No unoccupied habitat was included in the 2005 designation. 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 mainstem river environments that can provide seasonally important migration habitat for bull trout. This type of habitat is essential in areas where bull trout habitat and population loss over time necessitates reestablishing bull trout in currently unoccupied habitat areas to achieve recovery.

The final rule continues to exclude some critical habitat segments 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 habitat conservation plans (HCPs) issued under section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended, in which bull trout is a covered species on or before the publication of this 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 (USFWS 2010a, 75 FR 63898). Excluded areas are approximately 10 percent of the stream/shoreline miles and 4 percent of the lakes and reservoir acreage of designated critical habitat. Each excluded area is identified in the relevant CHU text, as identified in paragraphs (e)(8) through (e)(41) of the final rule. It is important to note that the exclusion of water bodies 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 stream segments.

2.3.3.2 Conservation Role and Description of Critical Habitat

The conservation role of bull trout critical habitat is to support viable core area populations (USFWS 2010a, 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 FMO areas, outside of core areas, that are important to the survival and recovery of bull trout.

As previously noted, 32 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 or biological features identified in this final rule and support multiple life-history requirements. Three of the mainstem river units in the Columbia and Snake River basins contain most of the physical or biological features necessary to support the bull trout's particular use of that habitat, other than those physical and biological features associated with Physical and Biological Features (PBFs) 5 and 6, which relate to breeding habitat (see list below).

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 (MBTSG 1998, pp. 48-49; Rieman and

McIntyre 1993, pp. 22-23); (3) are large enough to incorporate genetic and phenotypic diversity, but small enough to ensure connectivity between populations (MBTSG 1998, pp. 48-49; Rieman and McIntyre 1993, pp. 22-23); and (4) are distributed throughout the historic range of the species to preserve both genetic and phenotypic adaptations (MBTSG 1998, pp. 13-16; Rieman and Allendorf 2001, p. 763; Rieman and McIntyre 1993, p. 23).

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, outside of core areas, contain PBFs that are critical to adult and subadult foraging, migrating, and overwintering.

In determining which areas to propose as critical habitat, the Service considered the physical and biological features that are essential to the conservation of bull trout and that may require special management considerations or protection. These features are the PBFs laid out in the appropriate quantity and spatial arrangement for conservation of the species. The PBFs of designated critical habitat are:

1. Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to 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 2 to 15 °C (36 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, such as that 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 amounts 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 departures 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 nonnative predatory (e.g., lake trout, walleye, northern pike, smallmouth bass); interbreeding (e.g., brook trout); or competing (e.g., brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout.

2.3.3.3 Current Rangewide Condition of Bull Trout Critical Habitat

The condition of bull trout critical habitat varies across its range from poor to good. Although still relatively widely distributed across its historic range, the bull trout occurs in low numbers in many areas, and populations are considered depressed or declining across much of its range (USFWS 2002b, 67 FR 71240). This condition reflects the condition of bull trout habitat.

The primary land and water management activities impacting the physical and biological features essential to the conservation of bull trout include timber harvest and road building, agriculture and agricultural diversions, livestock grazing, dams, mining, urbanization and residential development, and nonnative species presence or introduction (USFWS 2010b, 75 FR 2282).

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 and have resulted in a legacy of degraded habitat conditions 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 habitat and upper watershed areas, particularly alterations in sedimentation rates and water temperature, 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 nonnative fish species, particularly brook trout and lake trout, as a result of fish stocking and degraded habitat conditions, which compete with bull trout for limited resources and, in the case of brook trout, hybridize 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 FMO habitat, and the degradation and loss of marine nearshore foraging and migration habitat due to urban and residential development.
5. Degradation of FMO habitat resulting from reduced prey base, roads, agriculture, development, and dams.

The bull trout critical habitat final rule also aimed to identify and protect those habitats that provide resiliency for bull trout use 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 in 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 nonnative fishes).

2.4 Environmental Baseline of the Action Area

This section assesses the effects of past and ongoing human and natural factors that have led to the current status of the species, its habitat and ecosystem in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area that have already undergone section 7 consultations, and the impacts of state and private actions which are contemporaneous with this consultation.

2.4.1 Bliss Rapids Snail

2.4.1.1 Status of Bliss Rapids Snail in the Action Area

Because the range of the Bliss Rapids snail is contained entirely within the action area, refer to section 2.3.1 of this Opinion for the baseline status of this snail.

2.4.1.2 Factors Affecting Bliss Rapids Snail in the Action Area

Our understanding of the threats to the Bliss Rapids snail has changed since we listed the species in 1992. Some threats are now known to be removed (i.e., new hydropower dam construction) while other threats have emerged (i.e., depletion of groundwater that supports the spring colonies). As discussed in the following sections, we believe, based on the best available data, that it is reasonable to expect the primary threats (i.e., reduced ground water levels, water quality and pollution concerns, competition from nonnative species, and climate change) to Bliss Rapids snails will continue to occur throughout the range of the species and to affect all colonies into the future.

Refer to section 2.3.1.5 for more information on the conservation needs of the Bliss Rapids snail.

Construction of New Hydropower Dams

In our 1992 final rule listing the Bliss Rapids snail as a threatened species, we stated, "Six proposed hydroelectric projects, including two high dam facilities, would alter free flowing river reaches within the existing range of [the Bliss Rapids snail]. Dam construction threatens the [Bliss Rapids snail] through direct habitat modification and moderates the Snake River's ability to assimilate point and non-point pollution. Further hydroelectric development along the Snake River would inundate existing mollusk habitats through impoundment, reduce critical shallow, littoral shoreline habitats in tailwater areas due to operating water fluctuations, elevate water temperatures, reduce dissolved oxygen levels in impounded sediments, and further fragment remaining mainstem populations or colonies of [the Bliss Rapids snail]" (57 FR 59251).

Proposed hydroelectric projects discussed in the 1992 final listing rule are no longer moving forward. The A.J. Wiley project and Dike Hydro Partners preliminary permits have lapsed; the Kanaka Rapids, Empire Rapids, and Boulder Rapids permits were denied by the Federal Energy Regulatory Commission (FERC) in 1995; there was a notice of surrender of the preliminary permit for the River Side Project in 2002; and two other proposed projects, the Eagle Rock and Star Falls Hydroelectric Projects, were denied preliminary permits by the FERC. In 2003, a notice was provided of surrender of the preliminary permit for the Auger Falls Project. Information provided by the state of Idaho indicates that all proposals and preliminary permits for the construction of new dams along the mid-Snake River have either lapsed or been denied by the FERC (Caswell 2006, *in litt*).

Operation of Existing Hydropower Dams

The Bliss Rapids snail occurs in riverine and spring or spring-influenced habitats but is not known to occur in reservoir habitats. In the December 14, 1992 final listing rule we stated, "Peak- loading, the practice of artificially raising and lowering river levels to meet short-term electrical needs by local run-of-the-river hydroelectric projects also threatens [the Bliss Rapids snail]. Peak- loading is a frequent and sporadic practice that results in dewatering mollusk habitats in shallow, littoral shoreline areas … these diurnal water fluctuations [prevent the Bliss Rapids snail] from occupying the most favorable habitats" (57 FR 59252). Peak loading operations within the range of river colonies of the Bliss Rapids snail occur below the Bliss Dam (RKM 901 (RM 560)) and the Lower Salmon Falls Dam (RM 573) (USFWS 2004d, pp. 19, 20). For example, at the Bliss Dam (Stephenson and Bean 2003, p. 30) the Snake River can experience daily fluctuation of water levels from hydropower generating activities (peak loading) up to 2.1 m (7 ft). It appears that Bliss Rapids snails are found primarily in areas less than 0.9 m (3 ft) deep, although this may be an artifact of more intensive sampling at shallow depths (Richards et al. 2006, pp. 43, 52-56). Nevertheless, our current understanding based on the best available information, is that a majority of Bliss Rapids snails in the Snake River occupy shallow water. Furthermore, Bliss Rapids snails in these shallow-water areas are susceptible to the effects from peak loading operations, including desiccation and freezing when water levels drop and expose snails to atmospheric conditions.

Laboratory studies have shown that peak-loading during winter months, a time when the species is reproducing, is likely to result in mortality of individual Bliss Rapids snails. Air temperatures within the range of Bliss Rapids snails in Idaho regularly fall below 0°C (32°F) between November and March (Richards 2006, p. 28). In a laboratory study conducted by Richards (2006, p. 12), half of the Bliss Rapids snails subjected to a temperature of minus 7°C (19°F) died in less than an hour. In a field study, Richards (unpublished data, cited in Richards et al. 2006, pp. 125-126) found that Bliss Rapids snails could survive for many hours to several days in moist conditions (i.e., undersides of cobbles) when air temperatures were above freezing (0° C (32° F)) (Richards et al. 2006, p. 125). Although the mortality rate outside of these conditions has not been documented in field studies or after an actual peak loading event, work by Richards et al. 2014, p. 961) utilizing laboratory-controlled aquaria, found Bliss Rapids snail mortality to be up to 100 percent under conditions characteristic of some hydropower operations in the middle Snake River (summer high and winter low temperatures). Based on the above information, peak loading likely affects individual Bliss Rapids snails through desiccation and freezing and may have population level effects as well.

Degraded Water Quality

In the 1992 final listing rule the Service stated, "The quality of water in [snail] habitats has a direct effect on the species survival. The [Bliss Rapids snail] require[s] cold, well-oxygenated unpolluted water for survival. Any factor that leads to deterioration in water quality would likely extirpate [the Bliss Rapids snail]" (57 FR 59252). New information has become available indicating some improvements to Snake River water quality. Significant nutrient and sediment reduction has occurred in the Snake River following implementation of the Idaho Nutrient Management Act and regulated Total Maximum Daily Load (TMDL) reductions from the mid-1990s to the present (Richards et al. 2006, pp. 5-6, 86). The Mid-Snake River reach also receives a large infusion of clean, cold-water spring flows and supports the highest densities and occurrence of Bliss Rapids snails.

Hypereutrophy (planktonic algal blooms and nuisance rooted aquatic plant growths), prior to listing in 1992, was very severe during drought cycles when deposition of sediments and organic matter blanketed river substrate often resulting in unsuitable habitat conditions for Bliss Rapids snails. Although some nutrient and sediment reduction has been documented in the Snake River since listing (Richards et al. 2006, p. 5), there are still large inflows of agriculture and aquaculture runoff entering the river at Twin Falls to Lower Salmon Falls dam (RKM 922 (RM 573)). As a result, nutrient and sediment concentrations can be relatively high in this portion of the river, especially during lower summer flows (Richards et al. 2006, p. 91). Phosphorus concentrations, the key nutrient leading to hypereutrophic conditions in the middle Snake River, exceeded EPA guidelines for the control of nuisance algae at numerous locations along the Snake River from 1989 to 2002, including areas immediately upstream of Bliss Rapids snail colonies (Hardy et al. 2005, p. 13). Several water quality assessments have been completed by the EPA, U.S. Bureau of Reclamation (USBR), and IPC, and all generally agree that water quality in the Snake River of southern Idaho meets Idaho water quality standards for aquatic life for some months of the year, but may not meet these standards when temperatures are high and flows are low (Meitl 2002, p. 33). Idaho Department of Environmental Quality's (IDEQ) 2005 performance and progress report to the EPA states that projects are meeting the Idaho non-point source pollution program goals (IDEQ 2006a, entire.). Others report that water quality has not improved appreciably between 1989 and 2002 (Hardy et al. 2005, pp. 19-21, 49, 51).

Several reaches of the Snake River are classified as water-quality-impaired due to the presence of one or more pollutants (e.g., total phosphorus (TP), total suspended solids (TSS), and total coliforms) in excess of State or Federal guidelines. Nutrient-enriched waters primarily enter the Snake River via springs, tributaries, fish farm effluents, municipal waste treatment facilities, and irrigation returns (EPA 2002, pp. 4-18 to 4-24). Irrigation water returned to rivers is generally warmer, contains pesticides or pesticide byproducts, has been enriched with nutrients from fish farms and land-based agriculture (e.g., nitrogen and phosphorous), and frequently contains elevated sediment loads. Pollutants in fish farm effluent include nutrients derived from metabolic wastes of the fish and unconsumed fish food, disinfectants, bacteria, and residual quantities of drugs used to control disease outbreaks. Furthermore, elevated levels of fine sediments, nitrogen, and trace elements (including cadmium, chromium, copper, lead, and zinc), have been measured immediately downstream of several aquaculture discharges (Hinson 2003, pp. 44-45). Additionally, concentrations of lead, cadmium, and arsenic have been previously detected in snails collected during a research study in the Snake River (Richards 2002, *in litt*). The effects of these elevated levels of nutrients and trace elements on Bliss Rapids snails, both individually and synergistically, are not fully understood. However, studies have shown another native Snake River snail, the Jackson Lake springsnail (*Pyrgulopsis robusta*), to be relatively sensitive to copper (a common component in algaecides) and pentachlorophenol, a restricted use pesticide/wood preservative (Ingersoll 2006, *in litt*).

Water Diversions and Ground Water Withdrawals

Threats to cold water spring-influenced habitats from ground water withdrawal and diversions for irrigation and aquaculture are not as they were perceived when the Bliss Rapids snail was listed in 1992. At that time the threat from ground water withdrawal was identified only at Box Canyon, and the scope of this threat was underestimated. Based on the current best available data, we now know that this threat is likely to affect the Bliss Rapids snail throughout its range. In concert with the historical losses of habitat to surface diversions of spring water for irrigation and aquaculture, the continuing decline of the groundwater aquifer is one of the primary threats to the long-term viability of the Bliss Rapids snail.

Average annual spring flows increased from about 4,400 cfs in 1910, to approximately 6,500 cfs in the early 1960s, because widespread flood irrigation caused artificial recharge of the aquifer (Richards et al. 2006, pp. 84, 87). As a result of more efficient irrigation practices from 1960 to the present (i.e., switching from flood irrigation or direct surface diversion to more efficient center-pivot irrigation systems utilizing ground water), more water was pumped from the aquifer while water percolation into the aquifer declined, resulting in declines (from the high values of the 1960s) of average annual spring flows to about 5,000 cfs (Richards et al. 2006, pp. 84, 87). Although the current spring flow levels total about 15 percent higher than average spring flows measured in 1910, they are declining (USFWS 2008a, pp. 23-24). We anticipate spring flows will likely continue to decline in the near future, even as water-conservation measures are implemented and are being developed as water demands in the vicinity continue to increase. The state of Idaho has taken steps to improve ground water recharge and limit new ground water development within the eastern Snake River plain; however, the Snake River Plain aquifer level continues to decline (USFWS 2008a, p. 26).

Effects from the over-allocation of ground water and the subsequent declining ground water levels appear to be more of a threat than previously thought. Evidence indicates that springs from the Eastern Snake River Aquifer where the Bliss Rapids snail resides depend on ground water levels, and that the ground water levels are declining (USFWS 2008a, p. 26) even with ongoing measures attempting to address the decline (Caswell 2007, *in litt*). Spring sites are important since Bliss Rapids snail colonies that occur in springs have been shown to be a source of genetic diversity to riverine colonies and to contain four times as many private (i.e., unique) alleles (n=16) compared to riverine populations (Liu and Hershler 2009, p. 1296). Colonies in springs or at their outflows are also the most dense, may account for most of the reproductive output of the species, and likely act as refugia from competition with invasive New Zealand mudsnails (see below). Finally, if spring colonies are lost, particularly those at the upstream end of the species' distribution, the probability of recolonization is likely to be extremely small (USFWS 2008a, p. 36).

Inadequacy of Existing Regulatory Mechanisms

In the 1992 final listing rule, we found inadequate regulatory mechanisms to be a threat because (1) regulations were inadequate to curb further water withdrawal from ground water spring outflows or tributary spring streams; (2) it was unlikely that pollution control regulations would reverse the trend in nutrient loading in the near future; (3) there was a lack of State-mandated protections for invertebrate species in Idaho; and (4) regulations did not require the FERC or the U.S. Army Corps of Engineers to address Service concerns regarding licensing hydroelectric projects or permitting projects under the Clean Water Act (CWA) for unlisted snails. Below, we address each of these concerns in turn.

Ground Water Withdrawal Regulations

The Idaho Department of Water Resources (IDWR) manages water in the state of Idaho. Among the IDWR's responsibilities is the development of the State Water Plan (IDWR 2006a, *in litt*). The State Water Plan was updated in 1996 and included a table of federally threatened and endangered species in Idaho, such as the Bliss Rapids snail. The State Water Plan outlines objectives for the conservation, development, management, and optimum use of all unappropriated waters in the State. One of these objectives is to "maintain, and where possible enhance water quality and water-related habitats" (IDWR 2006a, *in litt*). It is the intent of the State Water Plan that any water savings realized by conservation or improved efficiencies is appropriated to other beneficial uses (e.g., agriculture, hydropower, or fish and wildlife).

Another IDWR regulatory mechanism is the ability of the Idaho Water Resource Board to designate "in-stream flows" (IDWR 2006b, *in litt*). The IDWR currently has 89 licensed water rights for minimum in-stream flows in Idaho (IDWR 2006b, *in litt*). Of these, 11 potentially have conservation benefits for Bliss Rapids snails (i.e., provide for minimum in-stream flows near tributary spring outflows that provide habitat for Bliss Rapids snails). However, individuals that hold water rights with earlier priority dates have the right to fill their needs before the minimum stream flow is considered. If there is not enough water available to satisfy all of the water rights, then the senior water rights are satisfied first, and so on in order, until there is no water left. It is the junior water right holders that do not get water when there is not enough to satisfy all the water rights. Senior diversions can legally dewater the stream in a drought year or when low flows occur, leaving no water for the minimum stream flow (IDWR 2013, *in litt*), therefore impacting species such as the Bliss Rapids snail.

The IDWR and other State agencies have also created additional regulatory mechanisms that limit future surface and ground water development; they include the continuation of various moratoria on new consumptive water rights and the designation of Water Management Districts (Caswell 2007, *in litt*). The State is attempting to stabilize aquifer levels and enhance cold water spring outflows from the Eastern Snake River Plain by implementing water conservation measures contained in the Comprehensive Aquifer Management Plan (CAMP) for this area (IDWR 2009). The goal of the CAMP is to "sustain the economic viability and social and environmental health of the Eastern Snake Plain by adaptively managing a balance between water use and supplies" (IDWR 2009, p. 4). The CAMP will include several alternatives in an attempt to increase water supply, reduce withdrawals from the aquifer, and decrease overall demand for groundwater (IDWR 2009, p. 7).

In addition, the state of Idaho established moratoria in 1993 (the year after listing of the Bliss Rapids snail) that restricted further surface-water and groundwater withdrawals for consumptive uses from the Snake River Plain aquifer between American Falls Reservoir and C.J. Strike Reservoir. The 1993 moratoria were extended by Executive Order in 2004 (Caswell 2006, *in litt*, attachment 1). However, these actions have not yet resulted in stabilization of aquifer levels. Depletion of spring flows and declining groundwater levels are a collective effect of drought conditions, changes in irrigation practices (the use of central-pivot sprinklers contribute little to groundwater recharge), and groundwater pumping (University of Idaho 2007, *in litt*). The effects of groundwater pumping downstream in the aquifer can affect the upper reaches of the aquifer, and the effects of groundwater pumping can continue for decades after pumping ceases (University of Idaho 2007, *in litt*). Thus, we anticipate groundwater levels will likely continue to decline in the near future, even as water-conservation measures are implemented, and are being developed. Furthermore, species associated with these springs that are dependent upon the presence of water, such as the Bliss Rapids snail, will likely experience local extinctions without the opportunity for recolonization (USFWS 2008a, pp. 36-37). Loss of a colony from any individual habitat patch, without subsequent recolonization, increases the extinction risk for the species as a whole, a phenomenon dubbed the "extinction ratchet" (Burkey and Reed 2006, p. 11).

Pollution Control Regulations

Since the 1992 final listing rule, reductions in TSS and TP loading have improved water quality in localized reaches of the Snake River (Buhidar 2006, *in litt*). Various State-managed water quality programs are being implemented within the range of the Bliss Rapids snail. These programs are tiered off the Clean Water Act (CWA), which requires States to establish water-quality standards that provide for (1) the protection and propagation of fish, shellfish, and wildlife, and (2) recreation in and on the water. As required by the CWA, Idaho has established water-quality standards (e.g., for water temperature and dissolved oxygen) for the protection of cold-water biota (e.g., invertebrate species) in many reaches of the Snake River. The CWA also specifies that States must include an antidegradation policy in their water quality regulations that protects water body uses and high-quality waters. Idaho's antidegradation policy, updated in the State's 1993 triennial review, is detailed in their Water Quality Standards (IDEQ NA, pp. 15-16).

Idaho Department of Environmental Quality (IDEQ) works closely with the EPA to manage point and non-point sources of pollution to water bodies of the State through the National Pollutant Discharge Elimination System (NPDES) program under the CWA. IDEQ has not been granted authority by the EPA to issue NPDES permits directly; all NPDES permits are issued by the EPA Region 10[14]. These NPDES permits are written to meet all applicable water-quality standards established for a water body to protect human health and aquatic life. Waters that do not meet water-quality standards due to point and non-point sources of pollution are listed on EPA's 303(d) list of impaired water bodies. States must submit to EPA a 303(d) list (water-quality-limited waters) and a 305(b) report (status of the State's waters) every 2 years. IDEQ, under authority of the State Nutrient Management Act, is coordinating efforts to identify and quantify contributing sources of pollutants (including nutrient and sediment loading) to the Snake River basin via the Total Maximum Daily Load (TMDL) approach. In water bodies that are currently not meeting water-quality standards, the TMDL approach applies pollution-control strategies through several of the following programs: State Agricultural Water Quality Program, Clean Water Act section 401 Certification, BLM Resource Management plans, the State Water Plan, and local ordinances. Several TMDLs have been approved by the EPA in stream segments within the range of the Bliss Rapids snail in the Snake River or its tributaries (Buhidar 2006, *in litt*), although most apply only to TSS, TP, or temperature. Therefore, these stream segments do not yet have water quality attributes that are protective of the Bliss Rapids snail until the TMDL approach has sufficient time to bring the stream segment water quality in line with approved standards.

Federal Consultation Regulations

In Idaho, the EPA retains authority for the issuance of permits through the NPDES, which is designed to manage point source discharges. There are more than 80 licensed aquaculture facilities on the Snake River permitted by the EPA (EPA 2002, pp. 4-19, 4-20). Updated draft permits for aquaculture and fish processing facilities throughout Idaho have been made available for public review (71 FR 35269). Draft permits have been issued for aquaculture facilities on Billingsley Creek, Riley Creek, Niagara Springs, and Thousands Springs, all within the known range of the Bliss Rapids snail. Facilities that produce less than 9,072 kilograms (20,000

[14] See: https://www.deq.idaho.gov/permitting/water-quality-permitting/npdes.aspx

pounds) of fish annually are not required to obtain an NPDES permit (EPA 2006, p. 3-1). These smaller facilities lie outside of this regulatory nexus, and as such their discharges are not regulated or reported.

Since the species was listed in 1992, Federal agencies, including the Army Corps of Engineers and the FERC, have been required to comply with section 7 of the Act on any projects or managed activities that may affect the Bliss Rapids snail. Some conservation benefits to the species are being realized through section 7 consultation with other Federal agencies, but without the Act's protection there are no regulatory assurances that these conservation benefits would continue.

IPC and the Service cooperated in a Settlement Agreement (Agreement) approved by the FERC. This Agreement was designed to assess potential effects of IPC's operations in the Wiley and Dike Reaches, and was approved as part of the Biological Opinion and license issuance for the Lower Salmon Falls and Bliss Projects. These studies and their analyses were scheduled to be completed in 2009.

The BLM manages more than 245 million acres of land in the 11 western States, including land adjacent to the Snake River in Idaho. The BLM manages activities on Federal lands such as outdoor recreation, livestock grazing, mining development, and energy production to conserve natural, historical, cultural, and other resources on the public lands[15]. In Idaho, the BLM has been consulting with the Service pursuant to section 7 of the Act on ongoing BLM actions that may affect the Bliss Rapids snail. Through these consultation efforts, coordinated and cooperative conservation measures have been added to proposed actions (e.g., new or renewed grazing permits on public lands) to minimize impacts to the species. Programmatic guidance and direction, documented through a conservation agreement between the BLM and the Service, has increased the likelihood that conservation benefits may be realized for new, re-authorized, and ongoing actions; however, without the continued protections of the Act, there are no regulatory assurances that these conservation measures would continue.

Other Natural or Manmade Factors Affecting the Continued Existence of the Bliss Rapids Snail

The final listing rule stated that New Zealand mudsnails (*Potamopyrgus antipodarum*) were not abundant in cold water springflows with colonies of Bliss Rapids snails, but that they did compete with the Bliss Rapids snail in the mainstem Snake River (57 FR 59254; December 14, 1992). We have no direct evidence that New Zealand mudsnails have displaced colonies of Bliss Rapids snails, but New Zealand mudsnails have been documented in dark mats at densities of nearly 400 individuals per square inch in free-flowing habitats within the range of the Bliss Rapids snail (57 FR 59254). Richards et al. (2006, pp. 61, 64, 68) found that Bliss Rapids snails may be competitively excluded by New Zealand mudsnails in most habitats, and that Bliss Rapids snail densities would likely be higher in the absence of New Zealand mudsnails. Both species are mostly scraper-grazers on algae and have similar resource requirements (Richards et al. 2006, pp. 59, 66). Furthermore, New Zealand mudsnails have become established in every cold water spring-fed creek or tributary to the Hagerman Reach of the Snake River that has been surveyed (74 FR 47543). However, New Zealand mudsnails do not appear able to colonize

[15] http://www.blm.gov/wo/st/en/info/About_BLM.print.html (Accessed February 12, 2014).

headwater spring habitats, which may provide Bliss Rapids snails refugia from competition with New Zealand mudsnails (Frest and Johannes 1992, p. 50; Richards et al. 2006, pp. 67-68).

The physiological tolerances of the New Zealand mudsnail, including temperature and water velocity (Winterbourn 1969, pp. 457, 458; Lysne and Koetsier 2006, p. 81); life history attributes such as high fecundity and growth rates (Richards 2004, pp. 25-34); and wide variety of habitat use such as springs, rivers, reservoirs, and ditches (Cada 2004, pp. 27, 28; USBR 2002, pp. 3, 11; Hall et al. 2003, pp. 407, 408; Clark et al. 2005, pp. 10, 32-35; Richards 2004, pp. 47-67), may provide the New Zealand mudsnail a competitive advantage over Bliss Rapids snails outside of cold headwater springs.

Climate Change

Air temperatures have been warming more rapidly over the Rocky Mountain West compared to other areas of the coterminous U.S. (Rieman and Isaak 2010, p. 3). Data from stream flow gauges in the Snake River watershed in western Wyoming, and southeast and southwest Idaho indicate that spring runoff is occurring between 1 to 3 weeks earlier compared to the early twentieth century (Rieman and Isaak 2010, p. 7). These changes in flow have been attributed to interactions between increasing temperatures (earlier spring snowmelt) and decreasing precipitation (declining snowpack). Global Climate Models project air temperatures in the western U.S. to further increase by 1 to 3°C (1.8 to 5.4°F) by the mid-twenty-first century (Rieman and Isaak 2010, p. 5), and predict significant decreases in precipitation for the interior west. Areas in central and southern Idaho within the Snake River watershed are projected to experience moderate to extreme drought in the future (Rieman and Isaak 2010, p. 5).

While the effects of global warming on the Bliss Rapids snail are not fully understood, it has the potential to affect their habitat. While it is reasonable to suspect that populations of snails within the Snake River may be affected by elevated water temperatures, aquifer springs are less likely to immediately exhibit increased temperatures. If warmer winters deplete surface water reserves, either through earlier snow melt or greater proportions of precipitation as rain, then it is plausible that there will be an increased demand for groundwater, which could further reduce spring flows. Climate change will affect water use in the action area, but the magnitude of this effect will partially depend on how local government and water users respond to these changes. How this will affect Bliss Rapids snails and their habitat is uncertain, but has the potential to be adverse.

2.4.2 Bull Trout

2.4.2.1 Status of the Bull Trout in the Action Area

The Hells Canyon and Salmon River hatchery programs included under the proposed action occur within two bull trout Recovery Units (RUs) (Mid-Columbia and Upper Snake), over a total of six core areas, as well as foraging, migratory, and overwintering (FMO) habitat in the Snake and Clearwater rivers. In addition, adult and juvenile fish reared at Hells Canyon or Salmon River program facilities migrate through the Coastal RU on their way to and from the ocean. Core areas within the Mid-Columbia and Upper Snake RUs provide spawning and rearing (SR) habitat as well as FMO habitat for bull trout. The Coastal RU provides FMO habitat.

The Mid-Columbia RU is located within eastern Washington, eastern Oregon, and portions of Idaho. Major drainages include the Yakima River, John Day River, Umatilla River, Walla Walla

River, Grande Ronde River, Imnaha River, Powder River, Clearwater River, and small drainages along the Snake and Columbia rivers (USFWS 2015a, p. 40). The Mid-Columbia RU includes 24 core areas in 4 geographic regions. The only geographic region containing facilities that support Hells Canyon and Salmon River programs is the Mid-Snake. Within the Mid-Snake geographic region, Hells Canyon and Salmon River program facilities occur in the Pine, Indian, and Wildhorse Core Area. Though sited on the North Fork Clearwater River, the Dworshak National and Clearwater fish hatcheries are located downstream from Dworshak Dam near the mainstem Clearwater River. These facilities are, therefore, not within the North Fork Clearwater Core Area, but presumably overlap with and reflect FMO habitat on the mainstem Clearwater River.

The Upper Snake RU occurs within central Idaho, northern Nevada, and eastern Oregon. Major drainages include the Salmon, Malheur, Jarbidge, Little Lost, Boise, Payette, and Weiser rivers (USFWS 2015a, p.41). The Upper Snake RU contains 22 bull trout core areas found in 7 geographic regions, 2 of which contain facilities that support Hells Canyon and Salmon River programs: (1) Salmon River and (2) Payette River. Within the Little Salmon geographic region of the Upper Snake RU, Hells Canyon and Salmon River program facilities occur in four core areas: (1) Little Lower Salmon River, (2) Pahsimeroi River, (3) South Fork Salmon River, and (4) Upper Salmon River. Within the Payette River geographic region, facilities are located in one core area: the North Fork Payette River.

The mainstem Columbia River (from its mouth upstream to the Snake River) and the mainstem Snake River (from its mouth upstream to Lower Monumental Dam) are not included within any bull trout core areas, but portions provide FMO habitat. All spring/summer Chinook salmon and steelhead produced at the Hells Canyon and Salmon River mitigation hatchery programs use the mainstem Snake and Columbia rivers as a migration corridor to the ocean and back. The lower mainstem Columbia River, from its mouth upstream to John Day Dam, is part of the Coastal RU. The mainstem Columbia upstream of John Day dam to the confluence with the Snake River, and the Snake River from its mouth to Brownlee Dam are part of the Mid-Columbia RU and provide FMO habitat for bull trout (USFWS 2015d, p. C-341).

Niagara Springs, Magic Valley, and Hagerman National fish hatcheries are not located in any bull trout RU. Bull trout do not occupy water bodies near these facilities, and critical habitat has not been designated in this area.

2.4.2.1.1 Mid-Columbia Recovery Unit

The Hells Canyon and Salmon River hatchery programs included under the proposed action in the Mid-Columbia RU, occur only in the Pine, Indian, and Wildhorse Core Area (Oxbow Fish Hatchery). Adult and juvenile fish from the programs migrate through FMO habitat in the mainstem Columbia and Snake rivers during their migrations. Hatchery broodstock are collected at the Hells Canyon Trap, which is located in Snake River FMO habitat, but is not part of a core area.

As previously noted, the Dworshak National and Clearwater fish hatcheries are located on the North Fork Clearwater River near the confluence of the mainstem Clearwater River. The North Fork Clearwater River downstream of Dworshak Dam is not part of the North Fork Clearwater core area. It is likely that reaches near the facilities function similarly to FMO habitat on the mainstem Clearwater River.

North Fork Clearwater and Mainstem Clearwater River FMO Habitat

The Dworshak National and Clearwater fish hatcheries are located at the confluence of the North Fork and the mainstem Clearwater River at RKM 65 (RM 40) in the Clearwater River Basin, Idaho, downstream of Dworshak Dam. The North Fork Clearwater River core area, which is in Clearwater, Idaho and Shoshone counties, includes the North Fork Clearwater River and all its tributaries upstream of Dworshak Dam. The hatcheries are not within the core area.

Habitat at both facilities is functionally disconnected from the North Fork Clearwater Core Area by Dworshak Dam. It is appropriate to characterize the hatcheries in FMO habitat for the mainstem Clearwater River. The mainstem Clearwater River provides access to the other core areas in the Clearwater River Subbasin, providing essential FMO habitat and connectivity. Adult and subadult bull trout probably use the Lower (mainstem) Clearwater River, Middle Fork Clearwater River, and their tributaries primarily as foraging, migratory, subadult rearing, and overwintering habitat, although the extent of use is unknown (USFWS 2008b). Bull trout have been collected at the Dworshak National Fish Hatchery volitional ladder in the last 10 years (Robertson 2017, *in litt*).

Pine, Indian, Wildhorse Core Area

The Oxbow Fish Hatchery is located in the Pine, Indian, and Wildhorse Core Area, which is located in Baker and Union Counties in Oregon and in Adams County in Idaho. In Oregon, it includes Pine Creek and its tributaries. In Idaho, it includes Indian Creek, Wildhorse River, and all their tributaries. The core area is divided by the Snake River, which typically flows from south to north in this reach and forms the border between Idaho and Oregon (USFWS 2015d, p. C-335). Indian Creek and Wildhorse River bull trout populations have not been genetically studied; however, these creeks were included in this core area due to their close proximity to the tributaries in Oregon containing bull trout and the likelihood of historical connectivity.

The Service identified three local populations in the Pine, Indian, and Wildhorse Core Area (USFWS 2015d, p. C-34). Within these local populations, bull trout are currently known to use spawning and rearing habitat in at least seven water bodies in the core area including Indian Creek, Bear Creek, Crooked River, Upper Pine Creek, Clear Creek, East Pine Creek, and Elk Creek (USFWS 2015b, p. C-335; Buchanan et al. 1997, pp. 127-132). Bear Creek and the Crooked River are tributaries to the Wildhorse River. The Pine Creek local population includes West Fork Pine, Middle Fork Pine, and East Fork Pine creeks. The Clear Creek local population includes Trail and Meadow creeks.

Bull trout in the Pine, Indian, and Wildhorse core area are isolated from populations downstream of Hells Canyon Dam. Bull trout occur in Hells Canyon Reservoir (Chandler et al. 2001) and two tributaries to the reservoir: Indian Creek Basin in Idaho (Grunder 1999), and the Pine Creek Basin in Oregon. The confluence of Indian Creek is within the Oxbow Dam bypass, a 3.7-km (2.3-mile) reach of the original river channel between Oxbow Dam and the point of water discharged from the Oxbow Dam Powerhouse (IPC 1999). Since 1961, Oxbow Dam has isolated bull trout in the Wildhorse River drainage from populations downstream in the Oxbow bypass and in tributaries to Hells Canyon Reservoir.

All three stream basins in the core area (Pine Creek, Indian Creek, and Wildhorse River) currently provide spawning and rearing habitat for bull trout (USFWS 2015d, C-335). The number of redds observed during limited counts in spawning and rearing habitat index sites ranged from 0 to 43 per site from 1998 through 2000. This equates to 0 to 37.3 redds per kilometer (0 to 60.0 redds per mile) of stream length. Based on studies conducted in 1994 (Chandler et al. 2003, p. 39), it is believed that most bull trout in the Pine Creek population are resident fish. Near Oxbow Fish Hatchery (mouth of Pine Creek), the Snake River provides FMO habitat for bull trout (USFWS 2015d, p. C-341); Streamnet (2016, http://www.streamnet.org/) also reports that bull trout may rear in the reach.

The Hells Canyon Complex Management Unit Team estimated that the Pine, Indian, and Wildhorse core area contained less than 500 adult fish and was at risk from genetic drift (USFWS 2005b, p. 331).

Mainstem Snake River FMO Habitat (mouth to Brownlee Dam)

The Hells Canyon Dam Fish Trap is used to collect summer steelhead and spring Chinook salmon for the Hells Canyon programs, as well as Chinook salmon and steelhead for the Little Salmon River programs. It is located in the mainstem Snake River, downstream of the dam. At this location, the Snake River is not designated to a core area, but provides FMO habitat for bull trout in the Lower Snake geographic region. This geographic region includes all core areas that flow into the Snake River between its confluence with the Columbia River and Hells Canyon Dam, as well as mainstem Snake River FMO habitat.

The Snake River up to Hells Canyon Dam provides migratory habitat for local populations residing in tributaries to the Snake River between Hells Canyon Dam and Lower Granite Dam. Four local populations are located on the Oregon side of the Snake River in the Imnaha River Subbasin (Imnaha River and Upper Big Sheep, Lower Big Sheep, and McCully creeks) and two are on the Idaho side (Granite and Sheep creeks).

Fluvial radio-tagged bull trout from the Imnaha River have migrated upstream in the Snake River until they reach Hells Canyon Dam (Chandler et al. 2003). These migrations occur post-spawning after about October, and the majority of migratory bull trout return to their natal watershed the following spring (IDFG 2011, p. 98). Bull trout from other core areas may migrate up the Snake River to Hells Canyon Dam. In both 2012 and 2013, one bull trout (>300 mm) was interrogated at the Hells Canyon Trap (IDFG 2016c).

Bull trout have been incidentally observed at all of the Lower Snake River dams, smolt monitoring traps, juvenile fish facilities, and fish ladders (USFWS 2010a, b, p. XX). Radio telemetry studies in the Snake River have shown that bull trout migrate between the FMO habitat in the Snake River and SR habitat in its tributaries (Hemmingsen et al. 2001).

In the mainstem Snake River at the Hells Canyon Fish Trap site, where fluvial bull trout from other core areas outside the action area may occur (e.g., Imnaha River core area), the short-term abundance trend was stable, though the final ranking for extirpation risk was “potential” (USFWS 2008b, p. 34). Bull trout from downstream core areas may migrate up the Snake River to Hells Canyon Dam, including Granite and Sheep creeks. The short-term abundance trend for these core areas is unknown (USFWS 2008b, p. 34).

Mainstem Columbia River (upstream of John Day Dam to confluence with Snake River)

Although not designated as a core area, the mainstem Columbia River, upstream of John Day Dam to the confluence with the Snake River, is part of the Mid-Columbia RU and provides FMO habitat for bull trout (USFWS 2015b). Bull trout may reside in the mainstem Columbia River year-round as subadults and adults (USFWS 2010a, b). No Hells Canyon or Salmon River programs under the proposed action are located in mainstem Columbia River FMO habitat.

2.4.2.1.2 Upper Snake River Recovery Unit

The Hells Canyon and Salmon River hatchery programs included under the proposed action occur in the following core areas in the Upper Snake RU: (1) Little Lower Salmon River (Rapid River Fish Hatchery and Trap), (2) Pahsimeroi River (Upper and Lower Pahsimeroi fish hatcheries and Weir), (3) South Fork Salmon River (South Fork Salmon River Satellite and Weir, Johnson Creek Weir and Cabin and Curtis creeks egg boxes), (4) North Fork Payette (McCall Fish Hatchery), (5) Upper Salmon River (East Fork Salmon River Satellite and Trap, Sawtooth Fish Hatchery and Trap, Yankee Fork juvenile release sites [Ramey, Jordan, Greylock, Cearly, and Swift Gulch creeks], and SBT proposed weir location), and 6) Middle Salmon River-Panther (Beaver Creek and Indian Creek streamside incubators). All core areas are located in the Salmon River bull trout geographic region. Fluvial, resident, and adfluvial bull trout populations are present in this region (USFWS 2002b). Adult and juvenile fish from proposed action programs in the Upper Snake RU migrate through FMO habitat in the mainstem Columbia and Snake rivers during their migrations.

Released juveniles and returning adults migrate through several other core areas in the Upper Snake RU including the Middle Salmon-Panther River Core Area and the Middle Salmon Chamberlain Core Area

Little Lower Salmon River Core Area

The Rapid River Fish Hatchery and Trap are used to collect spring Chinook salmon for the Hells Canyon Spring Chinook salmon Program and the Little Salmon Spring Chinook salmon Program. Little Salmon spring Chinook salmon are also spawned and reared at the Rapid River Fish Hatchery, and Little Salmon River summer steelhead are released into the Little Salmon River near Pinehurst. The hatchery and trap are located in the Little-Lower Salmon River core area, in Idaho County. This core area extends from the watersheds of the confluence of the mainstem Salmon River with the Snake River, upstream to the confluence with French Creek as well as the Little Salmon River watershed. The core area encompasses 1,124,700 acres (455,160 hectares [ha]) owned by private entities as well as the Bureau and the U.S. Forest Service (USFS).

Bull trout currently use spawning and rearing habitat in seven streams or stream complexes (i.e., local populations). These local populations include Slate Creek, John Day Creek, Rapid River, Boulder Creek, Hard Creek, Lake/Lower Salmon, and Partridge Creek. The mainstem Salmon River provides migration, and adult and subadult foraging, rearing, and overwintering habitat. The Little Salmon River also provides adult foraging habitat and connectivity between local populations in the core area (USFWS 2015c). A strong population occurs in Rapid River, but bull trout in the rest of the core area are generally low in abundance, or their status is unknown (USFWS 2005b).

In this core area, the mainstem Salmon River provides FMO habitat and supports both resident and migratory populations. The Rapid River, from its confluence with the Little Salmon River upstream 22.6 RM to its headwaters, provides SR habitat (USFWS 2010b). According to IDFG, however, suitable spawning habitat does not exist in the vicinity of the Rapid River Hatchery, weir/trap, fish ladder, or water supply intake, and the weir is located in habitat that is primarily used for bull trout migration (IPC 2003 as cited in IDFG 2015c). The primary spawning areas for fluvial and resident bull trout in the Rapid River begin at the confluence of the mainstem and the West Fork Rapid River (USFS 2003, p. K-7), approximately 3-4 RM upstream of the Rapid River Fish Hatchery site. According to a recent Biological Opinion for an intake project at the Rapid River Hatchery, bull trout do not spawn in the vicinity of the hatchery; they outmigrate as juveniles and post-spawn adults through this reach from the headwaters (USFWS 2016a). Since 2008, IDFG has operated a screw trap near the hatchery from April through November. Juvenile bull trout have been captured during all months during operation of a screw trap with peak catch rates in September and October (USFWS 2016a). Based on screw trap data and trapping efficiency estimates, the USFWS (2016a) estimates that the number of juvenile bull trout moving past the hatchery from April through the first week of November is 8,560 individuals. From the first week of November through March 15, the estimated number of juvenile bull trout downstream migration past the hatchery is about 36 fish per day.

Annual runs of fluvial bull trout in the Rapid River drainage have been monitored since 1973, and bull trout abundance data has been estimated since 1992 via collections at the Rapid River Fish Hatchery Trap. Upstream migrant spawner counts at the trap ranged from 91 to 420 fish from 1992 to 2009 (IDEQ 2006b, p. 18). From 2010 through 2015, adult bull trout (>300 mm) captures at the Rapid River Hatchery weir/trap have ranged from 310 to 477 fish. During this same period (2010-2015), two juvenile bull trout (<300 mm) were captured at the weir, both in 2011 (IDFG 2016c). It is believed that a large number of migrants are subadults seeking thermal refugia in the river. Fluvial bull trout move upstream in Rapid River in spring following peak runoff, and when temperatures rise above 50°F (USFWS 2016b). A percentage of subadults exit Rapid River in late July and August, prior to spawning. Spawning bull trout typically emigrate from the river quickly after spawning, although adults have been caught in the hatchery's rotary screw trap during the first week of November (USFWS 2016b). It is assumed that all post-spawning migrations are completed by December 1. Overwintering habitat is not considered prime near the hatchery reach, and the Service (USFWS 2016b) assumes that no bull trout overwinter in or near the Rapid River Hatchery.

Copeland et al. (2015, pp. 20) report that bull trout are abundant in the Rapid River and their predation on salmonid smolts could explain the low juvenile salmonid productivity in the system. In mid-August 2014, Stiefel et al. (2015, p. 62) snorkeled 20 sites in the Rapid River watershed, 19 of which were in the Rapid River. Bull trout were present at 16 of the 20 sites, but more abundant in the upper watershed. Average bull trout density in the watershed was 1.2 fish/100 meters^2 (m^2) and the highest density was 3.9 fish/100 m^2.

In their 5-year status review, the Service (USFWS 2008b, p. 34) determined the Little-Lower Salmon River Core Area had an adult abundance level of 50-250 fish, occupying 125-620 river miles. This core area was ranked at "high risk" of extirpation (USFWS 2008b, p.34).

Pahsimeroi River Core Area

The Upper and Lower Pahsimeroi fish hatcheries and lower weir are located in the Pahsimeroi River core area, which is in Lemhi and Custer counties in Idaho. The Pahsimeroi River watershed is located on the east side of the Salmon River and includes numerous boulder, cobble, and gravel alluvial fans that cover a large underground reservoir. This reservoir provides the majority of the water to the river, which emerges as springs along the valley floor. Portions of the upper mainstem Pahsimeroi River approximately 4 miles upstream of the upper Pahsimeroi Hatchery switch to subterranean flow during the late summer and winter (USFWS

2015f, p. E-94). This is exacerbated by diversions along the reach.

Bull trout exhibit patchy distribution in the Pahsimeroi River watershed due to habitat fragmentation associated with channel dewatering at certain times of the year. This dewatering results in flow restrictions that block access to tributaries (USFWS 2015f, p. E-15), and may explain the low number of fluvial bull trout observed at the Lower Pahsimeroi Hatchery Weir. Tributaries in the upper portion of the Pahsimeroi River are considered the primary strongholds for bull trout, which are found in most of the tributaries that drain the eastern, southern, and southwestern portion of the core area. They currently use spawning and rearing habitat in streams comprising at least nine local populations including the Upper Pahsimeroi River, Big Creek, Patterson Creek, Falls Creek, Morse Creek, Little Morgan Creek (including the Lower Pahsimeroi River), Tater Creek, Big Gulch, and Ditch Creek. During a bull trout radio telemetry tracking study, Schoby and Curet (2007, p. 22) did not observe spawning migrations into the Pahsimeroi River; one fish was observed overwintering near the mouth of the Pahsimeroi and was frequently observed in the lower reaches of the river, which may have provided suitable foraging habitat and a winter thermal refuge.

The mainstem Pahsimeroi River serves as a migratory corridor for access to the mainstem Salmon River, however, continuous connectivity is an issue. No tributaries to the mainstem Pahsimeroi River are connected over the entire annual hydrograph due to extensive water diversions in the watershed (IDFG 2002 as cited in USFWS 2005b).

IDFG (2016a) reports that a "small number" of bull trout have been observed migrating through the Pahsimeroi River reach adjacent to the upper and lower facilities. From 1998 to 2003, a total of six bull trout were observed at the Lower Pahsimeroi Weir from July through September (IPC 2004). A total of nine bull trout were captured moving upstream at the lower weir between 2005 and 2009 (IDFG 2016a); from 2010 to 2015, the number of bull trout (>300 mm) collected moving upstream at the lower weir ranged from 0 to 12 fish (IDFG 2016c). The reach, including the Lower Pahsimeroi Weir, provides FMO habitat, but is not used for spawning or rearing.

South Fork Salmon River Core Area

The South Fork Salmon River Satellite facility and weir are located in the South Fork Salmon River Core Area, which is located in Valley and Idaho counties in Idaho. The Johnson Creek weir and Cabin and Curtis Creek egg boxes are also located within the South Fork Salmon River core area. Johnson Creek is a tributary to the East Fork South Fork Salmon River, and Curtis Creek is a tributary of the South Fork Salmon River in the Boise National Forest. Cabin Creek is a tributary to Warm Lake Creek, which flows into the South Fork Salmon River in the Boise National Forest.

The ridges that form the eastern boundary of this relatively narrow, north-south oriented core area lie in the headwaters of the Middle Fork Salmon River and Big Creek. The western boundary is the divide between the Upper North Fork Payette River and the South Fork Salmon River. The core area is 835,000 acres (338,100 ha) in size and is primarily managed by the USFS.

Bull trout are currently known to use spawning and rearing habitat in streams comprising 27 local populations including Upper Lake Creek, Grouse-Flat Creek, Ruby Creek, Summit Creek, Victor Creek, Loon Creek, Lick Creek, Zena Creek, Fitsum Creek, Buckhorn Creek, Cougar Creek, Fourmile Creek, Blackmare Creek, Dollar-Six Bit Creeks, Warm Lake, Curtis Creek, Upper South Fork Salmon River, Burntlog Creek, Trapper Creek, Riordan Lake, Upper East Fork South Fork Salmon River, Sugar Creek, Tamarack Creek, Profile Creek, Quartz Creek, Elk Creek, and Pony Creek.

Both resident and fluvial populations of bull trout have been documented in the mainstem South Fork Salmon River. Bull trout spawning and rearing occurs in the tributaries to the South Fork, which functions as a migratory corridor as well as overwintering habitat. Overwintering fluvial bull trout were observed in the Lower South Fork Salmon River from the Sheep Creek confluence, downstream to the mouth of the mainstem South Fork Salmon River (USFWS 2015c). High summer temperatures in August exceed the desired temperature criteria for bull trout and therefore mainstem occupancy in the summer months may be limited.

Bull trout abundance numbers are the highest in the East Fork of the South Fork Salmon River and the Secesh River local populations (USFWS 2002b). The South Fork Salmon River, from its confluence with the Salmon River upstream to its confluence with Tyndall Creek, provides FMO habitat (USFWS 2010b). Adults in the South Fork likely begin migrating in March or April and enter tributaries between late July and September. Spawning occurs in upstream tributaries from August 28 to September 15 (Hogen 2001, as cited in USFWS 2014b).

From 2012 to 2014, IDFG collected from 2 to 7 bull trout (>300 mm) at the South Fork Salmon River weir/trap during operations from mid-June through September (IDFG 2016c). In 2014, Stiefel et al. (2015, pp. 62, 96) snorkeled 24 sites in the Upper South Fork Salmon River watershed, 9 of which were in the South Fork Salmon River mainstem. Bull trout were observed in 10 of the 24 sites throughout the watershed, but at only 3 of the 9 mainstem sites. Average bull trout density in the watershed was 0.3 fish/100 m^2; the highest density was 1.5 fish/100 m^2 at Mormon Creek. The highest bull trout density within the mainstem South Fork Salmon River was 0.6 fish/100 m^2.

The current population status for bull trout in Johnson Creek is unavailable. Based on work by Hogen and Scarnecchia (2006, entire), it is likely that bull trout in Johnson Creek express a fluvial life history and use larger rivers (e.g., the East Fork South Fork Salmon River or Salmon River mainstem) for overwintering and smaller tributaries for spawning in August and September. This spawning migration timing is consistent with peak collection periods at the Johnson Creek weir and trap, which is seasonally operated from June into mid-September. Bull trout are typically captured at the weir in the summer months, with peaks in July, August, and September. Directional movement of bull trout captured at the weir is not well documented; however most are documented as occurring in the upstream trap box. No bull trout spawning has been observed in the mainstem, suggesting Johnson Creek is used as a migratory corridor to access upstream spawning tributaries.

The annual number of bull trout trapped at the Johnson Creek weir ranges from 0 to 56 fish, and sizes range from 170 mm to 630 mm in length (2000-2015 data) and average 453 mm. No mortalities are reported in the Johnson Creek HGMP (NPT 2017). Fish are held a maximum of 1 day, handled and passed upstream or downstream depending on the direction of travel at the time of interrogation (NPT 2017). Screw trap data (1998-2008) for the Johnson Creek screw trap, located at RM 3.8, show that bull trout captures in Johnson Creek typically occur during summer months, with peaks in August and September. Bull trout captured at the screw trap have ranged in size between 114 and 520 mm (fork length) and average 224 mm. For the purposes of this Opinion, juveniles are assumed to be any fish less than 170mm in size (Dambacher and Jones

1997, p. 353). Upon their capture, it is not uncommon for screw trap crews to document adult bull trout predation on juvenile Chinook, as recaptured Chinook PIT tags are often scanned within a bull trout and/or tails of Chinook are observed protruding from the mouths of bull trout (NPT 2017).

Within this core area, adult abundance was estimated to be greater than 5,000 individuals (USFWS 2002c, p. 65). The Service (2008, p. 34) reported that the South Fork Salmon River core area had an unknown adult abundance level and bull trout occupied from 125 to 620 river miles of habitat.

North Fork Payette River Core Area

The McCall Fish Hatchery, which is used only for incubation and rearing of South Fork Salmon River Chinook salmon, is located in Valley County, Idaho on the North Fork Payette River, just downstream of the Payette Lake Dam. The Cascade Dam, located downstream of the hatchery on the North Fork Payette River, forms an impassable barrier to fish. As a result only one resident bull trout population comprises the North Fork Payette River Core Area. This population occupies the Gold Fork River (USFWS 2015f, E-101). Bull trout are not documented to occur in the North Fork Payette River near the McCall Fish Hatchery (Streamnet 2016).

Trend data are lacking and the current population status is unknown for the single resident population of bull trout in this core area (USFWS 2015f, E-101). Suitable bull trout habitat in the core area is greatly reduced compared to historic conditions.

Upper Salmon River Core Area

The East Fork Salmon River Satellite and Trap, Sawtooth Fish Hatchery and Trap, and future Yankee Fork Weir and Yankee Fork juvenile release sites (streamside incubators in Ramey, Jordan, Greylock, Cearly, and Swift Gulch creeks) are located in the Upper Salmon River Core Area, which is in Custer County, Idaho. This core area extends from the mouth of the Pahsimeroi River to the headwaters in the Sawtooth Mountains, including the mainstem Salmon River and tributaries (USFWS 2015c). Juveniles released from facilities migrate downstream through several other core areas in the Upper Snake RU including the Middle Salmon-Panther River core area, Middle Salmon Chamberlain core area, and the Little Lower Salmon River core area.

In the Upper Salmon River core area, bull trout currently use spawning and rearing habitat in streams comprising 18 local populations including Valley Creek, Basin Creek, Yankee Fork (year-round presence), Thompson Creek, Squaw Creek, Challis Creek, Garden Creek, Morgan Creek, East Fork Salmon River, Slate Creek, Warms Springs Creek, Fourth of July Creek, Germania Creek, Upper Salmon River, Alturas Lake Creek, Pettit Lake, Yellowbelly Creek, and Redfish Lake Creek. Both fluvial and adfluvial bull trout are present in the Sawtooth Valley; Alturas Lake has adfluvial bull trout.

Data from radio-telemetry studies in the Upper Salmon River Subbasin indicate that bull trout enter Upper Salmon River tributaries to spawn between May and July and return to mainstem habitats mostly in September (Schoby and Curet 2007). The average distance between winter habitat and spawning habitat was about 69 RKM (43 RM). Generally, bull trout that spawn in the Yankee Fork Salmon River migrate into the Redfish Lake system to overwinter, which may indicate that suitable wintering habitat in the upper reaches of the Salmon River is limited (Schoby and Curet 2007).

Bull trout have been observed migrating through the reach of the Salmon River near the Sawtooth Fish Hatchery and adult weir; however, bull trout redds have not been observed in the reach of the Salmon River near the Sawtooth Hatchery, which is likely used as a migratory corridor to and from spawning areas (IDFG 2013). Bull trout may overwinter near the Sawtooth Hatchery. Juvenile abundance is relatively low, particularly during the summer. From 1998 to 2012, IDFG collected 230 juvenile bull trout in the Sawtooth Hatchery screw trap, 61 of which were collected in August (IDFG 2013). From 2010 – 2015, the number of juvenile bull trout collected at the screw trap ranged from 1 to 20. During that period (2010 – 2015), 6 to 58 adults (>300 mm) were collected annually at the Sawtooth Hatchery trap during operations from June through September (IDFG 2016c).

The reach of the Yankee Fork near the SBT-proposed adult collection weir location is designated as FMO habitat for bull trout (USFWS 2010b). Spawning habitat is located several miles upstream. The 2001 Yankee Fork Watershed Analysis (USFS 2006) indicates that water temperatures are relatively warm during the late summer period in the Yankee Fork below Jordan Creek, and fish seek refugia in cooler tributary streams (i.e., West Fork). Streamside incubator sites in Ramey, Greylock, Cearly, and Swift Gulch creeks may provide year-round habitat for rearing bull trout, particularly in Greylock and Swift Gulch, which are located higher in the system. Jordan Creek headwaters provide spawning and rearing habitat.

The largest tributary of the Salmon River Subbasin is the East Fork Salmon River, portions of which occur in the action area. Snorkel surveys conducted in July and August from 27 sites throughout the East Fork Salmon River revealed that bull trout were the second most abundant species in the drainage, with a mean density of 0.5 fish/100 m^2. Bull trout were sampled from 11 of the 27 total sites, including the 4 sites in the mainstem East Fork Salmon River. The highest density of bull trout in the four East Fork Salmon River sites was 1.3 fish/100 m^2. The highest density from all 27 sites in the watershed was 3.4 fish/100 m^2 in East Pass Creek (Stiefel et al. 2015, p. 81). IDFG formerly operated the East Fork Salmon River trap during the summer and fall for Chinook salmon and bull trout monitoring. During the most recent summer/fall monitoring period (2015), 323 bull trout (>300 mm) were collected. The summer Chinook salmon monitoring has been discontinued and the trap now only operates to trap steelhead in the spring. No bull trout have been trapped in the spring during steelhead operations (IDFG 2016c); however, the potential for their occurrence during the spring period cannot be discounted. Future operations to monitor bull trout trend or abundance will be covered under the IDFG section 6 agreement and are not part of this proposed action.

<u>Middle Salmon River – Panther Creek and Chamberlain Core Areas</u>

Summer steelhead eggs from the Pahsimeroi hatchery are incubated in egg boxes in Indian Creek, 1 mile from the confluence with the Salmon River, and Beaver Creek, just upstream of the confluence of Beaver and Panther creeks. Both streamside incubation locations are in the Panther Creek core area. In addition, juveniles released from facilities in the Upper Salmon River, South Fork Salmon River, and Pahsimeroi River core areas migrate downstream through several other core areas in the Upper Snake RU including the Middle Salmon-Panther River core area, Middle Salmon Chamberlain core area, and the Little Lower Salmon River core area (described previously in this section).

In the Middle Salmon-Panther core area, 19 local bull trout populations are present, and populations are trending stable (USFWS 2015f, p. E-92). Both resident and migratory bull trout are present in this core area, and bull trout are reportedly widespread. Adult abundance was estimated to be between 500 and 5,000 individuals (USFWS 2002c, p. 65). The bull trout 5-year status review conducted in 2008 (USFWS 2008b, p. 34) determined the core area had an unknown adult abundance level and occupied 125-620 stream miles.

In the Middle Salmon Chamberlain Core Area, fluvial bull trout are common in nine local populations. A substantial portion of the core area is encompassed by the Frank Church—River of No Return and Gospel Hump wilderness areas. Adult abundance was estimated to be between 500 and 5,000 individuals in 2002 (USFWS 2002c, p. 65). The bull trout 5-year status review conducted in 2008 (USFWS 2008b, p. 34) determined the core area had an unknown adult abundance level and occupied about 125-620 stream miles. High et al. (2008, p. 1696) determined a weakly positive rate of population growth since 1994, and IDFG (2014) reported an increasing population.

2.4.2.1.3 Coastal Recovery Unit

The lower mainstem Columbia River, from its mouth upstream to John Day Dam, is part of the Coastal RU. The lower mainstem provides bull trout FMO habitat (USFWS 2015d). No Hells Canyon or Salmon River hatchery programs included under the proposed action occur in the Coastal RU; however, adults and juvenile spring/summer Chinook salmon and steelhead migrate to and from the Hells Canyon and Salmon River program sites via the mainstem Columbia River and Snake River.

The Coastal RU's Lower Columbia River major geographic region includes the lower mainstem Columbia River, an important migratory waterway essential for providing habitat and population connectivity in the region. The lower mainstem river is designated as migratory habitat, but does not contain any bull trout core areas.

Adult bull trout are occasionally observed within the lower mainstem Columbia River, but any further migration by bull trout in this region to the Pacific Ocean is largely unknown (USFWS 2015d). Historically, the Lower Columbia River region is believed to have largely supported the fluvial life history form; however, hydroelectric facilities built in a number of the core areas have isolated or fragmented watersheds and largely replaced the fluvial life history with the adfluvial form.

In the Lower Columbia River region of the Coastal RU, the mainstem Columbia River provides productive foraging habitats and critical connectivity among core areas for potential gene flow and population re-founding. Bull trout use, abundance, and periodicity in the lower section of the Columbia River are largely unknown and data is limited due to infrequent detections (USFWS 2015d).

Although currently fragmented by dams, the mainstem Lower Columbia River provides FMO habitat that may facilitate interactions among bull trout populations. No local populations reside in the lower mainstem Columbia River "shared FMO" area (USFWS 2015d).

2.4.2.2 Factors Affecting the Bull Trout in the Action Area

2.4.2.2.1 Mid-Columbia Recovery Unit

The Hells Canyon and Salmon River hatchery programs included under the proposed action occur only in the Pine, Indian, and Wildhorse Core Area (Oxbow Fish Hatchery). Adult and juvenile fish from the programs migrate through FMO habitat in the mainstem Columbia and Snake rivers during their migrations. Hatchery broodstock are collected at the Hells Canyon Trap, which is located in Snake River FMO habitat, but is not part of a core area. Each core area or FMO habitat is delineated into specific CHUs.

As previously noted, the Dworshak National and Clearwater fish hatcheries are located on the North Fork Clearwater River near the confluence of the mainstem Clearwater River. The North Fork Clearwater River downstream of Dworshak Dam is not part of the North Fork Clearwater core area. It is likely that reaches near the facilities function similarly to FMO habitat on the mainstem Clearwater River.

Primary Threats

Bull trout in the mainstem Clearwater River are threatened by sedimentation from mining and forestry practices, roads, transportation corridors, increased water temperature, lost connectivity and entrainment at Dworshak Dam, reduced prey base, and nonnative brook trout (*Salvelinus fontinalis*) (USFWS 2015b).

Populations in the Pine, Indian, and Wildhorse Core Area are threatened by dewatering from numerous diversion dams, reduced stream flow, and elevated stream temperatures. Entrainment and passage barriers at Oxbow Dam isolate Wildhorse River bull trout from other populations in the core area (USFWS 2015b). Hybridization and competition with brook trout are also serious threats to bull trout in this core area.

2.4.2.2.2 Upper Snake River Recovery Unit

The Hells Canyon and Salmon River hatchery programs included under the proposed action occur in the following core areas in the Upper Snake RU: (1) Little Lower Salmon River (Rapid River Fish Hatchery and Trap), (2) Pahsimeroi River (Upper and Lower Pahsimeroi fish hatcheries and Weir), (3) South Fork Salmon River (South Fork Salmon River Satellite and Weir, Johnson Creek Weir and Cabin and Curtis creeks egg boxes), (4) North Fork Payette (McCall Fish Hatchery), (5) Upper Salmon River (East Fork Salmon River Satellite and Trap, Sawtooth Fish Hatchery and Trap, Yankee Fork juvenile release sites [Ramey, Jordan, Greylock, Cearly, and Swift Gulch creeks], and SBT proposed weir location), and (6) Middle Salmon River-Panther (Beaver Creek and Indian Creek streamside incubators). All core areas are located in the Salmon River bull trout geographic region. Fluvial, resident, and adfluvial bull trout populations are present in this region (USFWS 2002b). Adult and juvenile fish from proposed action programs in the Upper Snake RU migrate through FMO habitat in the mainstem Columbia and Snake rivers during their migrations.

Released juveniles and returning adults migrate through several other core areas in the Upper Snake RU including the Middle Salmon-Panther River core area and the Middle Salmon Chamberlain core area.

Primary Threats

In the Little-Lower Salmon River core area, threats to bull trout include degraded habitat, low in-stream flows, livestock grazing, and small population size. Primary threats include potential hybridization with brook trout and small population size (USFWS 2015c). Major threats in the Pahsimeroi River core area include connectivity impairment, low in-stream flows, and in-stream structures. In the Pahsimeroi River core area, bull trout-brook trout hybrids have been found in

Big, Mahogany, Burnt, and Goldburg creeks (BLM and USFS 2001 as cited in USFWS 2005b). Although the Service does not list any primary threats on bull trout in the South Fork Salmon River core area, other threats include connectivity impairment, habitat degradation, and potential hybridization with brook trout. No primary threats to bull trout have been identified in the Upper Salmon River core area; however, bull trout are impacted by connectivity impairment, habitat degradation, and potential hybridization with brook trout (USFWS 2015c).

2.4.2.2.3 Coastal Recovery Unit

The lower mainstem Columbia River, from its mouth upstream to John Day Dam, is part of the Coastal RU. The lower mainstem provides bull trout FMO habitat (USFWS 2015d). No Hells Canyon or Salmon River hatchery programs included under the proposed action occur in the Coastal RU; however, adults and juvenile spring/summer Chinook salmon and steelhead migrate to and from the Hells Canyon and Salmon River program sites via the mainstem Columbia River and Snake River.

Primary Threats

In the lower mainstem Columbia River, primary limiting factors and threats to bull trout include habitat degradation and fragmentation, blocked migratory corridors, poor water quality, angler harvest and poaching, entrainment (process by which aquatic organisms are pulled through a diversion or other device) into diversion channels and dams, and introduced nonnative species.

Climate Change Effects to Bull Trout

Changes in hydrology and temperature caused by changing climate have the potential to negatively impact aquatic ecosystems in the action area, with salmonid fishes being especially sensitive. Average annual temperature increases due to increased carbon dioxide are affecting snowpack, peak runoff, and base flows of streams and rivers (Mote et al. 2003, p. 45). Increases in water temperature may cause a shift in the thermal suitability of aquatic habitats (Poff et al. 2002, p. iii). For species that require colder water temperatures to survive and reproduce, warmer temperatures could lead to significant decreases in available suitable habitat. Increased frequency and severity of flood flows during winter can affect incubating eggs and alevins in the streambed and over-wintering juvenile fish. Eggs of fall spawning fish, such as bull trout, may suffer high levels of mortality when exposed to increased flood flows (ISAB 2007, p. iv).

Isaak et al’s 2010 (p. 1350) study of changing stream temperatures over a 13 year period in the Boise River basin estimated an 11 to 20 percent loss of suitable coldwater bull trout spawning and early juvenile rearing habitats. These results suggest that a warming climate is already affecting suitable bull trout in-stream habitats. This is consistent with Rieman et al. (2007, p. 1552) and Wenger et al. (2011, p. 988) conclusions that bull trout distribution is strongly influenced by climate, and predicted warming effects could result in substantial loss of suitable bull trout habitats over the next several decades. For the bull trout, which tends to have lower thermal requirements than other salmonids, Rieman et al. (2007, p. 1559) predicted that global warming could reduce suitable habitat in the interior Columbia River basin by up to 92 percent (range 18 to 92 percent). Bull trout already seem to inhabit the coldest available streams in study areas (Wenger et al. 2011, p. 1002), and in several watersheds bull trout do not have the potential to shift upstream with warming stream temperatures at lower elevations.

2.4.3 Bull Trout Critical Habitat

2.4.3.1 Status of Bull Trout Critical Habitat in the Action Area

The action area is encompassed by Critical Habitat Units (CHUs) in the Mid-Columbia, Upper Snake, and Coastal RUs (USFWS 2010a, pp. 4-7). The CHUs are the Mainstem Upper Columbia River, Clearwater River, Mainstem Snake River (in the Mid-Columbia RU), Salmon River Basin, and Puget Sound,. These CHUs and applicable Critical Habitat Subunits (CHSU) are described in the following sections.

2.4.3.1.1 Mainstem Upper Columbia River Critical Habitat Unit

The mainstem Upper Columbia River CHU, Unit 22, is essential for maintaining bull trout distribution within a unique geographic region of the Mid-Columbia RU. It functions to conserve the fluvial, migratory life history types exhibited by many of the populations from adjacent core areas. The CHU includes the mainstem Columbia River from John Day Dam, upstream to Chief Joseph Dam. Several studies in the Upper Columbia and Lower Snake rivers indicate that bull trout migrate between the mainstem Upper Columbia River CHU and core areas, generally during periods of cooler water temperatures (USFWS 2010a).

This CHU provides a migratory corridor for juvenile and adult spring Chinook and steelhead reared at the Hells Canyon and Salmon River programs. It contains no Hells Canyon or Salmon River hatchery programs (or facilities) included under the proposed action.

2.4.3.1.2 Clearwater River Critical Habitat Unit

The Clearwater River CHU, Unit 21, consists of 1,679 miles of streams, as well as portions of some lakes and reservoirs. The CHU is located in north-central Idaho and extends to the Montana border. It represents the easternmost extent of the Mid-Columbia RU and includes the Clearwater River and numerous tributaries including the South Fork, Middle Fork, and North Fork Clearwater River. Hells Canyon and Salmon River hatchery programs located in this CHU and included under the proposed action include the Dworshak National and Clearwater fish hatcheries.

This CHU includes five critical habitat subunits (CHSUs): Middle–Lower Fork Clearwater River, South Fork Clearwater River, Selway River, Lochsa River (and Fish Lake), and the North Fork Clearwater River (and Fish Lake). Both the Dworshak National and Clearwater fish hatcheries are in the Middle-Lower Fork Clearwater River CHSU. This CHSU includes the Clearwater River from its confluence with the Snake River upstream to its confluence with the South Fork Clearwater River, and the Middle Fork Clearwater River from its confluence with the South Fork upstream to the confluence of the Lochsa and Selway Rivers. Both of these reaches provide FMO habitat. This CHSU also includes FMO habitat in the North Fork Clearwater River from its confluence with the Clearwater River upstream 2 miles to the base of Dworshak Dam. Both subadult and adult bull trout have been documented in the Clearwater River mainstem near the mouth of the North Fork (USFWS 2010a).

2.4.3.1.3 Salmon River Critical Habitat Unit

The mainstem Snake River (from its mouth upstream to Lower Monumental Dam) downstream of Hells Canyon and Salmon River facilities are part of the Salmon River CHU, which provides migratory habitat for hatchery juvenile and returning adult salmon and steelhead. The Salmon

River CHU is located in the Upper Snake River RU. In addition, several Hells Canyon and Salmon River hatchery programs included under the proposed action are located in the Salmon River CHU of the Upper Snake River RU.

The Salmon River Basin CHU, Unit 27, extends across portions of Adams, Blaine, Custer, Idaho, Lemhi, Nez Perce, and Valley Counties in Idaho. This CHU includes 4,584 miles of streams and 4,161 acres of lakes and reservoirs designated as critical habitat. This CHU is the largest in the Upper Snake RU and contains the largest populations of bull trout in the RU. It supports adfluvial, fluvial, and resident bull trout. Large portions of this CHU occur within the Frank Church—River of No Return Wilderness and, as such, many of the CHSUs in the Salmon River CHU face few threats.

The Salmon River Basin CHU has 10 CHSUs that provide spawning, rearing, foraging, migratory, connecting, and overwintering habitat. Hells Canyon and Salmon River hatchery programs included under the proposed action occur in the following five CHSUs: (1) Little Lower Salmon River (Rapid River Fish Hatchery and Trap), (2) South Fork Salmon River (South Fork Salmon River Weir and Satellite, Knox Bridge, Johnson Creek weir and release sites, Cabin and Curtis creeks egg boxes), (3) Pahsimeroi (Upper and Lower Pahsimeroi fish hatcheries and weir), (4) Upper Salmon River (East Fork Salmon River Satellite and Trap and the Sawtooth Fish Hatchery and Trap, proposed Yankee Fork Weir and Trap; juvenile release sites in Yankee Fork tributaries), and (5) Mid-Salmon Panther River CHSU (Beaver Creek and Indian Creek summer steelhead streamside incubators). The McCall Fish Hatchery is located along the North Fork Payette River, which is not designated as critical habitat for bull trout (USFWS 2010a).

Little Lower Salmon River Critical Habitat Subunit

The Little Lower Salmon River CHSU is located in Adams, Idaho, Lewis, Nez Perce, and Valley counties in west-central Idaho. Designated critical habitat includes 294 miles of streams. This CHSU provides access to the Snake River, and serves as a migratory corridor. In this CHSU, the Salmon River, from its confluence with the Snake River upstream to RM 1041, contains FMO habitat. The Rapid River, from its confluence with the Little Salmon River upstream to its headwaters, provides bull trout SR habitat in this CHSU (USFWS 2010b). In this CHSU, the Little Salmon River, from its confluence with the Salmon River upstream 19 miles, contains FMO habitat.

The Rapid River Fish Hatchery and Trap occur within SR habitat in this CHSU; however, suitable spawning habitat is reportedly not present near the hatchery or weir trap (IPC 2003 as cited in IDFG 2015c), and the primary spawning areas for fluvial and resident bull trout in the Rapid River reportedly begin at the confluence of the mainstem and the West Fork Rapid River (USFS 2003, p. K-7), approximately 3-4 miles upstream of the Rapid River Fish Hatchery site. The Little Salmon River Steelhead Program release sites are located within this CHSU.

Pahsimeroi River Critical Habitat Subunit

The Pahsimeroi River CHSU is located within Custer and Lemhi counties in east-central Idaho, and critical habitat includes 204 miles of streams. It contains many individuals and a moderate level of threats (USFWS 2010b). The Pahsimeroi River, from its confluence with the Salmon River upstream 53 miles, provides FMO habitat.

The Upper and Lower Pahsimeroi fish hatcheries and adult weir are located in this CHSU, along a reach of the river designated as FMO habitat for bull trout.

South Fork Salmon River Critical Habitat Subunit

The South Fork Salmon River CHSU is located in Idaho and Valley counties in central Idaho and includes 758 miles of streams and 640 acres of lake surface area. It contains many individuals and few threats, and supports fluvial populations that are essential for long-term recovery (USFWS 2010b). This CHSU includes FMO habitat in the South Fork Salmon River, from its confluence with the Salmon River upstream 80 miles, and SR habitat from its confluence with Tyndall Creek upstream to its headwaters. Johnson Creek from its confluence with East Fork South Fork Salmon River upstream 29 miles to Rock Creek contains FMO habitat; Cabin Creek from its confluence with Warm Lake Creek upstream 5 miles to its headwaters provides SR habitat. Curtis Creek from its confluence with South Fork Salmon River upstream 8 miles to its headwaters provides SR habitat. Moose Creek from its confluence with Johnson Creek upstream 2 miles to its headwaters contains FMO habitat (USFWS 2010b).

The South Fork Salmon River Weir and Satellite (RM 70), Johnson Creek weir and release site, and Knox Bridge release site are designated as FMO habitat for this CHSU. Egg boxes are installed in SR habitat in Cabin and Curtis creeks.

Upper Salmon River Critical Habitat Subunit

In the Upper Salmon River CHSU, the Salmon River, from approximately its confluence with the Pahsimeroi River upstream 102 miles to Alturas Lake Creek, contains FMO habitat, and from Alturas Lake Creek upstream 19 miles to its headwaters, provides SR habitat. The East Fork Salmon River, from its confluence with the Salmon River upstream 21.1 miles to its confluence with Little Boulder Creek contains FMO habitat, and from its confluence with Little Boulder Creek upstream 15.2 miles to the confluence of West Fork East Fork Salmon River and South Fork East Fork Salmon River provides SR habitat. In this CHSU, the Yankee Fork, from its confluence with the Salmon River upstream 9 miles to its confluence with Jordan Creek, contains FMO habitat; from its confluence with Jordan Creek upstream 20 miles to its headwaters, provides SR habitat (USFWS 2010b). Jordan Creek from its confluence with Yankee Fork upstream 4 miles to an unnamed tributary contains FMO habitat; Jordan Creek from its confluence with an unnamed tributary upstream 4 miles to its headwaters provides SR habitat.

The East Fork Salmon River Satellite and Trap, the Sawtooth Fish Hatchery and Trap, and the proposed Yankee Fork Weir are part of this CHSU; all facilities are located along reaches designated as FMO habitat for bull trout, and support year-round bull trout use (Streamnet 2016, entire). Summer steelhead streamside incubators are used in Jordan Creek, a tributary to the Yankee Fork Salmon River. Ramey, Cearly, Greylock, and Swift Gulch creeks (all streamside incubator sites off the Yankee Fork) are not included in the critical habitat designation. Ramey and Cearly creeks flow into lower reaches of the Yankee Fork that are designated as FMO habitat, and Greylock and Swift Gulch creeks flow into higher reaches that are designated as SR habitat.

Middle Salmon-Panther River Critical Habitat Subunit

The Middle Salmon-Panther River CHSU is located in Lemhi County in east-central Idaho, and is essential to bull trout conservation because it contains many individuals, a large amount of habitat, and moderate threat levels (USFWS 2010b). This CHSU supports fluvial migrants and provides a migratory corridor between multiple CHSUs in the Salmon River basin.

Indian Creek from its confluence with the Salmon River upstream 12 miles to its headwaters provides SR habitat for bull trout. Panther Creek from its confluence with the Salmon River upstream 29 miles contains FMO habitat. Beaver Creek from its confluence with Panther Creek upstream 10 miles to its headwaters provides SR habitat (USFWS 2010b). Summer steelhead eggs from the Pahsimeroi hatchery are incubated in streamside incubators in Indian Creek about 1 mile from the confluence with the Salmon River, and Beaver Creek just upstream of the confluence of Beaver and Panther creeks.

2.4.3.2 Factors Affecting Bull Trout Critical Habitat in the Action Area

The same threats described above for bull trout in section 2.4.2.2 also apply to bull trout critical habitat, including climate change.

With a warming climate, thermally suitable bull trout spawning and rearing areas are predicted to shrink during warm seasons, in some cases very dramatically, becoming even more isolated from one another under moderate climate change scenarios (Rieman et al. 2007, pp. 1558–1562; Porter and Nelitz 2009, pp. 5–7). Climate change will likely interact with other stressors, such as habitat loss and fragmentation (Rieman et al. 2007, pp. 1558–1560; Porter and Nelitz 2009, p. 3); invasions of nonnative fish (Rahel et al. 2008, pp. 552–553); diseases and parasites (McCullough et al. 2009, p. 104); predators and competitors (McMahon et al. 2007, pp. 1313–1323; Rahel et al. 2008, pp. 552–553); and flow alteration (McCullough et al. 2009, pp. 106–108), rendering some current spawning, rearing, and migratory habitats marginal or wholly unsuitable. Over a period of decades, climate change may directly threaten the integrity of the essential physical or biological features described in section 2.3.3.2 (PBFs 1, 2, 3, 5, 7, 8 and 9).

2.5 Effects of the Proposed Action

Effects of the action considers the direct and indirect effects of an action on the listed species and/or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action. These effects are considered along with the environmental baseline and the predicted cumulative effects to determine the overall effects to the species. Direct effects are defined as those that result from the proposed action and directly or immediately impact the species or its habitat. Indirect effects are those that are caused by, or will result from, the proposed action and are later in time, but still reasonably certain to occur. An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation.

2.5.1 Bliss Rapids Snail

The Bliss Rapids snail inhabits both the mainstem Snake River outside the project action area and coldwater springs along the Snake River, including those that supply water to Hagerman National, Niagara Springs, and Magic Valley fish hatcheries within the action area (74 FR 47536). These hatcheries take and divert spring water for use, reducing the amount of cold spring water directly entering the Snake River and reducing spring influenced pockets of the mainstem. However, the known distribution of Bliss Rapids snails in the mainstem Snake River is downstream of Little Salmon Falls Dam (Bean 2011; 74 FR 47536), and is therefore outside the river area measurably impacted by water discharge from the project hatchery facilities. No new construction or river alteration is proposed as part of the proposed action, and therefore, river substrate composition or channel characteristics would not be impacted.

Operation and routine maintenance of the water intake facilities have the potential to affect Bliss Rapids snails that inhabit these coldwater spring habitats. The timing of reproduction in the coldwater spring populations may overlap with some seasonal maintenance activities at the water intake facilities. Impacts from these activities would be similar to all life stages of snails, as eggs are laid on rock surfaces inhabited by adults.

The dependence of the Bliss Rapids snail on coldwater spring outflows makes the species particularly vulnerable to changes in water quality and ground water levels. Ground water levels are declining, and it is expected that the downward trend will continue into the future. Surface diversions of spring water for irrigation and aquaculture, and the continuing decline of the groundwater aquifer are primary threats to the long-term viability of the Bliss Rapids snail (section 2.4.1).

The Bliss Rapids snail occurs in Niagara Spring (below the hatchery intake) which serves as the water source for the steelhead egg incubation system, fire suppression system and irrigation system at Niagara Springs Fish Hatchery. Because of the steepness of the slope, the natural downward movement of rock within the spring can occasionally obstruct the flow of water into the collection box. Hatchery personnel must annually inspect the spring water source and remove any rocks or vegetation that restrict the flow of water to the hatchery. No machinery or equipment would be used for these routine maintenance activities to eliminate the risk of contamination of the spring water from petroleum products. Previous assessments performed by IPC (Stephenson 2005, *in litt*) concluded that the Bliss Rapids snail does not inhabit the upper Niagara Springs in the vicinity of the collection box due to high water velocity, and therefore, maintenance activities at the collection structure would not directly impact the Bliss Rapids snail; however, snails located downstream of the intake would be adversely affected by increased suspended and deposited sediment during intake maintenance.

Management practices, as described in Section 2.1.3.4, include performing all excavation by hand and prohibit the use of equipment or machinery to remove vegetation from the collection box area to minimize effects to Bliss Rapids snails. Inspection of removed pipe sections and removal of rocks could potentially impact snails that may be present on these surfaces, and possible impacts to some snails cannot be completely discounted.

The Bliss Rapids snail also inhabits springs near the Hagerman National Fish Hatchery (74 FR 47536). The hatchery receives water from several springs emanating from the Eastern Snake River Aquifer, which provides many spring outflows in the Hagerman area. The water in the springs is diminishing as a result of the overall decline of the groundwater aquifer, which is one of the long-term threats to the Bliss Rapids snail. Maintenance activities on the water intake are likely to adversely snails present near or on the intake structure through crushing; burying, desiccation, and habitat loss.

Management practices including those described in Section 2.1.3.4 are in place to minimize adverse effects on the Bliss Rapids snail at Hagerman National Fish Hatchery, including monitoring hatchery effluent to ensure compliance with the NPDES permit (IDFG 2011).

Magic Valley Fish Hatchery receives water from Crystal Springs, which is located on the north side of Snake River. The water is piped to the hatchery facilities on the south side. Bliss Rapids snails are also reported to occur in Crystal Springs (74 FR4 7536), and therefore, have the potential to be impacted through water drawdowns and maintenance activities for the intake facilities as described above. As with the Niagara Springs and Hagerman National fish hatcheries, management practices are in place to minimize impacts to Bliss Rapids snails, and all effluent water is monitored regularly for compliance with NPDES standards (IDFG 2011). Despite this, there exists the potential, however limited, that individual Bliss Rapid snails may be adversely affected by operation and maintenance of in-water facilities at the Hagerman National, Niagara Springs, and Magic Valley fish hatcheries.

2.5.2 Bull Trout

2.5.2.1 Direct and Indirect Effects of the Proposed Action

Program Facilities with No Effect on Bull Trout

Bull trout are not known to occur in stream reaches adjacent to or in the vicinity of the McCall, Niagara Springs, Magic Valley, and Hagerman National fish hatcheries or related infrastructure, and the facilities are not located in critical habitat for bull trout.

No program-related broodstock collection occurs at any of these facilities, and no hatchery juveniles are released into waters near the facilities. For these reasons, there is no likelihood that ongoing hatchery operations, including water diversion, effluent discharge, or maintenance activities, would impact bull trout. Further, all facilities would 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 NPDES permits would not be measurable over background conditions.

No impacts from the introduction of infectious disease from NPDES-regulated facilities to occupied bull trout waters would occur. In the unlikely event that juvenile smolts released from the facilities harbor infectious diseases, the likelihood for transmission of diseases from smolts is insignificant because hatchery smolts are typically released into bull trout FMO habitat and migrate rapidly downstream. Based on this information, ongoing and future operation of these facilities would have no effect on bull trout or their critical habitat, and facility operations are not discussed further in this section.

Information Applicable to All Programs in Mid-Columbia and Upper Snake Recovery Units

The actions of the Hells Canyon and Salmon River hatchery programs included under the proposed action occur within or adjacent to rivers that contain bull trout and within critical habitat that has been designated for bull trout. The facilities and release sites are widely dispersed through the Mid-Columbia and Upper Snake RUs for bull trout, primarily in the state of Idaho.

Disturbance to bull trout will primarily occur in proximity to existing hatchery and adult collection facilities and where released salmon and steelhead overwinter and/or migrate to the ocean. The effects on bull trout in SR habitat are likely to be minor, because with the exception of the Rapid River Fish Hatchery, existing facilities are located below primary bull trout SR habitat in the action area. The effects on FMO habitats will be generally localized near facility locations and extend out into FMO habitat during release of salmon and steelhead.

Disturbance of bull trout may occur from hatchery operation activities (adult collection, holding, and spawning; incubation; juvenile rearing; routine on-station maintenance), fish health activities, water withdrawals, discharge of effluent, releases of juvenile spring Chinook and steelhead, installation, removal and operation of streamside incubators, and upland or in-water maintenance actions. RM&E activities that are part of the proposed action are those directly related to NPT monitoring of hatchery success for the Johnson Creek spring/summer Chinook salmon collection and subsequent juvenile screw trap operations. The SBT also conducts RM&E related to the success of hatchery programs including the Yankee Fork Chinook Program and the Salmon River B-Run Steelhead Program. The SBT operates a weir to enumerate returning adults spring Chinook (Yankee Fork Chinook Program), a rotary screw trap to monitor natural juvenile production and hatchery juvenile success (Yankee Fork Chinook and B-run steelhead programs), and regular electrofishing to monitor the success of steelhead streamside incubation projects (B-run steelhead program) and trends in natural origin fish abundance.

Previous Hatchery Assessments

The hatchery operations and RM&E programs were recently analyzed for effects on bull trout through Hatchery and Genetic Management Plans developed for each subject hatchery program in the Hells Canyon and Salmon River. These reviews, along with previous section 7 consultations and permitting, have resulted in significant modifications to improve methods of handling fish, controlling effluents and diseases, timely monitoring of traps, and timing of maintenance projects to minimize risks to listed fish. Thus, hatchery programs have been modified to improve their efficiency to produce salmon and steelhead while minimizing effects on listed species.

Fish Health

Fish health monitoring and testing is and will be conducted in accordance with Integrated Hatchery Operations Team (IHOT), Pacific Northwest Fish Health Protection Committee (PNFHPC), American Fisheries Society (AFS), and Office International des Epizooties (OIE) protocols and standards to limit the introduction of disease from hatchery fish to natural bull trout populations. Effects on fish health as related to bull trout disease transfer from hatchery fish are discussed in Section 2.5.2.1.6.

Water Withdrawal

Most hatchery facilities associated with Hells Canyon and Salmon River programs withdraw surface water from adjacent streams to facilitate fish holding, spawning, incubation, and rearing. Such water withdrawals reduce the quantity of water between the diversion point and the point of return, or discharge. To estimate the potential impact of surface water diversions on listed species and their habitat, IDFG compared the maximum flow diversion for each facility to the average monthly flows, using the closest gauge data available for each hatchery location. This data was then used to determine the percentage of streamflow remaining in the diversion reach associated with each facility.

For bull trout, the percentage of remaining flow was assessed to determine the suitability of in-stream habitat for use by life stages that may occur in each diversion reach. To facilitate this analysis, IDFG used the “Montana method" (Tennant 1976, p. 9), which is a reconnaissance-level habitat evaluation based on historic discharge records. This method has been applied to warm and coldwater streams in the Midwest, Great Plains, and Intermountain West, and is based on measured pre- and post-diversion stream widths, average depths, and average velocities in 11 streams in Montana, Wyoming, and Nebraska. The results of these measurements indicated that the quality of in-stream habitat changed more rapidly from a flow of 10 percent of the average to no flow, than in it did in any higher range. As a result of these measurements, Tennant (1976, p. 9) concluded that 10 percent of the average annual flow is the minimum instantaneous flow needed to sustain short-term survival. At this flow, Tennant found that depths and velocities were significantly reduced, substrate was one-third exposed, gravel bars were dewatered, streambank cover was diminished, fish were crowded into the deeper pools, and riffles were too shallow for larger fish to pass. A flow of 30 percent of the average annual flow was required to maintain good habitat for aquatic life; at this flow, widths, depths, and velocities were generally satisfactory, streambanks provided some cover, and larger fish could pass most riffles. Optimum habitat was provided by flows of 60-100 percent of the average annual flow. Flushing flows occurred at 200 percent of the average annual flow.

For the purposes of this Opinion, a hatchery-related surface water withdrawal may affect bull trout when diversions remove water from the subject reach. A facility is not likely to adversely affect bull trout if it diverts up to 40 percent of average annual flow, resulting in the retention of 60-99 percent of average annual flow through the diversion reach. A facility is likely to adversely affect bull trout when it diverts more than 40 percent of average annual flow, resulting in the retention of less than 60 percent of average annual flows through the diversion reach.

Fish Passage

In July 2011, the NMFS published new Anadromous Salmonid Passage Facility Design criteria (NMFS 2011, entire). The document provides criteria, rationale, guidelines, and definitions for the purpose of designing proper fish passage facilities for the safe, timely, and efficient upstream and downstream passage of anadromous salmonids at impediments created by artificial structures, natural barriers (where provision of fish passage is consistent with management objectives), or altered in-stream hydraulic conditions. This document provides fishway facility design standards for actions in the Northwest Region under the various authorities and jurisdictions of the NMFS, including section 18 of the Federal Power Act (FPA), the Act, and the Magnuson-Stevens Fishery Conservation and Management Act (MSA).

The fish passage facilities described in this document include various fish ladders, exclusion barriers, trap and haul facilities, fish handling and sorting facilities, in-stream structures, and juvenile fish screens. The existing facilities and any subsequent structures (as applicable) were built to design specifications at the time of construction. LSRCP structures are currently being evaluated relative to compliance with NMFS's 2011 Screening and Passage criteria. When final assessments are completed, the LSRCP and facility managers and cooperators will coordinate with the NMFS to determine compliance levels (e.g., in compliance, in compliance with minor variances, or out of compliance) and develop a strategy to prioritize appropriate/necessary modifications contingent on funding availability, program need, and biological impacts to listed and native fish. Such modifications would require separate section 7 consultations.

Impact Minimization Measures

To reduce impacts to bull trout and bull trout critical habitat, all programs will adhere to the minimization measures described in section 2.1.3.4.

2.5.2.1.1 Broodstock Collection

All Hells Canyon and Salmon River programs require the collection of returning Chinook salmon or steelhead adults for broodstock. If listed fish are captured in collection traps, they would be subject to physical handling, which can promote stress in fish and may result in post-capture mortality (Sharpe et al. 1998, p. 81-82). Accepted standard operating procedures (IDFG et al. 2015) will be followed for handling of bull trout.

Primary contributing factors to stress and death from handling include differences in water temperatures (between the river and holding vessel), dissolved oxygen conditions, the amount of time fish are held out of the water, and physical trauma (NMFS 2016). Debris buildup at traps can also kill or injure fish if the traps are not monitored and cleared regularly. The co-managers of the facilities have extensive experience capturing, handling, and releasing listed species in these areas, and have demonstrated low bull trout mortality rates through past implementation. The IDFG section 6 report consistently shows less than 1 percent mortality for bull trout handled in research and monitoring activities (excluding gill net sampling) (Leitzinger 2016).

Mid-Columbia Recovery Unit

Two adult broodstock collection facilities associated with four spring Chinook salmon and steelhead programs are located in the Mid-Columbia RU:

- The Hells Canyon Fish Trap collects broodstock for the Hells Canyon summer steelhead and spring Chinook salmon programs and the Little Salmon River steelhead program.
- The Dworshak National Fish Hatchery Trap collects broodstock for the Salmon River B-Run steelhead programs. Although brood from both programs is currently collected at the trap, the long-term goal is to phase out this stock and discontinue use of the trap.

Each of these traps is operated at intermittent periods throughout the year for broodstock collection (Table 6).

Table 6. Bull trout Presence and Adult Collection periods for Hatchery Programs in the Mid-Columbia Recovery Unit (typical and approximate) (from Assessment Table 8-2).

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bull Trout Migration or Foraging													
Facility, Program													
Hells Canyon Trap	Hells Canyon Spring Chinook salmon												
	Hells Canyon and Little Salmon River steelhead												
	Little Salmon River steelhead												
Dworshak National Fish Hatchery Trap	Salmon River B-Run steelhead												

Hells Canyon Fish Trap

As presented in Section 2.1.3.1.2, the Hells Canyon Fish Trap operates intermittently to collect broodstock for several programs. The trap operates to collect steelhead (both the Hells Canyon and Little Salmon River steelhead programs) from late October until the collection goal is reached (typically through November), and then again in April until the collection goal is reached (typically through May). The trap operates from May through June to collect spring Chinook salmon. Trapping typically occurs 3 days per week but may be operated more frequently to meet broodstock collection goals, in consideration of predicted future in-stream conditions. The trap is located along the left bank (looking downstream) on the Oregon side of the Snake River immediately downstream of the Hells Canyon Dam, which forms a complete barrier to upstream migration.

The trap is adjacent to mainstem Snake River FMO habitat; SR habitat is not present. Therefore, trapping operations do not impact spawning habitat or rearing juveniles. A low number of adults and subadult bull trout could potentially be present during trapping activities (Chandler et al. 2003). Direct effects on subadult and adult bull trout could, therefore, include migratory delay, mortality, or blockage of migration through the trap site. These effects occur infrequently at the Hells Canyon Trap because bull trout are rarely captured, and are immediately returned to the river downstream if collected. Between 2001 and 2009, one bull trout was captured and subsequently released unharmed (IDFG 2011). In both 2012 and 2013, one bull trout (>300 mm) was interrogated at the Hells Canyon Trap (IDFG 2016c). Bull trout captures at the Hells Canyon Trap are not reported in the IDFG Annual Take Report, but are recorded by hatchery staff with the trapping data. Therefore, the likelihood that bull trout may be captured is low; however, if collected, bull trout would be adversely affected through handling stress and disturbance, and potentially, mortality.

Bull trout are handled and transported if necessary in accordance with accepted standard operating procedures (SOPs) developed by IDFG, IPC, the Service, the NPT, and the SBT

(IDFG et al. 2015). Regarding adult handling, the SOPs states that incidental catches of bull trout and other non-target species will be transported and released below Hells Canyon Dam.

Dworshak National Fish Hatchery Trap

Dworshak National Fish Hatchery operates a volitional fish ladder on the north Bank of the North Fork Clearwater River that attracts fish via attraction flow, and traps them at the hatchery. If captured at the trap, direct effects on individual bull trout could occur and would be similar to those described above for the Hells Canyon Trap. However, because the trap is located on a reach of the North Fork Clearwater River downstream of Dworshak Dam, bull trout usage of the reach at the trap site is limited; the reach adjacent to the trap most likely functions as FMO habitat similar to the nearby mainstem Clearwater River.

Low numbers of bull trout have been collected at the Dworshak National Fish Hatchery volitional ladder in the last 10 years (Robertson 2017, *in litt*.). Considering this information, the likelihood that bull trout would be collected in the trap is low, however, a small number of bull trout may enter the trap and be adversely affected (from handling stress, passage delay).

In accordance with current SOPs for *Salmon and Steelhead Production Programs in the Salmon and Snake River Basins* (IDFG et al. 2015), incidental catches of non-target species (e.g., bull trout) are returned to the Clearwater River or the North Fork Clearwater River, depending on river temperatures and conditions. Hatchery operators will also follow the recently developed protocols for handling captured bull trout (see Appendix B of this Opinion).

Upper Snake Recovery Unit

Six existing adult broodstock collection facilities and one future collection facility (Yankee Fork Weir) are currently or would be operated under the proposed action to collect adult broodstock for 11 spring Chinook salmon and steelhead programs in the Upper Snake RU (Table 7).

Table 7. Adult/subadult bull trout presence and adult collection period in the Upper Snake Recovery Unit (from Assessment Table 8-5).

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bull Trout Overwintering and Foraging													
Bull Trout Spawning Migration/Outmigration													
Facility, Program													
Rapid River Fish Hatchery	Little Salmon Spring Chinook salmon												
	Hells Canyon Spring Chinook salmon												
Lower Pahsimeroi Weir	Little Salmon summer steelhead[a]												
	Pahsimeroi summer Chinook salmon												
	Pahsimeroi summer steelhead												
	Upper Salmon A-run steelhead												
	Salmon B-run steelhead												
South Fork Salmon Weir	South Fork Salmon River summer Chinook salmon												
Johnson Creek Weir	Johnson Creek spring/summer Chinook salmon												
Sawtooth Fish Hatchery Weir	Upper Salmon River spring Chinook salmon												
	Upper Salmon River A-run steelhead												
East Fork Salmon River trap	East Fork Salmon River summer steelhead												
Yankee Fork trap[b]	Salmon B-run steelhead[a]												

[a] Broodstock for these programs are also currently collected at the Dworshak National Fish Hatchery (Mid-Columbia RU); the long-term goal is to phase out use of stock. Broodstock for Little Salmon River summer steelhead are also collected at the Hells Canyon Trap.

[b] The Yankee Fork Trapping is currently conducted using picket weirs in pond outlets located off the main channel of the Yankee Fork. A future collection site to be constructed and operated by the SBT is in development; construction of the new weir is not part of the proposed action and the SBT will conduct separate consultation.

The ongoing operation of adult collection facilities may impact bull trout in affected core areas by blocking or delaying migration to and from spawning reaches, altering spawn timing, and modifying local bull trout distribution. Trapped individuals may also be subject to stress from confinement and handling. Although the operation of the adult collection facilities may alter the temporal and spatial distribution of bull trout on a local scale, the level of effects relative to migration throughout the Upper Snake River RU is unknown. Larger adult and subadult bull trout traveling upstream are typically captured in traps; however, smaller bull trout may move through weir panels.

To minimize the likelihood for effects on bull trout in the Upper Snake River RU, trap facilities and weirs are maintained on a regular basis during the trapping periods and all bull trout captured in traps are counted and immediately released (within 24 hours) above the weir with minimal handling. Bull trout are handled and transported if necessary in accordance with current SOPs for the *Salmon and Steelhead Production Programs in the Salmon and Snake River Basins* (IDFG et al. 2015). The SOPs state that incidental catches of bull trout and other non-target species will be transported and released at specific locations for each site, which are included below. Bull trout would be subject to stress and migration delays during these activities, but as discussed in the following sections, mortality associated with operation of the traps and weir facilities in the Upper Snake RU has been minimal.

Rapid River Trap

The Rapid River Trap collects broodstock for the Little Salmon River spring Chinook salmon hatchery program from late April through early September. During the adult collection period (see Table 7), the velocity barrier weir and trap operates continuously and forms a complete barrier to upstream migration. When trapping operations are not in progress, the trap is lowered and allows unimpeded migration of anadromous and resident fish around the velocity barrier.

Bull trout occupy the Rapid River year-round (Streamnet 2016, entire) and are relatively abundant. Operation of the Rapid River Trap is likely to adversely affect bull trout. In accordance with current SOPs for *Salmon and Steelhead Production Programs in the Salmon and Snake River Basins* (IDFG et al. 2015), incidental catches of bull trout are released upstream of the Rapid River trap. Bull trout entering the trap are measured, scanned for tags, and given a caudal punch to identify recaptures. Collected adults and subadults are therefore delayed at the trap, and may alter their migratory behaviors in response to holding. Individuals may also be subject to stress or injury during temporary holding periods and during marking procedures.

Annual counts of collected bull trout at the Rapid River Trap from 1992 to 2009 have ranged from 91 to 420 fish (IDEQ 2006b). Bull trout may be captured from late April through August. Direct bull trout mortality associated with operations at the trap has been extremely limited. From 2005 through 2009, out of 1,430 bull trout captured, one bull trout was incidentally killed as a result of trapping operations (IDFG 2006, 2007, 2008, 2009). From 2010 through 2015, adult bull trout (>300 mm) captures at the Rapid River Hatchery weir/trap have ranged from 310 to 477. During this same period (2010-2015), two juvenile bull trout (<300 mm) were captured at the weir, both in 2011 (IDFG 2016c).

This trapping program has been ongoing for many years. Since 1994, positive trends in bull trout population growth rates have been observed in the core area (High et al. 2008). Based on this information, even though individuals would be adversely affected during trapping operations, continued use of the Rapid River Trap is not expected to limit the future viability of the Rapid River local population.

As discussed in Section 2.4.3.1.3, the Rapid River from its confluence with the Little Salmon River upstream to its headwaters, provides bull trout SR habitat (USFWS 2010a, b). However, suitable spawning habitat does not exist in the vicinity of the Rapid River Hatchery, weir/trap, fish ladder, or water supply intake, and the weir is located in habitat that is primarily used for bull trout migration (IPC 2003 as cited in IDFG 2015c). The primary spawning areas for fluvial and resident bull trout in the Rapid River begin at the confluence of the mainstem and the West Fork Rapid River (USFS 2003, p. K-7), approximately 3-4 RM upstream of the Rapid River Fish Hatchery site.

Lower Pahsimeroi Fish Hatchery Weir

The Lower Pahsimeroi Fish Hatchery Weir is located on the Pahsimeroi River about 1 mile upstream from the confluence with the Salmon River. Summer Chinook and a number of steelhead runs are seasonally collected at the weir from about mid-February through September. The weir consists of a removable barrier that spans the full channel of the Pahsimeroi River. The weir diverts adults into a holding pond via an attraction canal and a fish ladder. The trap is monitored daily and all fish, including nontarget bull trout, are handled in accordance with protocols established by the Service (2012) and the NMFS (2008). In accordance with current SOPs for *Salmon and Steelhead Production Programs in the Salmon and Snake River Basins* (IDFG et al. 2015), incidental catches of bull trout are released upstream of the adult collection weir.

No bull trout spawning or rearing occurs near the existing weir. In the vicinity of the weir, the Pahsimeroi River provides FMO habitat for bull trout and a small number of bull trout have been observed migrating through the Pahsimeroi River adjacent to the lower hatchery. Because migratory adult or subadult bull trout may be present, they may be directly affected by operation of the channel-spanning weir. Migratory bull trout may be captured and subject to migratory delay, handling stress, or mortality. However, few bull trout typically enter the trapping facility. A total of nine bull trout were captured at the lower weir between 2005 and 2009 (IDFG 2016a); from 2010 – 2015, the number of bull trout (>300 mm) collected at the lower weir ranged from 0 to 12 annually (IDFG 2016c) during summer Chinook collections from June through September.

South Fork Salmon River Weir

The South Fork Salmon River Weir is located about 112.6 km (70 mile) upstream from the confluence with the Salmon River. The removable, channel-spanning weir is operated for Chinook salmon broodstock collection from mid-June through mid-September. This operational period overlaps with bull trout migration through the river corridor. In the vicinity of the removable weir location, the South Fork Salmon River provides FMO habitat for migratory bull trout, which have been observed in the mainstem river (Stiefel et al. 2015).

Bull trout may be present during the mid-June through September operational period of the South Fork weir and are therefore likely to be adversely affected during trapping operations. In accordance with current SOPs for *Salmon and Steelhead Production Programs in the Salmon and Snake River Basins* (IDFG et al. 2015), incidental catches of bull trout are released upstream of the South Fork trap. Bull trout entering the trap are measured at fork length, operculum-punched for retrap identification, and returned to the river. Collected adults and subadults are delayed at the trap, and may alter their migratory behaviors in response to holding. Individuals may also be subject to stress, injury, or mortality during temporary holding periods, and during recapture marking procedures.

From 2005-2009, 11 total bull trout were captured in the South Fork Salmon River weir trap, and one capture resulted in an incidental mortality (IDFG 2016b). From 2012 to 2014, IDFG collected from 2 to 7 bull trout annually (>300 mm) at the South Fork Salmon River Weir/Trap (IDFG 2016c).

Johnson Creek Weir

Broodstock for the Johnson Creek spring/summer Chinook salmon program are collected at a temporary picket weir and trap annually placed in Johnson Creek approximately 5 miles above the confluence of Johnson Creek and the East Fork of the South Fork of the Salmon River. The Johnson Creek seasonal weir is operated from mid-June until mid- to late-September. Johnson Creek provides FMO habitat and is well downstream of SR tributaries. The picket weir spans the entire river channel when in operation, and funnels upstream migrating fish into a trap box at the point of the V. As mentioned previously, the weir currently relies only upon the upstream trap box to capture fish; a downstream trap box used to be operated on the west-side weir wing (2001-2009) but has since been decommissioned. Therefore, current operation of the weir and trapping facility is only likely to adversely affect bull trout individuals moving upstream in the subject reach.

Adults and subadult bull trout have been captured at the Johnson Creek weir and trap, with peak collections from July through September. In accordance with current SOPs for *Salmon and Steelhead Production Programs in the Salmon and Snake River Basins* (IDFG et al. 2015), incidental catches of bull trout are released upstream of the weir. Weir operations overlap with bull trout upstream migrations to spawning tributaries in August and September. Therefore, erection and removal of the Johnson Creek weir and trap may affect migrating bull trout because the presence of weir operators could temporarily displace individuals or haze them from the area. Impacts during installation and removal are likely insignificant because mobile adults and subadults would be only temporarily displaced and would likely continue the upstream (or downstream for subadults) migration. Bull trout may be adversely affected after the weir is erected beacause of passage delays and potential holding stress in the traps.

Installation and removal of the seasonal weir and trap also results in a minor amount of turbidity for a distance of about 450 feet (USFWS 2015c) downstream of the weir location. Elevated in-stream turbidity could result in displacement from foraging habitat or alteration of migration patterns immediately downstream of the work area. However, considering the short-term nature of installation and removal, and the low embeddedness at the Johnson Creek weir location, sedimentation effects are not anticipated to be significant. No bull trout spawning or rearing occurs in Johnson Creek; therefore, installation and removal would have no effect on redds, eggs, alevins, or young-of-the-year bull trout.

Operation of the weir from June through September may adversely affect bull trout in the form of disturbance, injury, or mortality from handling, holding stress, and temporary passage delay. However, no mortalities have been reported and collections have ranged from 0 to 56 bull trout per year (NPT 2017). To reduce the likelihood of handling and holding stress, collected bull trout are sorted and immediately released upstream or downstream of the weir trap, depending on the direction of travel, with minimal handling (NPT 2017). Releases occur within 24 hours of capture, as the weir and trap are monitored at a minimum of once per day. During times of peak migration the weir may be checked several times a day. The Johnson Creek weir is located in FMO habitat, well downstream of SR habitat. Only one bull trout 170 mm in size has been collected at the weir in 17 years of operation (Gebhards 2017, *in litt*) Therefore, the likelihood of collecting juvenile bull trout at the weir is discountable.

Sawtooth Fish Hatchery Weir

The Sawtooth Fish Hatchery Weir is located on the Salmon River about 400 miles upstream of the confluence with the Snake River. Picket panels for this channel-spanning weir are installed annually to collect steelhead and Chinook salmon from March through September. In the vicinity of the existing weir, the Salmon River provides FMO habitat for bull trout, and supports year-round migration and rearing. Operation of the Sawtooth Fish Hatchery Trap may also alter bull trout migration routes and delay movements throughout the Salmon River Subbasin.

Migratory adult bull trout are usually captured in the Sawtooth Fish Hatchery Trap from the end of June through September. This period coincides with Chinook salmon trapping periods. Bull trout are not typically collected during steelhead trapping periods (March and April; IDFG 2011). In accordance with current SOPs for *Salmon and Steelhead Production Programs in the Salmon and Snake River Basins* (IDFG et al. 2015), incidental catches of non-target species (e.g., bull trout) are released upstream of the hatchery collection weir.

From 2005 through 2009, 167 bull trout were captured and released upstream of the Sawtooth Fish Hatchery weir. From 2010 through 2015, from 1 to 20 juvenile bull trout were collected annually at the natural production monitoring screw trap (currently operated under a section 6 permit) located near the hatchery intake. During that period (2010-2015), 6 to 58 adults (>300 mm) were collected annually at the Sawtooth Hatchery trap (IDFG 2016c). Some bull trout mortality has been reported at the facility (IDFG 2015a). From 2005 to 2008, the total bull trout mortality rate was 2.41 percent at the weir, with a total of 4 mortalities (IDFG 2006, 2007, 2008, 2009, 2010).

East Fork Salmon River Weir

The existing East Fork Salmon Satellite Facility, including the weir, is approximately 18 miles upstream of the confluence of the East Fork with the mainstem Salmon River. The weir spans the entire channel, and is installed annually from April through mid-May to collect East Fork Salmon River steelhead broodstock. The weir is located on a reach of the East Fork Salmon River that provides FMO habitat for bull trout. No bull trout spawning occurs in the vicinity; however, the East Fork provides SR habitat about 3 miles upstream of the weir location.

Operation of the East Fork Salmon Satellite Trap for steelhead collection occurs before bull trout begin their upstream migration. Captures of bull trout typically start at the end of June, while trap operations for steelhead cease in May. In accordance with current SOPs for *Salmon and Steelhead Production Programs in the Salmon and Snake River Basins* (IDFG et al. 2015), incidental catches of non-target species (e.g., bull trout) are released upstream of the velocity barrier.

Although the East Fork trap has not operated to collect Chinook salmon since 1998, IDFG operated the trap from 2004 through 2015 to monitor adult Chinook salmon and bull trout escapement (IDFG 2015a). Bull trout mortalities have occurred during these trapping operations. From 2005 to 2008, the total bull trout mortality rate was 1.4 percent at the East

Fork trap (14 mortalities total; IDFG 2011). The Chinook salmon escapement monitoring has been discontinued and the trap now only operates to trap steelhead in the spring. No bull trout have been trapped in the spring during steelhead operations (IDFG 2016c); however, the potential for their occurrence during the spring period and associated adverse effects cannot be completely discounted.

Yankee Fork Weir

Current broodstock trapping efforts for the Upper Salmon B-run steelhead program on the Yankee Fork are conducted using picket weirs in the outlets of off-channel ponds where steelhead are released in April and early May. The SBT proposes to construct a new collection weir on the Yankee Fork, adjacent to the USFS Pole Flat Campground. If completed, steelhead broodstock collection would shift from the temporary off channel picket weir to the SBT permanent weir. The Tribes currently operate a temporary weir at the site from June through September to collect adult Chinook salmon under a special use agreement with USFS. If constructed, the permanent weir would be a channel-spanning facility that impedes passage of all bull trout that are larger than the picket openings. This would result in a temporary delay in migration through the Yankee Fork Reach. Captured bull trout individuals would be immediately released either upstream or downstream of the weir with minimal handling, but would still be subject to disturbance and stress. Based on a radio telemetry study of bull trout movements in the Salmon River, bull trout are not expected to be encountered until high water recedes (Schoby and Curet 2007, p. 14). This typically happens in June after steelhead brood trapping is over. However, bull trout have been captured at the Chinook weir (Table 9, Section 2.5.2.1.3) and would be adversely affected through capture and associated migration delays and handling stress.

The SBT research weir, operated from June through September to monitor returns of natural and hatchery origin adult Chinook, is described in section 2.5.2.1.3 (RM&E). Effects on bull trout and their habitat from construction and maintenance of the new Yankee Fork Weir will be consulted on separately; construction of the new weir is not part of the proposed action.

2.5.2.1.2 Acclimation and Release

Mid-Columbia Recovery Unit Releases

Within the Mid-Columbia RU, Hells Canyon spring Chinook salmon and steelhead smolts are released from Hells Canyon Dam into the mainstem Snake River. The mainstem Snake River, as well as downstream habitats in the mainstem Columbia River, are used as a migratory corridor to/from Hells Canyon programs in the Mid-Columbia RU. Such releases have the potential to affect listed bull trout via increased competition for resources as well as predation, as described below.

Upper Snake Recovery Unit Releases

In the Upper Snake RU, spring Chinook salmon and steelhead releases include the following:

- Little Salmon River steelhead program releases smolts into the Little Salmon River, in FMO habitat for bull trout.
- Little Salmon River spring Chinook salmon program releases smolts into the Rapid River and Little Salmon River. Smolts are also released into the Snake River below Hells Canyon Dam, part of the Mid-Columbia River RU. In the Upper Snake River RU, smolts

are released into FMO bull trout habitat in the Little Salmon River. Smolts are also released into a reach of the Rapid River designated as SR habitat for bull trout (USFWS 2010b); however, suitable spawning habitat does not exist near the hatchery release site, and the primary spawning areas for fluvial and resident bull trout in the Rapid River begin at the confluence of the mainstem and the West Fork Rapid River ((USFS 2003, p. K-7) approximately 3-4 miles upstream of the Rapid River Fish Hatchery site.

- South Fork Salmon River summer Chinook salmon program releases smolts into FMO habitat at Knox Bridge on the South Fork Salmon River.
- Johnson Creek spring/summer Chinook salmon program direct-releases smolts into Johnson Creek and FMO habitat at Moose Creek.
- Cabin and Curtis creeks summer Chinook salmon egg box program places approximately 6 egg boxes (25,000 eggs per box) into SR habitat in each creek. After hatching, fry leave the boxes volitionally.
- Pahsimeroi summer Chinook salmon and summer steelhead program releases smolts into bull trout FMO habitat in the Pahsimeroi River.
- Indian and Beaver Creeks summer steelhead streamside incubator program places five streamside incubators (100,000 eggs per incubator) into SR habit in Indian and Beaver Creeks. After hatching, fry leave the boxes volitionally.
- East Fork Salmon River steelhead program releases smolts into FMO habitat in the East Fork Salmon River.
- Upper Salmon River Chinook salmon and Upper Salmon River A-run steelhead programs release smolts into FMO habitat in the Salmon River.
- Upper Salmon River B-run steelhead program releases smolts into the Yankee Fork. The Yankee Fork smolt release location is located in bull trout FMO habitat near the proposed permanent weir to be constructed by the SBT.
- For the Yankee Fork summer steelhead streamside incubator program, approximately 10 incubators (50,000 eggs per incubator) are placed into FMO habitat in Jordan Creek, though in proximity to SR habitat, and possible FMO habitat in other Yankee Fork tributaries. After hatching, fry leave the boxes volitionally. Yankee Fork tributaries, including Ramey, Swift Gulch, Greylock, and Cearly creeks, are not included in the critical habitat designation (USFWS 2010a, b). However, Ramey and Cearly creeks flow into lower reaches of the Yankee Fork that are designated as FMO habitat, and Greylock and Swift Gulch creeks flow into higher reaches that are designated as SR habitat.

Effects of Juvenile Releases

Spring Chinook salmon and steelhead releases from the Hells Canyon and Salmon River hatchery programs included under the proposed action in the Mid-Columbia and Upper Snake RUs may result in both positive and negative effects on bull trout, as described below.

All programs release hatchery smolts over several weeks from late March through early May (or April to June at Hells Canyon Dam). In FMO habitat, such releases would overlap with potential use by adults or subadults. In SR habitat, released hatchery smolts could overlap with age 0+ juvenile bull trout. However, the vast majority of hatchery fish are released well downstream of

SR habitat, which minimizes the likelihood for competition with and predation on juvenile bull trout. Hatchery smolt releases may actually provide forage for larger fluvial bull trout overwintering in the lower reaches of each release stream and therefore are considered a beneficial effect. Potential effects on bull trout from hatchery smolt releases and the use of streamside incubators primarily include competition for resources and predation and are discussed in the following sections.

Competition

Hatchery smolt releases

Hatchery-reared smolts may compete with other fish species for rearing habitat and feeding opportunities. Direct competition for resources between hatchery smolts and bull trout may occur in SR habitat and within FMO habitat used as a bull trout migration corridor. Competition is greatest in spawning and nursery areas and near juvenile release areas with the highest fish density (BAMP 1998 as cited in NMFS et al. 2014).

Competition is possible between residualized juvenile Chinook salmon, juvenile steelhead, and subadult bull trout. The likelihood for competition is anticipated to be low for proposed and ongoing releases because of the distance between the majority of release sites and bull trout SR habitat. Hatchery rearing practices, including volitional release of smolts that are physiologically ready to migrate, tend to minimize residualism rates of hatchery salmon and steelhead.

With few exceptions, release sites in the mid-Columbia and Upper Snake RUs are located in FMO habitat for bull trout. Although juvenile releases may affect bull trout, adverse effects are only associated with releases that occur within or in close proximity to SR habitat (Rapid River Hatchery and the East Fork Salmon River Satellite), or reaches that are mapped (Streamnet 2016) as rearing habitat (Sawtooth Hatchery reach, South Fork Salmon Satellite). Therefore, juvenile releases from these facilities are likely to adversely affect bull trout because hatchery smolt releases have the likelihood to overlap and compete with age 0+ bull trout. All other release locations are well downstream of SR habitat and are not likely to adversely affect bull trout because of limited spatial and temporal overlap between hatchery salmon and steelhead smolts with juvenile bull trout.

The likelihood for adverse effects on bull trout juveniles from smolt releases from the Rapid River and East Fork Salmon sites is minimized, but not eliminated, because IDFG releases smolts that are physiologically ready to outmigrate upon release in the spring and during high spring flow conditions that encourage downstream migration. This strategy reduces the period of time when hatchery smolts and bull trout may overlap in the same system, and therefore reduces the likelihood for inter-species interaction. This strategy may also reduce residualism. Steelhead residualism in the upper Salmon River appeared to be about 4 percent in 1992 (IDFG 1993).

Streamside incubation

Competition for resources is possible in most streamside incubator locations. Eyed eggs are reared in the incubator and hatch as alevins. Once hatching occurs, personnel enumerate dead eggs and remove trays from the incubators. Fry volitionally migrate from the incubators to the natural stream.

In Cabin and Curtis creeks, summer Chinook salmon that volitionally exit the streamside incubators will remain in the system for about 1 year before migrating downstream as smolts. During this time, competition for resources in SR habitat in both creeks may affect juvenile bull trout; however, the impact is likely insignificant considering the limited freshwater rearing residency of Chinook salmon, and the relatively low density of outplanted eggs in the streamside incubators. If Chinook salmon smolts residualize and continue to compete for resources with larger life histories of bull trout, this impact would continue throughout the lifetime of each residual.

Similar competition may result in SR habitats used for summer steelhead incubators, including Beaver and Indian creeks. Steelhead may remain in the system for up to 3 years, and could elect a resident life history. Therefore, the potential exists for competition with young rearing bull trout, which could adversely affect individuals through resource competition if partitioning does not occur. The relatively low number of steelhead incubated in each stream reduces, but does not eliminate, the likelihood for adverse effects.

Predation

Hatchery smolt releases

Predation by hatchery fish on wild fish can occur anywhere the two stocks exist in the same space and time, and risks to wild fish are increased when hatchery fish, particularly larger smolts, are released during periods when vulnerable, newly emergent fry are present.

The impact of direct predation by the majority of program juvenile releases is expected to be minimal because (1) juvenile spring/summer Chinook and steelhead primarily feed on insects (Bjornn and Reiser 1991), (2) hatchery-reared smolts will be similar in size to naturally-reared smolts, and (3) emigration has been shown to occur immediately after direct release (Rabe and Nelson 2009). Under the proposed action, smolts are released at a time and size designed to optimize the percentage of smolts migrating out of the system and to minimize interaction with bull trout. With the exception of the sites located near SR habitat (e.g., Rapid River), all smolt releases would occur in FMO habitat for bull trout; therefore, predation on juvenile bull trout by hatchery-released program smolts is unlikely.

Regarding releases from Rapid River, as previously discussed, although the Rapid River Fish Hatchery is located adjacent to a reach of the river that is designated as SR habitat (USFWS 2010b), suitable spawning habitat does not exist in the vicinity of the hatchery or downstream (USFWS 2016a; IDFG 2015c), and primary spawning habitat is 3-4 miles upstream near the confluence with the West Fork Rapid River (USFS 2003, p. K-7). Therefore, it is highly unlikely that Chinook salmon smolts released from the subject hatchery programs in the Upper Snake RU would encounter juvenile bull trout small enough to prey upon. The rapid outmigration of Chinook salmon smolts from the Rapid River Hatchery suggests limited residency in release tributaries, further reducing the likelihood for predation on bull trout juveniles. The median travel time to the Lower Granite Dam for Rapid River Chinook over the last 10 years is 25 days (Fish Passage Center 2017).

Predation could occur if hatchery smolts residualize or stray into tributary habitats during their outmigration. However, the likelihood for these behaviors is relatively low. Steelhead residualism in the upper Salmon River appeared to be about 4 percent in 1992 (IDFG 1993). Predation-related effects on bull trout are expected to be low and associated only with salmon and steelhead releases that occur within or in close proximity to SR habitat for bull trout (Rapid River Hatchery and associated release tributaries, and the East Fork Salmon River Satellite), or reaches that are mapped as rearing habitat (Sawtooth Hatchery reach, South Fork Salmon

Satellite). Therefore, juvenile releases from these facilities are likely to adversely affect bull trout. All other release locations are well downstream of SR habitat and are not likely to adversely affect bull trout should smolts residualize. Further, juveniles released into FMO habitat in the spring would likely encounter only adult bull trout; smaller bull trout would not be expected in large numbers in these systems at this time.

Streamside incubation

Hatchery fish originating from egg boxes can prey upon fish from the local natural population during juvenile rearing. In general, the threat from predation is greatest when natural populations of Chinook salmon and steelhead are at low abundance and when spatial structure is already reduced, when habitat is limited, and when environmental conditions favor high visibility (NMFS 2013). Summer Chinook are placed in streamside incubators in Cabin and Curtis creeks, which are part of the South Fork Salmon River core area. In Cabin and Curtis creeks, summer Chinook salmon that volitionally leave the incubator and exit the egg box will remain in the system for about 1 year before migrating downstream as smolts. Due to the presence of rearing Chinook salmon in bull trout SR habitat in both creeks, there is some potential that they could prey on young-of-the-year bull trout prior to exiting the system as smolts. In their freshwater stage, Chinook salmon primarily feed on plankton, insects, terrestrial drift, and benthic aquatic invertebrates (Utz et al. 2012). Considering this, and the relatively low number of eggs placed into each system (150,000 total in each creek), the likelihood for predation on bull trout by Chinook salmon in Cabin and Curtis creeks is discountable.

Predation on young-of-the-year bull trout juveniles by steelhead is possible in SR habitats used for summer steelhead incubators, including Beaver and Indian creeks. Steelhead may remain in the system for up to 3 years, and could ultimately express a resident life history. The percentage of steelhead residualism in the upper Salmon River appeared to be about 4 percent in 1992 (IDFG 1993). Therefore, the likelihood exists for predation on young rearing bull trout, which could adversely affect individuals. The relatively low number of steelhead incubated in each stream reduces the likelihood for adverse effects on bull trout from predation, but does not eliminate them. Therefore, predation by rearing juveniles hatched in egg boxes is likely to adversely affect individual bull trout juveniles; however, the likelihood that rearing steelhead predation would result in measurable reductions in bull trout populations is discountable. Numerous studies (see SBT and IDFG 2010b; Martin et al. 1993; Cannamela 1992; Shriever 1992 as cited in SBT and IDFG 2010b) have examined the importance of Chinook salmon fry in a steelhead smolt's diet; no studies have been conducted for bull trout. The Service cited several studies (USFWS 1992) where the contents of steelhead stomachs had been examined; few, if any, salmonids were found. They concluded that the limited empirical data suggested that the number of Chinook salmon fry/fingerlings consumed by steelhead is low. Therefore, it can be assumed that predation on bull trout of similar size is also low, but not discountable.

Beneficial Effects

Hatchery smolt releases

Released juvenile hatchery Chinook and steelhead likely provide increased forage for migratory adult and subadult bull trout, which are highly piscivorous. This may be considered a beneficial effect of smolt releases on foraging bull trout, particularly in areas that are documented to support year-round bull trout use (i.e., Yankee Fork, Rapid River, South Fork Salmon River, East Fork Salmon River). The existing practice of releasing smolts below SR habitat (excluding the sites in or near SR habitat discussed above) when they are expected to quickly outmigrate to the ocean reduces the likelihood for ecological interactions with bull trout. At Johnson Creek, although bull trout may prey on hatchery-reared summer Chinook releases, the co-occurrence of these species within Johnson Creek during the spring release period is likely low.

Although an increase in the amount of available forage fish could result in benefits to bull trout, such benefits are likely insignificant at the population level.

Streamside incubation

Under the proposed action, in-stream incubation boxes are used to incubate and rear summer Chinook salmon and steelhead in Cabin Creek, Curtis Creek, Beaver Creek, Indian Creek, and up to five tributaries in the Yankee Fork. Following emergence from the gravel, juveniles volitionally exit the boxes and enter the stream. Such young-of-the-year juveniles would provide benefits to bull trout from increased forage items in the subject streams. Similar to the discussion above, such benefits are likely insignificant on a population level, though individual bull trout may benefit to a greater degree in the immediate vicinity of streamside incubation locations.

2.5.2.1.3 Research, Monitoring, and Evaluation

The only research, monitoring and evaluation activities (RM&E) under the proposed action are those NPT activities directly related to monitoring of hatchery success for the Johnson Creek summer Chinook salmon collection, and those conducted by the SBT in the Yankee Fork Subbasin.

NPT

RM&E actions for the Johnson Creek program include Chinook salmon spawning surveys and seasonal (March to November) operation of a floating rotary screw trap. The trap is placed downstream of the weir, approximately 4 miles upstream from the confluence with the East Fork of the South Fork of the Salmon River. Although trap operation is planned to be continuous, there are times when traps cannot be operated due to low flow or freezing conditions, excessive debris, or mechanical breakdowns.

Bull trout are typically collected at the Johnson Creek screw trap in the summer months, with peaks in August and September (see Section 2.1.3.2.1). Adult bull trout are often observed preying on juvenile Chinook in the traps (NPT 2017). Year-round operation of the screw trap adversely affects bull trout, particularly during summer operations when most bull trout are collected. If captured in the screw trap, bull trout would be subject to passage delays and potential disturbance from holding stress and handling during release. Adult bull trout upstream migrants would be delayed along their spawning route. The live box of the screw trap is checked every morning (several times throughout each night and day during high water, storms, or ice-up events), and non-target fish (e.g., bull trout) are released. The typical size of bull trout collected in the screw traps indicates that young-of-the-year juveniles are unlikely to be collected. The lack of young-of-the-year-sized juvenile captures is consistent with the FMO habitat designation for Johnson Creek.

Occasional maintenance of the screw trap may be required to replace worn parts or modify anchor placement. Such activities would be conducted by personnel working in the creek; no heavy machinery would operate in the creek. Maintenance activities could displace bull trout in the vicinity of the trap and could result in minor downstream sedimentation; however, given that the reach is in FMO habitat, effects on older, mobile life stages would be insignificant.

Under the proposed action, the NPT conducts annual spawning surveys for spring/summer Chinook salmon in Johnson Creek. Surveys would consist of either walking stream margins or floating stream reaches to count and record the spatial distribution of Chinook salmon redds in these areas. Creek surveys are conducted on foot, by raft, or by power boat. Data including length, sex, and scales for age analysis would be collected from spawned-out carcasses. Because the Chinook salmon spawning surveys occur in FMO habitat for bull trout, there is no overlap with bull trout spawning locations. Therefore, redds, incubating eggs, alevins, and juvenile young-of-the-year bull trout are unlikely to be encountered during the surveys. Adult and subadult migrants, however, may occasionally be encountered during these activities and could be adversely affected via disturbance or displacement from surveyors in the creek. The surveys are currently and would continue to be conducted in a manner that would avoid touching, capturing, or intentionally harassing bull trout.

SBT[16]

In addition to broodstock collection and smolt releases (discussed above), the SBT Fish and Wildlife Department conducts extensive RM&E programs in the Yankee Fork Salmon River basin. The lower section of Yankee Fork contains FMO habitat and the upper section and tributaries of Yankee Fork contain SR habitat.

These RM&E activities include juvenile salmonid production monitoring using a rotary screw trap, adult Chinook enumeration using a portable picket weir, adult Chinook and steelhead enumeration using a permanent PIT array, long-term trend monitoring using electrofishing, spawning ground surveys, physical habitat monitoring salmon, and carcass nutrient supplementation.

Rotary screw trap

Juvenile production monitoring in the Yankee Fork is conducted with a rotary screw trap for measuring juvenile salmonid out-migration of fish species in the basin and to estimate habitat-specific juvenile production. A rotary screw trap (RST) is typically operated from March to November (Table 8) with operation stoppages during high flows and smolt releases. The live box of the RST is checked daily and both target and non-target fish are transported in river water to a nearby trailer where salmonid individuals with a fork length greater than 70 mm are anaesthetized with Eugenol, measured for weight and length, and marked with PIT tags. Operation of the rotary screw trap may adversely affect bull trout. Juvenile bull trout are captured in the trap during summer and fall operation, which delays their passage downstream and exposes them to stress and disturbance through handling and tagging. Young-of-the-year are rarely, if ever, captured in the screw trap suggesting that these individuals remain in their tributary habitats until later in life and are uninfluenced by SBT juvenile trapping activities. Individuals greater than 250 mm (i.e., individuals assumed to be adults) were captured in the RST only during 2015 (Table 8). While bull trout mortality has not been reported to date, it remains a possibility in the future.

[16] The following information was provided to the Service through an Addendum to the Assessment. The Addendum is included in this Opinion as Appendix A.

Table 8. Summary of bull trout data collected at the rotary screw trap in Yankee Fork from 2014-2016 (from SBT 2017, BA Addendum)

Capture method	Year	Dates in operation	Size class	No. bull trout captured	Fork length (mm; mean ± 1SD)	No. of individuals recaptured	No. of individuals PIT tagged	No. of known mortalities
Rotary screw trap	2016	31 Mar – 07 Nov	< 250mm	68	212 ± 35	0	63	0
			> 250mm	0	N/A	N/A	N/A	N/A
	2015	25 Mar – 11Nov	< 250mm	21	228 ± 25	0	21	0
			> 250mm	23	365 ± 96	0	23	0
	2014	04 Apr – 04 Nov	< 250mm	33	173 ± 29	0	32	0
			> 250mm	0	N/A	N/A	N/A	0

Adult Chinook enumeration – Pole Flat Weir

The SBT operate a portable picket weir from June to September to monitor returns of natural and hatchery origin adult Chinook salmon to the Yankee Fork (Table 8). The weir is located near Pole Flat Campground, about 3 miles upstream from the confluence of the Yankee Fork and the mainstem Salmon River. The weir is checked at least once daily and all fish captured in the weir trap, including bull trout, are anaesthetized with a low concentration Eugenol solution in a large insulated cooler filled with fresh river water, visually inspected for existing marks and general physical condition, scanned for internal tags, and measured for weight and length. Fish are placed in a live well until they have recovered from handling before being released upstream of the weir. Bull trout tagged at the Pole Flat weir have been recaptured or detected on the Valley Creek PIT array and Redfish Lake trap in autumn and often return to the Yankee Fork in late June to early July. PIT tags detected at or placed in bull trout from 2013 to 2016 resulted in 1092 detections of bull trout throughout the upper Salmon River basin. When fully analyzed, this movement data corroborates earlier radio telemetry data from bull trout and will be useful for future monitoring of the effects of the proposed action on bull trout populations using the Yankee Fork Salmon River. Bull trout captures at the SBT portable picket weir are summarized in Table 9. Operation of the picket weir adversely affects bull trout by delaying passage and exposing individuals to handling and tagging stress. Additional effects of the picket weir are summarized in Table 9.

Table 9. Bull trout captured at adult Chinook weir in the Yankee Fork from 2013-2016.

Year	Dates in operation	No. of individuals captured	Fork length (mm; mean ± 1SD)	No. of individuals recaptured	No. of individuals PIT tagged	No. mortalities[1]
2013	13Jun-24Sep	207	440 ± 99	30	177	2
2014	19Jun – 19Sep	124	471 ± 54	34	90	10
2015	09Jun-20Sep	21	482 ± 74	7	14	3
2016	15Jun-11Sep	105	480 ± 80	20	85	5

[1]Mortalities are not directly associated with tagging efforts. Bull trout mortalities have been found on the upstream side of the weir fence an average of 1 week after being handled at the weir. Some mortalities from 2013-2016 were recaptured fish. Based on SBT observations, these fish are moving back downstream when they try to force themselves through the weir pickets and consequently die. To avoid mortalities by this mechanism, SBT actively monitors the weir face twice daily to allow these fish to pass by lifting the pickets on the fence when they occur.

In addition, SBT proposes to construct a permanent weir as part of the Crystal Springs Hatchery (Chinook hatchery program) between 2018 and 2020. The construction of this weir is included in proposed actions under separate consultation; the effects of construction are not considered here. However, operational effects of this weir and the associated M&E activity do fall under the purview of this proposed action. Operation of the picket weir adversely affects bull trout by delaying passage and exposing individuals to handling and tagging stress. Additional effects of the picket weir are summarized in Table 9.

Adult Chinook and steelhead enumeration – Permanent PIT array

In conjunction with the portable Chinook weir, the SBT collaborates with BioMark to operate a permanent stream-wide PIT array on the lower Yankee Fork. This piece of equipment allows the SBT to monitor real time movements of salmonids into and out of the Yankee Fork. This piece of equipment has shown that bull trout move between Yankee Fork and Redfish Lake/ Valley Creek, arriving in the Yankee Fork at the same time year after year, nearly to the day. PIT array maintenance may affect bull trout by displacing them during instream adjustments of array panels; however, this maintenance is rare, constrained in time, occurs immediately after peak snowmelt in FMO habitat, and is therefore not likely to adversely affect bull trout.

Electrofishing

Electrofishing in the mainstem Yankee Fork and its tributaries occurs during some years as part of long term population trend monitoring and is a research tool used to investigate things such as the effect of carcass outplants on salmonid growth and density, and the spatial distribution of native fishes in the Yankee Fork. Electrofishing consists of single pass survey sampling, two pass mark-recapture technique, and triple-pass depletion techniques, depending on the question being asked. Electrofishing can disturb, injure, or kill bull trout. Typically, adverse effects to bull trout are more frequent due to capture by electrofishing when the SBT samples tributary habitats (Table 10). There is substantial inter-annual variability in number of bull trout handled explained by inter-annual variability in the amount and type of electrofishing effort and the river segments sampled.

Table 10. Summary of bull trout data collected by electrofishing in the mainstem Yankee Fork and tributaries.

Section	Year	No. of individuals captured	Fork length (mm; mean ± 1SD)	No. of individuals PIT tagged	No. of mortalities
Mainstem Yankee Fork	2013	167	125 ± 41	81	1
	2014	-	-	-	-
	2015	9	180 ±28.3	9	0
	2016	5	153 ± 30	5	0
Yankee Fork Tributaries	2013	-	-	-	-
	2014	470	107 ± 48	258	9
	2015	-	-	-	-
	2016	44	95 ± 31	20	0

Spawning Ground Surveys

The SBT conducts annual spawning ground surveys of the mainstem Yankee Fork from the confluence of 12-mile Creek and Yankee Fork to the confluence of Yankee Fork with the mainstem Salmon River, as well as surveys the lower 2 miles of 8-Mile Creek. Spawning ground surveys consist of walking in the stream or stream margins while counting and geo-referencing Chinook redds and carcasses. These surveys are conducted in both SR habitat (i.e., upper Yankee Fork and 8-Mile Creek) and FMO habitat (i.e., lower Yankee Fork). Spawning ground surveys in SR habitat may temporarily disturb bull trout adults and juveniles encountered while walking. Number of bull trout redds encountered are not recorded, but are anecdotally rare and technicians are advised to walk stream margins when redds are encountered. Thus, disturbance-related adverse effects are short-lived and occur at the level of the individual rather than the population.

Physical habitat monitoring

Physical mainstem Yankee Fork habitat monitoring activities are unlikely to influence bull trout populations in this basin but may adversely affect individual bull trout because these activities occur in FMO habitat when bull trout may be present. Habitat monitoring consists of walking in the stream and making observations of habitat system, stream width, and channel gradient. There is no physical disturbance of habitat; however bull trout may be temporarily displaced from their preferred habitats when technicians are in the stream channel taking measurements. The SBT does not know how many bull trout have been displaced by past habitat monitoring activities.

Carcass nutrient supplementation

Chinook carcasses from Sawtooth Hatchery are distributed throughout sections of lower and middle Yankee Fork below 5-Mile Creek. The goal of carcass outplants is to mitigate the effects of low Chinook salmon returns on the food webs in the Yankee Fork. Generally, these carcass outplants occur in FMO habitat and are used as a food source for migrating pre- and post-spawn bull trout. Carcass outplants probably have a positive effect on bull trout by providing additional food resources.

2.5.2.1.4 Water Withdrawals/Diversions

Most hatchery facilities associated with Hells Canyon and Salmon River programs withdraw surface water from adjacent streams to facilitate fish holding, spawning, incubation, and rearing. Such water withdrawals reduce the quantity of water between the diversion point and the point of return, or discharge. To estimate the potential impact of surface water diversions on listed species and their habitat, IDFG compared the maximum flow diversion for each facility to the average monthly flows, using the closest gauge data available for each hatchery location. This data was then used to determine the percentage of streamflow remaining in the diversion reach associated with each facility.

Mid-Columbia Recovery Unit

Water withdrawals for hatchery program operations in the Mid-Columbia RU have the potential to affect individual bull trout. The Oxbow Fish Hatchery withdraws water from the Snake River, which provides FMO habitat for bull trout near the hatchery. The Hells Canyon fish ladder is supplied by surface water from turbines in the dam and is located in FMO habitat. Neither of these facilities is located near SR habitat for bull trout (USFWS 2010b), however, the Snake River near the Oxbow Fish Hatchery reportedly supports bull trout rearing (Streamnet 2016).

Water diversion could affect bull trout with outcomes as benign as a minor migratory delay to outcomes as severe as injury or mortality. Facility water intakes have the potential to affect bull trout by reducing water levels in the river between the facility intake and outfall, resulting in the loss of rearing habitat and/or blockage of passage for both adults and juveniles. Improperly screened diversions may also result in fish being diverted and entrained into the facilities' water system and could impinge bull trout juveniles. However, eggs and larvae are not expected to be impinged or entrained because of the lack of SR habitat.

Oxbow Fish Hatchery

The Oxbow Fish Hatchery is located in eastern Oregon immediately upstream of the confluence of Pine Creek and the Snake River. The hatchery is located in FMO habitat for bull trout (USFWS 2010b). Streamnet (2016) indicates that the reach may also be used for rearing. Relative to the Hells Canyon and Salmon River hatchery programs included under the proposed action, the hatchery is used for holding, spawning, and/or incubation for Hells Canyon spring Chinook salmon and steelhead, and holding and spawning of Little Salmon River summer steelhead.

The hatchery is supplied with pumped surface water from the Snake River at a maximum diversion rate of 15.5 cfs per month (Table 11). This diversion reduces the amount of flow between the pumping location and the outfall of the hatchery over a distance of approximately 180 feet.

Table 11. Maximum monthly surface waterdiversion (cfs) at Oxbow Fish Hatchery relative to average monthly streamflows (cfs) near Oxbow Fish Hatchery (from Assessment Table 8-3).

Month	Maximum Intake Diversion (cfs)	Snake River Flow below Oxbow Dam (cfs)[a]	% of River Diverted
January	15.5	16,400	< 0.5
February	15.5	19,300	< 0.5
March	15.5	22,100	< 0.5
April	15.5	29,600	< 0.5
May	15.5	28,600	< 0.5
June	15.5	25,300	< 0.5
July	15.5	12,200	< 0.5
August	0.0	9,600	--
September	0.0	11,200	--
October	15.5	13,500	< 0.5
November	15.5	14,800	< 0.5
December	15.5	15,600	< 0.5

Based on the information in Table 11, surface water diversions at the Oxbow Fish Hatchery intake comprise much less than 1 percent of Snake River flows, and therefore, are not likely to adversely affect water quantity in the diversion reach. Such diversions would not impact bull trout FMO habitat, usage, or occurrence in this reach of the Snake River, particularly considering the relatively small length of the diversion reach (180 feet). Further, because spawning does not occur in the diversion reach, water reductions associated with hatchery diversions are not anticipated to impact redds. Additionally, eggs and larvae would not be impinged or entrained by the water diversion.

Although the reach of the Snake River adjacent to the Oxbow Fish Hatchery is delineated as FMO habitat (USFWS 2010b), Streamnet (2016) indicates the reach may also be used for rearing. Although juvenile bull trout may be present within the surface water withdrawal area, withdrawal impacts are minimized based on the use of appropriate fish screens, the relatively short length of the diversion reach, and the small percentage of Snake River flows diverted between the intake and outfall. At the Oxbow Fish Hatchery, a tee screen with an air-burst cleaning system was installed on the river pumps in 2013. The screen is designed and built to current NMFS standards to prevent fish entrainment and impingement (IDFG 2015b), and fish impingement has not been documented at the facilities since the screens were installed in 2013.

Snake River water temperatures at this site vary throughout the year from seasonal lows of 1.1°C (34°F) in the winter, to seasonal highs of 22.2°C (72°F) in the late summer. The hatchery does not divert surface water in August and September, when in-stream temperatures are likely highest, and because the volume diverted is extremely small, impacts to adjacent waters is considered unlikely. Therefore, hatchery diversions are highly unlikely to have any measurable impact on in-stream temperatures in the relatively short diversion reach or downstream of the outfall when it re-enters the Snake River. In summary, because water withdrawals are not expected to be notable over background conditions for bull trout potentially present in the area, and because the diversion is screened, water withdrawals at the Oxbow Fish Hatchery are highly unlikely to impact bull trout. Therefore, the likelihood for effects on bull trout is expected to be discountable.

Hells Canyon Trap

As described in Section 2.1.3.1.1, the Hells Canyon Trap and ladder are provided with attraction flow from turbines in the dam. Because the trap is located immediately downstream of the dam, no effects on bull trout would occur from the diversion of turbine water into the fish trap.

Dworshak and Clearwater Hatcheries

Although the Dworshak National and Clearwater fish hatcheries are located in the Mid-Columbia RU, the facilities serve limited utility with regard to Hells Canyon and Salmon River hatchery programs included under the proposed action (see Section 2.1.3.2.1). Based on the very limited existing and proposed future use, water diversions associated with these two facilities are insignificant. Regardless, a brief summary of existing water diversions and effects on FMO habitat for bull trout are summarized below. Activities at these facilities will be addressed in more detail in a separate Opinion being developed for hatchery programs in the Clearwater River Subbasin.

Dworshak National Fish Hatchery diverts surface water for holding and spawning of the Upper Salmon B-Run steelhead program. No incubation or rearing occurs at the site. The main supply for the hatchery is river water pumped from the North Fork of the Clearwater River. The hatchery is also connected to a reservoir supply source from Dworshak Reservoir for incubation and nursery rearing. The reservoir intake screens do not comply with current NMFS screening criteria for juvenile salmonids. Therefore, in the highly unlikely event that rearing juvenile bull trout were present near the surface water pumps, unscreened diversions may result in bull trout being diverted and entrained into the facilities' water system; improperly screened diversions may result in impingement of bull trout juveniles. However, the potential that juveniles would be encountered in the reservoir (near reservoir intake), or along the North Fork Clearwater River intake, is so remote as to be discountable. Bull trout have been collected at the Dworshak National Fish Hatchery volitional ladder in the last 10 years (Robertson 2017, *in litt*) but it is highly unlikely that juveniles would be present and subject to potential impingement.

Clearwater Fish Hatchery receives water through two supply pipelines from Dworshak Reservoir. The warm water intake is attached to a floating platform and can be adjusted from 5 feet to 40 feet below the surface. The cool water intake is stationary at 245 feet below the top of the dam. An estimated 10 cfs is provided by the cool water supply and 70 cfs by the warm water supply. All water is gravity fed to the hatchery.

Current, on-going hatchery review will determine if the intakes are in compliance with current (2011) NMFS screening criteria and whether future upgrades may be required. If intakes are out of compliance with NMFS (2011) juvenile screening criteria, the likelihood of effects on juvenile bull trout is discountable because the intakes are sited in FMO habitat in the reservoir where juvenile bull trout are unlikely to be present. Only one of hundreds of radio tagged bull trout was entrained through the dam from 2000-2003 (Schiff et al. 2005), indicating that entrainment through intakes to the hatchery is unlikely. Reservoir withdrawals may locally impact surface water temperatures in the reservoir; however, ample FMO habitat is available for bull trout in the reservoir and in adjacent tributaries, and the volume of withdrawal is very small relative to reservoir volume.

Upper Snake River Recovery Unit

Water withdrawals for operation of the Hells Canyon and Salmon River hatchery programs included under the proposed action in the Upper Snake River RU may affect bull trout. The Rapid River Fish Hatchery diverts water from the Rapid River. The Upper and Lower Pahsimeroi fish hatcheries divert surface water from FMO habitat in the Pahsimeroi River. The South Fork Salmon Satellite, the Sawtooth Fish Hatchery, and the East Fork Salmon Satellite divert water from FMO habitat in the South Fork Salmon River, Salmon River, and East Fork Salmon River, respectively.

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 may 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 being diverted and entrained into the facilities' water system, and improperly screened diversions may result in impingement of bull trout juveniles.

As presented in Section 2.5.2.1, for the purposes of this assessment, a hatchery-related surface water withdrawal may affect bull trout when diversions remove water from the subject reach. A facility is not likely to adversely affect bull trout if it diverts up to 40 percent of average annual flow, resulting in the retention of 60-99 percent of average annual flow through the diversion reach. A facility is likely to adversely affect bull trout when it diverts more than 40 percent of average annual flow, resulting in the retention of less than 60 percent of average annual flows through the diversion reach.

Rapid River Fish Hatchery

The Rapid River Fish Hatchery diverts a portion of Rapid River flows about 2.5 miles upstream of the confluence of the Rapid River with the Little Salmon River. This reach provides year-round habitat for bull trout (Streamnet 2016). According to IDFG, however, suitable spawning habitat does not exist in the vicinity of the velocity barrier weir, fish ladder, and water supply intake, and the weir is located in habitat that is primarily used for bull trout migration (IPC 2003 as cited in IDFG 2015c). Bull trout do not spawn in the vicinity of the hatchery; they outmigrate as juveniles and post-spawn adults through this reach from the headwaters (USFWS 2016b). As discussed previously, the primary spawning areas for fluvial and resident bull trout in the Rapid River reportedly begin at the confluence of the mainstem and the West Fork Rapid River (USFS 2003, p. K-7), approximately 3-4 miles upstream of the Rapid River Fish Hatchery site.

Surface water at the hatchery is diverted to the facility through one 30-inch pipe and one 24-inch pipe; water is returned to the river about 1,700 feet downstream of the diversion location. The surface water intake at the Rapid River Fish Hatchery is equipped with a NMFS compliant screen to prevent entrainment of fish from the river. Maximum surface water withdrawals range from a low of about 16 cfs in May to a high of about 35 cfs in February and December (Table 12).

Table 12. Maximum monthly surface water diversion (cfs) at Rapid River Fish Hatchery relative to streamflow (cfs) (from Assessment Table 8-6).

Month	Maximum Intake Diversion (cfs)	River Flow (cfs)[a]	% River Diverted
January	33.0	63.7	51.8
February	35.0	74.7	46.9
March	34.0	154.1	22.1
April	34.0	352.3	9.7
May	16.0	419.6[b]	3.8
June	28.0	411.9	6.8
July	34.0	202.4	16.8
August	31.0	111.6	27.8
September	29.0	82.0	35.4
October	29.0	77.9	37.2
November	29.0	--	--
December	35.0	--	--

[a] Idaho Power gauge 13316390 Rapid River above fish hatchery near Riggins, January 1, 2016 through October 23, 2016.
[b] River flows for the month of May are based on limited data from 2016.

As shown in Table 12, during year-round operations, the hatchery diverts from 3.8 to 51.8 percent of the average stream flows over a distance of about 518 meters (1,700 feet). Based on this, and the approach presented in Section 2.5.2.1, hatchery surface water diversion are likely to adversely affect bull trout. The potential for adverse effects is greatest during January and February when the highest proportion of flow diversion occurs. Because no suitable spawning habitat is present in the vicinity of the hatchery, water supply intake, or downstream reaches (IPC 2003 as cited in IDFG 2015c), hatchery surface water diversions are unlikely to impact bull trout redds.

Although spawning habitat is unlikely to be affected by hatchery diversions due to the proximity of the hatchery to primary spawning habitat, rearing juveniles could occur in the diversion reach year-round. Therefore, during periods of extreme low flow, potential off-channel and shoreline rearing habitat may be reduced in the hatchery diversion reach.

Facility operation and associated surface water diversions would overlap with bull trout moving upstream into spawning reaches, and outmigration following spawning in September. Although adult bull trout would be present during water withdrawals, enough flow remains in the channel between the intake and outflow to prevent bull trout stranding. Based on the Montana method (see Section 2.5.2.1), because at least 30 percent of river flow would remain in the river under all maximum monthly diversion scenarios (based on average monthly flows), suitable migratory habitat should persist over the hydrograph through the diversion reach; however, adverse effects from water reductions in January and February could impact the quantity of habitat available along stream margins for rearing juveniles.

Lower Pahsimeroi Fish Hatchery

Surface water is diverted into the Lower Pahsimeroi Fish Hatchery near RM 1. This reach of the Pahsimeroi River provides FMO habitat for bull trout many miles downstream of SR habitat, in headwater tributaries. Water is supplied to the Lower Pahsimeroi Fish Hatchery through a 0.25-mile earthen intake canal, which is equipped with NMFS-approved rotating drum screens designed to prevent fish from being entrained at the hatchery water intake. IPC holds a water right to divert up to 40 cfs of surface water for operations at the hatchery. This right is typically fully utilized from February through September (Table 13). The in-river distance between the intake diversion and the outfall discharge location is about 1,980 feet.

Table 13. Maximum monthly surface water diversion (cfs) at Lower Pahsimeroi Hatchery Relative to streamflows (cfs) (from Assessment Table 8-7).

Month	Maximum Intake Diversion (cfs)	River Flow (cfs)*	% River Diverted
January	0	266	NA
February	40.0	274	14.6
March	40.0	279	14.3
April	40.0	227	17.6
May	40.0	151	26.5
June	40.0	203	19.7
July	40.0	177	22.6
August	40.0	152	26.3
September	40.0	181	22.1
October	0	267	NA
November	0	296	NA
December	0	277	NA

*USGS gauge 13302005 Pahsimeroi River at Ellis, October 1984 through February 2016, immediately downstream of the hatchery outfall.

During the February through September operational period, surface water diversions at the Lower Pahsimeroi Fish Hatchery range from a low of 14.3 percent in March to a high of 26.5 percent in May. Although diversions comprise a relatively large portion of average streamflows from May through September, they are unlikely to impact an individual bull trout's ability to use FMO habitat in the reach. Based on the diversion quantities presented above and the assessment approach presented in Section 2.5.2.1, hatchery surface water diversions at the Lower Pahsimeroi Hatchery would retain 60 to 99 percent of average flows and are therefore not likely to adversely affect bull trout.

Properly functioning temperatures for adult bull trout migration should not exceed 15ºC (59°F; USFWS 1996). Pahsimeroi River water temperatures at this site vary throughout the year from seasonal lows of 0.6°C (33°F) in the winter to seasonal highs of 22.2°C (72°F) in the summer. Daily fluctuations can be as much as 7°C (12°F; IDFG 2016a). Hatchery surface water diversions may influence surface water temperatures in the diversion reach, particularly during the summer low-flow months, when temperatures are already prohibitively high for bull trout passage. Shallower reaches may experience more solar gain, and therefore, higher in-stream temperatures that may be unsuitable for bull trout migration (i.e., greater than 15ºC [59°F]). However, this reach is designated as bull trout FMO habitat (USFWS 2010b) and "naturally" experiences higher in-stream temperatures in the summer, due in part to consumptive water diversions throughout the watershed.

Because bull trout do not spawn in the 1,980-foot diversion reach, hatchery diversions would not impact incubating redds. Further, because the site is well downstream of headwater spawning tributaries, there is a discountable likelihood for hydrologic impacts to off-channel rearing habitat.

The facility is compliant with NMFS (2011) screening criteria. In addition, the intake is sited along an FMO habitat reach, well downstream from SR habitat. Therefore, juvenile bull trout impingement or entrainment is highly unlikely.

Upper Pahsimeroi Fish Hatchery

The Upper Pahsimeroi Fish Hatchery diverts surface water from the Pahsimeroi River about 7 miles upstream of its confluence with the Salmon River. This reach of the Pahsimeroi River provides FMO habitat for bull trout (USFWS 2010b). The hatchery intake is equipped with NMFS-approved rotating drum screens designed to prevent fish, including bull trout, from being entrained. Water withdrawals occur well below SR habitat.

The Upper Pahsimeroi Fish Hatchery operates on a combination of well water and river water. IPC holds a water right to divert 20 cfs of river water at the Upper Pahsimeroi Fish Hatchery, allowing approximately 10 cfs of flow to each rearing pond. The maximum amount of water withdrawn ranges from about 16 cfs in April to about 20 cfs in September (Table 13), though minimum and average diversions are typically much less. The in-river distance from intake to discharge back to the river is about 800 feet.

Table 14. Table Maximum monthly surface water diversion (cfs) at Upper Pahsimeroi Hatchery relative to streamflows (cfs) (from Assessment Table 8-8).

Month	Maximum Intake Diversion (cfs)	River Flow (cfs)*	% River Diverted
January	20.0	266	7.5
February	20.0	274	7.3
March	20.0	279	7.2
April	16.0	227	7.1
May	20.0	151	13.2
June	20.0	203	9.9

Month	Maximum Intake Diversion (cfs)	River Flow (cfs)*	% River Diverted
July	20.0	177	11.3
August	20.0	152	13.2
September	20.0	181	11.0
October	20.0	267	7.5
November	20.0	296	6.8
December	19.7	277	7.1

* USGS gauge 13302005 Pahsimeroi River at Ellis, October 1984 through February 2016, approximately 8 miles downstream of the Upper Pahsimeroi Hatchery.

During year-round operations, maximum surface water diversions at the Upper Pahsimeroi Fish Hatchery range from a low of about 7 percent to a high of about 13.2 percent of average monthly streamflows, as measured about 8 miles downstream of the facility (Table 14). Although maximum surface water diversions at the site include a relatively large proportion of Pahsimeroi River flow (particularly from May through September), the facility is located well below SR habitat. Because bull trout do not spawn in the 800-foot diversion reach, hatchery diversions would not impact redds or incubating eggs. Further, because the site is well downstream of headwater spawning tributaries, hydrologic effects on off-channel rearing habitat are highly unlikely to impact rearing juveniles.

As discussed in the previous section for the Lower Pahsimeroi Fish Hatchery, the Pahsimeroi River experiences high in-stream temperatures in the summer. Hatchery surface water diversions may influence surface water temperatures in the diversion reach, particularly during the summer low-flow months. At these times, diversions reduce flows in the diversion reach and may reduce wetted widths and depths. Shallower reaches may experience more solar gain, and therefore, higher in-stream temperatures that may be unsuitable for bull trout migration (i.e., greater than 15ºC [59°F]). However, this reach is designated as bull trout FMO habitat (USFWS 2010b) and naturally experiences higher in-stream temperatures in the summer, due in part to consumptive water diversions throughout the watershed.

Considering the low number of bull trout captured at the lower weir, few bull trout would be exposed to flow reductions (see Section 2.5.2 1.1). Further, based on the diversion quantities presented above and the water quantity assessment approach presented in Section 2.5.2.1, hatchery surface water diversions at the Upper Pahsimeroi Hatchery would retain 60 to 99 percent of average flows and are therefore not likely to adversely affect bull trout.

The facility is compliant with NMFS (2011) screening criteria (Rosenberger 2017, *in litt*). In addition, the intake is sited along an FMO habitat reach, well downstream from SR habitat. Therefore, juvenile bull trout impingement or entrainment is highly unlikely.

South Fork Salmon River Satellite

The South Fork Salmon River Satellite facility is located 70 miles upstream of the confluence with the Salmon River. In this reach, the South Fork Salmon River provides FMO habitat for bull trout. The satellite facility currently operates from mid-June through mid-September for broodstock collection, holding, and spawning of South Fork Salmon River summer Chinook salmon. The holding ponds receive water directly from the South Fork Salmon River. About 8 cfs to 11 cfs are supplied from a concrete intake structure upstream of the facility (Table 14). The in-river distance between intake and discharge back to the river is about 2,750 feet.

Table 15. Maximum Monthly Surface water Diversion (cfs) at South Fork Salmon Satellite Facility Relative to Streamflows (cfs) (from Assessment Table 8-9).

Month	Maximum Intake Diversion (cfs)	River Flow (cfs)[a]	% River Diverted
January	0	212	NA
February	0	216	NA
March	0	316	NA
April	0	727	NA
May	0	1,770	NA
June	11.1	1,700	0.7
July	10.4	501	2.1
August	10.0	185	5.4
September	8.6	147	5.9
October	0	156	NA
November	0	199	NA
December	0	216	NA

[a]USGS gauge 13310700 South Fork Salmon River near Krassel Ranger Station, October 1966 through October 2016, approximately 48.2km (30 miles) downstream of the hatchery.

During adult holding from June through September, the South Fork Salmon Satellite facility diverts a relatively small portion (0.7 to 5.9 percent) of the average monthly streamflow as measured at a gauge about 30 miles downstream of the facility. This is the closest river gauge to the facility and may not accurately reflect conditions at the site; however, this data provides an approximate comparison to river flows in lieu of reach-specific flow data. Based on this gauge data, it is unlikely that surface water diversions adversely affect in-stream habitat to a level that would affect adult and subadult bull trout using FMO habitat in the diversion reach during operations from June through September. Bull trout use occurs during weir operations, as discussed in Section 2.5.2 1. Because the facility is downstream of SR habitat, water diversions have no effect on bull trout redds or juveniles in the 2,750-foot diversion reach. Based on the diversion quantities presented above and the assessment approach presented in Section 2.5.2.1, hatchery surface water diversions at the South Fork Salmon River Satellite would retain 60 to 99 percent of average flows and are therefore not likely to adversely affect bull trout.

Current, on-going hatchery review will determine if the facility is in compliance with current (2011) NMFS screening criteria and whether future upgrades may be required (see Section 2.5.2 1). If the facility is out of compliance with NMFS (2011) juvenile screening criteria, the likelihood for adverse effects on juvenile bull trout is discountable because the intake is sited along an FMO habitat reach, well downstream from SR habitat. Therefore, juvenile bull trout impingement or entrainment is highly unlikely.

Johnson Creek Weir

The Johnson Creek weir and trap box are flow-through facilities sited in the river channel. No surface water is diverted from Johnson Creek for seasonal (June through September) operation of the adult spring/summer Chinook salmon collection weir and trap. Therefore, operation results in no effect on bull trout from water quantity reductions at the weir site.

Sawtooth Fish Hatchery

The Sawtooth Fish Hatchery diverts surface water from the Salmon River about 400 miles upstream of its confluence with the Snake River. This reach of the Salmon River provides FMO habitat for bull trout, as well as year-round migration and adult and subadult rearing habitat. The maximum amount of water typically withdrawn from the river ranges from about 22 cfs in winter to about 33 cfs in fall (Table 16). Surface water enters an intake structure upstream of the hatchery. The distance between intake and discharge is about 4,850 feet.

Table 16. Maximum Monthly Surface water Diversion (cfs) at Sawtooth Hatchery Relative to Streamflows (cfs) (from Assessment Table 8-10).

Month	Maximum Intake Diversion (cfs)	River Flow (cfs)*	% River Diverted
January	22.3	277	8.1
February	24.5	273	8.9
March	31.2	283	11.0
April	31.2	508	6.1
May	26.7	1,253	2.1
June	32.3	1,753	1.8
July	30.1	868	3.5
August	31.2	376	8.3
September	29.0	317	9.2
October	33.4	339	9.9
November	22.3	333	6.7
December	22.3	295	7.6

* USGS gauge 13296500 Salmon River below Yankee Fork Salmon River, October 1921 through September 2016, approximately 20 miles downstream of the hatchery. USGS gauge 13296000 Yankee Fork Salmon River near Clayton, May 1921 through April 2016, and USGS gauge 13295000 Valley Creek at Stanly, June 1911 through July 2016, were subtracted to approximate the Salmon River discharge near Stanley, ID.

Year-round surface water diversions at the Sawtooth Fish Hatchery comprise a relatively small portion of the average monthly stream flow in the Salmon River, ranging from a low of 1.8 percent in June to a high of 11 percent in March. Considering the relatively high average monthly river flows, diversion impacts are insignificant relative to bull trout use or occurrence in this FMO reach of the Salmon River. Because the facility is located well downstream of spawning habitat, effects on incubating eggs are unlikely. Based on the diversion quantities presented above and the assessment approach presented above, hatchery surface water diversions at the Sawtooth Fish Hatchery would retain 60 to 99 percent of average flows and are therefore not likely to adversely affect bull trout.

Facility operation and associated surface water diversions would overlap with bull trout migration periods as individuals move upstream and downstream to/from spawning reaches. In addition, juveniles may rear in the reach (Streamnet 2016). Although adult, subadult, and possibly juvenile bull trout could be present during year-round operations, sufficient flow remains in the channel between the intake and outflow to prevent stranding. Based upon the Montana method (above), because about 90 percent of river flow would remain in the river under all maximum monthly diversion scenarios, suitable in-stream habitat conditions should persist over the hydrograph through the diversion reach.

Future upgrades to the intake structure may be required if the ongoing LSCRP facility review determines the intake is out of compliance with current NMFS (2011) screening criteria. Modifications to the intake structure would be considered a non-routine maintenance activity requiring a separate, project-specific section 7 consultation.

East Fork Salmon River Satellite

The East Fork Salmon River Satellite facility diverts surface water from the East Fork Salmon River about 18 miles upstream of its confluence with the Salmon River. This reach of the East Fork Salmon River provides FMO habitat for bull trout and is about 3 miles downstream of SR habitat (USFWS 2010b). The facility weir is typically operated from as early as late-March through mid-May to collect East Fork Salmon River steelhead broodstock. Broodstock are routed to holding ponds and spawned at the facility. Approximately 15 cfs are delivered to the holding pond facility during the collection period (Table 17). The river intake screens do not fully comply with current NMFS (2011) screen criteria. The in-river distance between intake and discharge back to river is about 200 feet.

Table 17. Maximum monthly surface water diversion (cfs) at East Fork Salmon Satellite Facility relative to streamflows (cfs) (from Assessment Table 8-11).

Month	Maximum Intake Diversion (cfs)	River Flow (cfs)[a]	% River Diverted
January	0	128.19	NA
February	0	89.45	NA
March	15.0	96.13	15.6
April	15.0	174.28	8.6
May	15.0	423.56	3.5
June	0	711.12	NA
July	0	253.02	NA

Month	Maximum Intake Diversion (cfs)	River Flow (cfs)[a]	% River Diverted
August	0	128.05	NA
September	0	127.37	NA
October	0	142.88	NA
November	0	110.90	NA
December	0	189.02	NA

[a]Idaho Power gauge 13298050 East Fork Salmon River near Clayton, October 2014 through October 23, 2016, approximately 16 miles downstream of the facility.

During the spring operational period, surface water diversions at the East Fork Salmon River Satellite comprise a relatively small portion of the average stream flow, as measured at a gauge about 16 miles downstream of the facility. This is the closest river gauge to the facility and may not accurately reflect conditions at the site; however, this data provides an approximate comparison to river flows in lieu of reach specific flow data. Based on this gauge data, surface water diversions range from a low of 3.5 percent of average monthly flows in May to a high of 15.6 percent in March. Diversion impacts are insignificant relative to bull trout FMO habitat, usage, or occurrence in this reach of the East Fork Salmon River. Because bull trout are not reported to spawn in the diversion reach, hatchery diversions are not anticipated to impact incubating eggs, should eggs still be in the gravel during facility operations. Further, the limited length of the 200-foot diversion reach minimizes the likelihood for measurable effects on bull trout and their habitat.

Facility operation and associated surface water diversions would overlap with bull trout migration periods as individuals move upstream and downstream to/from spawning reaches, just a few miles upstream from the facility (USFWS 2010b). In addition, juveniles may rear in the reach (Streamnet 2016). Although adult, subadult, and possibly juvenile bull trout could be present during facility operations, sufficient flow remains in the channel between the intake and outflow to prevent stranding. Based upon the Montana method, because about 85-95 percent of river flow would remain in the river under all maximum monthly diversion scenarios, suitable in-stream habitat conditions should persist over the hydrograph through the diversion reach. In addition, the use of appropriate fish screens would reduce the likelihood for juvenile impingement at the intake.

Based on the diversion quantities presented above and the assessment approach presented in Section 2.5.2.1, hatchery surface water diversions at the East Fork Salmon River Satellite would retain 60 to 99 percent of average flows and are therefore not likely to adversely affect bull trout.

Future upgrades to the intake structure may be required if the ongoing LSCRP facility review determines that the intake is out of compliance with current NMFS (2011) screening criteria. Modifications to the intake structure would be considered a non-routine maintenance activity requiring a separate, project-specific section 7 consultation.

Streamside Incubation Boxes

Streamside incubators are currently used to support summer Chinook incubation and rearing in Cabin and Curtis creeks, summer steelhead incubation and rearing in Beaver and Indian creeks, and summer steelhead incubation and rearing in various tributaries in Yankee Fork (Ramey, Cearly, Jordan, Swift Gulch, and Greylock, Creeks). In Cabin and Curtis creeks, summer Chinook egg boxes are placed in mid-October and removed in mid-May; summer steelhead egg boxes are placed from May through June and removed in early to mid July in all other streams.

Incubators are gravity-fed in-stream, and do not divert surface water from the active channel. Therefore, operation results in no effect on bull trout from water quantity reductions at the streamside incubation sites.

2.5.2.1.5 Hatchery Effluent

Effluent discharge from the Hells Canyon and Salmon River hatchery programs included under the proposed action may affect individual bull trout in the action area. Although most facilities meet or exceed State and Federal NPDES water quality standards for effluent and fish health protocols, these water quality standards have not been evaluated relative to potential effects on bull trout. Negative effects from effluent may result from increased nutrient loading, the addition of chemicals to the waterways, and the transmission of parasites and pathogens. The effects of effluent may depend on water temperature, the life stage of fish present, the monthly volume of fish production, monthly pounds of feed fed, efficacy of pollution abatement, and the rate of dilution.

The affected water body reach from discharge of hatchery effluent occurs from the point of discharge downstream until thorough mixing occurs in the adjacent stream or river (NMFS 2016). Despite the fact that all facilities, with the exception of Dworshak, operate within the criteria of the hatchery facilities' respective NPDES permit administered by IDEQ, the effluent may affect water quality below the hatchery facility. Bartholomew (2013, as cited in NMFS 2016) showed the effluent discharge effects to be short- lived and extending downstream for less than 200 meters before they became undetectable. For the purposes of this assessment, therefore, it is estimated that impacts from effluent may be measurable within 656 feet (200 m) of hatchery outfalls.

During low-flow summer periods, Kendra (1991) reported that benthic invertebrates (i.e., juvenile salmonid prey items) sensitive to organic waste were often replaced by pollution tolerant forms in the vicinity of hatchery outfalls. The Federal Water Quality Administration (1970) states waste concentrations of hatchery effluents are small and that the impact of hatchery discharges depends on the quantity and quality of the receiving water, as well as waste water treatment methods employed at each facility. In Turkey, effluent from trout farms had significantly deviated ($P>0.05$) from baseline conditions for dissolved oxygen (DO), biological oxygen demand, nitrogen ,and total phosphorus concentrations of the subject stream as measured 100 m downstream of the effluent outfall. However, changes in pH, total suspended solids (TSS) and ammoniacal nitrogen (NH_3-N) concentrations were insignificant (Pulatsu et al. 2004). Despite the changes in water quality parameters, none of the changes resulted in exceedances of water quality. Similar results were reported from studies of a river in Iran (Mahboobi Soofiani et al. 2012). At distances 50 to 100 m downstream from the outfalls of three trout farms, monitoring results showed a significant increase in biochemical oxygen demand and total suspended solids and a decline in dissolved oxygen concentration and pH in the outflow. However, concentrations of measured variables at each downstream monitoring site were generally within acceptable water quality limits.

Despite the likelihood for localized water quality degradation from hatchery effluent, measurable effects on bull trout are unlikely. In their Biological Opinion for continued operation and maintenance of the Northeast Oregon and Southwest Washington hatchery programs, funded by the LSRCP and BPA (USFWS 2016b), the Service determined that "effluent from facilities regulated by the NPDES permits will not be noticeable or measurable over background conditions or result in effects on bull trout." Based on the similarities of actions and permit terms and conditions described in NEOR/SEWA Biological Opinion (USFWS 2016b), effluent impacts from these facilities similarly are expected to result in insignificant effects on bull trout.

Mid-Columbia Recovery Unit

Oxbow Fish Hatchery

The Oxbow Fish Hatchery is sited adjacent to a reach of the Snake River that provides FMO habitat for bull trout. Bull trout do not spawn in this reach, but StreamNet (2016) indicates that bull trout may rear in the reach. Because the hatchery produces less than 20,000 pounds of fish per year and distributes less than 5,000 pounds of feed at any one time, no NPDES upland finfish rearing discharge permit is required. However, adherence to established protocols will ensure effluent is monitored to minimize the likelihood for negative water quality impacts. Established disease management policies and protocols including the IHOT (1995) policies, PNFHPC (2007) fish health model program, and State, Federal, and Tribal policies are expected to reduce the likelihood for water quality effects on bull trout habitat.

During operations, the return flow from the Oxbow Fish Hatchery represents much less than 1 percent of the average stream flow of the Snake River near the hatchery. It is therefore highly unlikely that water quality is measurably affected downstream of the outfall. Further, because the facility discharges into the mainstem Snake River, dilution rates would mitigate potential negative effects on water quality a relatively short distance from the outfall. Regardless, during operations, effluent releases may result in insignificant increases in chemical and organic loading into the river immediately below the outfall and for a distance of about 656 feet downstream. Effects on bull trout are expected to be insignificant.

Dworshak and Clearwater Hatcheries

Although the Dworshak National and Clearwater fish hatcheries are located in in the Mid-Columbia RU, the facilities serve limited utility with regard to fish rearing for hatchery programs included under the proposed action, as described in Section 2.1.3.2.2. Based on existing and proposed future use, effluent discharges associated with the Hells Canyon and Salmon River hatchery programs are exceedingly minor. Regardless, a brief summary of existing water diversions and effects on FMO habitat for bull trout are summarized below. Effects of effluent from these hatcheries will be included in a separate Opinion being developed for hatchery programs in the Clearwater River Subbasin.

The return flow from the Dworshak National Fish Hatchery enters the North Fork Clearwater River near the confluence with the mainstem Clearwater River. These water bodies provide FMO habitat for bull trout; no spawning or rearing occurs in these reaches. Discharge from the Dworshak National Fish Hatchery is permitted by the EPA under a NPDES permit, but does not fully meet the requirements of the permit (IDFG 2011). Untreated water from the nursery building and Burrows ponds, and cleaning water from the Burrows ponds is discharged directly into the Clearwater River. Direct discharge of unsettled effluent may result in water quality impairment and, therefore, reduce the quality of FMO habitat near the Dworshak National Fish Hatchery outfall in the Clearwater River. Despite the potential for habitat impairment from effluent discharge, because the Dworshak National Fish Hatchery provides such limited utility for the Hells Canyon and Salmon River hatchery programs included under the proposed action, effects on habitat attributed to effluent from the proposed action are insignificant. Only a limited amount of effluent is attributed to the Hells Canyon and Salmon River hatchery programs.

Similar to the Dworshak National Fish Hatchery, the return flow from the Clearwater Hatchery enters the North Fork Clearwater River near the confluence with the mainstem Clearwater River. In the vicinity of the Clearwater Fish Hatchery, water bodies provide FMO habitat for bull trout; no spawning or rearing takes place in these reaches. Although effluent discharge from the facility results in localized increases in nutrient loadings in the immediate vicinity of the outfall, considering average monthly flows near the hatchery (mean annual outflow at Dworshak Dam is 5,727 cfs), measurable impacts on bull trout FMO habitat are unlikely.

Upper Snake Recovery Unit

Rapid River Fish Hatchery

All effluent discharged from the hatchery to the Rapid River or Shingle Creek (a small tributary to the Rapid River just downstream of the hatchery) complies with NPDES standards (IDFG 2015b). The return flow from the hatchery comprises between 3.8 and 51.8 percent of the average monthly flow in the Rapid River. Facility operations overlap with the bull trout spawning and post-spawning migration period, as well as year-round rearing use of the reach near the hatchery. Discharged effluent may locally increase chemical and organic loading below the outfall. As reported by Kendra (1991), because benthic macroinvertebrates that are sensitive to organic wastes may be replaced by more tolerant species downstream of hatchery outfalls, released effluent may affect benthic prey items; however, juvenile bull trout are highly unlikely to rear in the reach near hatchery facilities because the nearest spawning habitat is 3-4 miles upstream. However, Bartholomew (2013, as cited in NMFS 2016) reported that effluent discharge effects on water quality are short- lived and extend downstream for less than 656 feet before effluent pollutants become undetectable. Therefore, given the relatively small distance of potential impairment, effects on bull trout prey items are likely insignificant.

The Rapid River Fish Hatchery is located along a reach of the river that reportedly provides SR habitat for bull trout (USFWS 2010b) and supports year-round bull trout use (Streamnet 2016). According to IDFG, however, suitable spawning habitat does not exist in the vicinity of the hatchery site (IPC 2003 as cited in IDFG 2015c). Further, as discussed in Section 2.4.3.1.3, the primary spawning areas for fluvial and resident bull trout in the Rapid River begin at the confluence of the mainstem and the West Fork Rapid River (USFS 2003, p. K-7), approximately 3-4 miles upstream of the Rapid River Fish Hatchery site. Based on these conditions, bull trout use of the reach downstream of the hatchery is most likely restricted to mobile migrants; rearing juveniles are highly unlikely to occur near the hatchery facilities. Considering this, and because the hatchery complies with NPDES discharge thresholds, the anticipated increase in chemical and organic loading below the outfall would be insignificant. Therefore, effects on bull trout from the Rapid River Fish Hatchery effluent discharge would similarly be insignificant.

Pahsimeroi Fish Hatcheries (upper and lower)

The Upper and Lower Pahsimeroi fish hatcheries currently operate under a joint NPDES permit (Permit # IDG130039). The hatcheries operate as Class 4 facilities, producing more than 20,000 pounds, but less than 100,000 pounds, of fish annually. The permit specifies waste discharge standards for net total suspended solids and net total phosphorus, and an additional standard for net settleable solids that applies only during harvest events.

The return flow from the lower hatchery ranges from a low of 14.3 percent in March to a high of 26.5 percent in May. The return flow from the upper hatchery ranges from about 7 to 13.2 percent of average monthly flows measured just downstream of the lower hatchery. At the higher range, such return flows comprise a relatively large portion of average monthly streamflows, particularly from May through September. However, because each facility complies with NPDES discharge requirements, effluent from both facilities is unlikely to impact an individual bull trout's ability to use FMO habitat in the lower reach of the Pahsimeroi River. Although it is unlikely that effluent releases would adversely impact water quality downstream of each facility, effluent releases would result in a minor increase in chemical and organic loading into the river immediately below the facilities' outfalls. However, no adverse effects on bull trout use of FMO habitat are expected; impacts are anticipated to be insignificant and effluent releases are not likely to adversely affect bull trout.

South Fork Salmon Satellite

The South Fork Salmon Satellite is used to hold and spawn adult Chinook salmon for 3 months (June-August) annually; no fish rearing occurs at this site. Because of this, an NPDES upland finfish rearing discharge permit is not required. During adult holding from June through August, the return flow from the South Fork Salmon Satellite facility comprises a relatively small portion (0.7 to 5.9 percent) of the average stream flow as measured about 30 miles downstream of the facility. Holding water is returned to the river in FMO habitat for bull trout, well below SR habitat. Limited, localized increases in nutrients in effluent from adult holding facilities during the 3-month operation would quickly dissipate due to the level of water flow in the discharge area. Because adult Chinook salmon do not eat during their upstream migrations and are not fed during holding, effluent production is limited. Therefore, although temporary water quality degradation might occur at the outfall, water-quality related effects on bull trout are anticipated to be insignificant.

Sawtooth Fish Hatchery

The return flow from the Sawtooth Fish Hatchery represents a relatively small portion of the average monthly stream flow in the Salmon River, ranging from a low of 1.8 percent in June to a high of 11 percent in March (Table 16). In addition, the hatchery operates year-round under an NPDES permit for upland finfish rearing, and is in compliance with discharge thresholds. Because of these factors, it is unlikely that water quality downstream of the facility outfall is measurably affected from effluent discharge. Further, because the facility discharges into the mainstem Salmon River, dilution rates at the outfall mitigate potential negative effects on water quality (e.g., increase in chemical and nutrient loading) a relatively short distance from the outfall. Therefore, effects on bull trout from hatchery effluent releases are expected to be insignificant.

East Fork Salmon River Satellite

The East Fork Salmon Satellite operates for 3 months (March-May) to acclimate and release steelhead smolts, hold and spawn returning adults, and provide early incubation for eggs. Limited rearing occurs at this facility, and an NPDES upland finfish rearing permit is not required. During the March through May operational period, return flow from the East Fork Salmon River Satellite to FMO habitat represents a relatively small portion of the average stream flow, ranging from a low of 3.5 percent in May to a high of 15.6 percent in March. It is therefore unlikely that water quality is measurably affected, with the exception of habitat immediately downstream of the outfall. In this area, effluent releases may result in a minor, though insignificant, increase in chemical and organic loading. However, no measurable effects on bull trout are expected.

Streamside Incubation Boxes

Incubating eggs within streamside incubators do not produce effluent and therefore result in no effect on bull trout from water quality reductions due to effluent discharge.

2.5.2.1.6 Fish Disease Management

Mid-Columbia and Upper Snake River Recovery Units

Little evidence suggests that diseases are routinely transmitted from hatchery to natural fish (NMFS 2016). Although high-density or poorly-managed hatchery programs can increase disease and pathogen transfer risks downstream of hatchery facility effluent discharge, compliance with applicable protocols for fish health can effectively minimize this risk to insignificant levels. Elevated levels of disease and pathogen are typically concentrated near the hatchery effluent outfall and then are diluted by water as it discharges downstream (NMFS 2016). The higher concentration of disease and pathogens associated with hatcheries is typically localized and short-lived (Bartholomew 2013, as cited in NMFS 2016).

To address the likelihood of disease transmission, IDFG monitors the health status of hatchery-produced Chinook salmon and steelhead from the time they are ponded at rearing facilities, until their release as full-term smolts. Policies established by the Pacific Northwest Fish Health Committee (PNFHC) were designed to prevent the spread of pathogens resulting from infected hatchery fish. All fish are examined annually by IDFG and Service fish health specialists and certified for release as required under the PNFHPC (2007) guidelines to mitigate for effects on bull trout and other fish in the receiving waters. Adherence to these fish health policies limits the disease risks associated with hatchery programs (IHOT 1995; NWIFC and WDFW 2006). Specifically, the policies govern the transfer of fish, eggs, carcasses, and water to prevent the spread of exotic and endemic reportable pathogens. For all pathogens, spread and amplification are minimized through regular monitoring (typically monthly), removal of mortalities, and disinfection of all eggs. Vaccines, if necessary, can provide additional protection from certain pathogens (NMFS 2016). At all spawning facilities, necropsies are performed on pre-spawn mortalities as dictated by IDFG's Eagle Fish Health Laboratory, which establishes fish health monitoring, disease treatment, and sanitation procedures. If a pathogen is determined to be the cause of fish mortality, treatments (e.g., antibiotics) are used to limit further pathogen transmission and amplification.

Under the proposed action, the IDFG-operated Chinook salmon and steelhead programs would continue to follow hatchery (IHOT 1995) guidelines and regional fish health standards to minimize potential risks to bull trout and other listed species. Fish health staff would continue to monitor hatchery fish for signs of disease throughout their rearing cycle. Diagnostic visits are on demand and are completed rapidly to ensure timely treatments and limited mortality and morbidity. Mortalities would be checked daily and live grab samples would be taken every other month. Fish would also continue to be tested, at a statistically valid number, prior to transfer to acclimation sites and before release. Sampling, testing, and treatment/control procedures are outlined in multiple documents (PNFHPC 2007; IHOT 1995; NWIFC and WDFW 2006). All IDFG hatchery personnel follow protocols in the Biosecurity Plan and Hazardous and Critical Control Point Plan to minimize the likelihood of disease transmission or invasive species introductions (IDFG 2015b). Protocols are also in place to guide the disinfection of equipment and gear to minimize risks associated with the transfer of disease agents.

In summary, although bull trout have the potential to occur in the rivers near existing hatchery facilities and release sites, several factors would reduce the likelihood of disease and pathogen transmission between hatchery fish and bull trout. The proportion of facility surface water withdrawal and subsequent discharge at most sites would comprise only a portion of the total stream flow (see Sections 2.5.2.1.4 and 2.5.2.1.5), which would reduce, via dilution, the likelihood for transmission of pathogens from effluent. Smolt release strategies promote distribution of hatchery fish throughout the system and rapid outmigration, which would reduce the concentration of hatchery-released fish, and therefore, the likelihood for a diseased hatchery fish to encounter bull trout. Lastly, fish health protocols currently in place to address pathogens are expected to minimize the likelihood for disease and pathogen effects on bull trout. For these reasons, effects on bull trout from hatchery disease management are expected to be insignificant.

Streamside Incubation Facilities

Streamside incubators are currently used to support summer Chinook incubation and rearing in Cabin and Curtis creeks, summer steelhead incubation and rearing in Beaver and Indian creeks, and summer steelhead incubation and rearing in several tributaries to the Yankee Fork (Ramey, Cearly, Jordan, Swift Gulch, and Greylock creeks). In Cabin and Curtis creeks, summer Chinook egg boxes are placed in mid-October and removed in mid-May; summer steelhead egg boxes are placed from May through June and removed in early- to mid-July in all other streams. Each box contains a various quantity of eggs, typically ranging from 25,000 to 50,000 eggs. After fertilization, eggs are rinsed with pathogen-free well water, disinfected with a 100 parts per million (ppm) buffered iodophor solution for a half hour before being placed in incubation trays. Eggs are incubated to the eyed-stage of development and then transferred to streamside incubation streams from various hatcheries.

The transfer of fish health pathogens from disinfected eggs placed in streamside incubators may affect bull trout in SR habitat. However, factors of dilution, low water temperature, and low population density of listed anadromous species in the production area reduce the likelihood of disease transmission. In a review of the literature, Steward and Bjornn (1990) stated there was little evidence to suggest that horizontal transmission of disease from hatchery smolts to naturally produced fish is widespread in the production area or free-flowing migration corridor. The SBT and IDFG (2010b) have no evidence that horizontal transmission of disease from the hatchery steelhead release in the upper Salmon River has an adverse effect on listed species. Regardless, young-of-the-year juvenile bull trout may be exposed to potential disease if they are rearing in close proximity to egg boxes placed in SR habitat (Cabin Creek, Curtis Creek, Beaver

Creek, Indian Creek, Jordan Creek, and near proximity to SR habitat in Yankee Fork for Greylock and Swift Gulch creeks).

To minimize the likelihood for disease transfer, pre-spawned hatchery adults may be injected with antibiotic medication at trapping to reduce infection levels, limit associated pre-spawning mortality, limit horizontal transmission, and reduce the chance of vertical transmission to progeny. Eggs are disinfected, and eggs are culled prior to placement in boxes based on program-specific disease monitoring. Sampling protocols follow those established by the PNFHPC and AFS Fish Health Section. Given these measures, and the relatively low volume of eggs placed into streamside incubators at each location, the likelihood for disease transfer to wild bull trout is considered discountable.

2.5.2.1.7 Facility Maintenance

Facility operations and maintenance include adult holding, spawning, incubation, rearing, and routine maintenance activities that occur above the OHWM at the facilities. Sediment generated by these activities would be contained within the facility through the adherence to the impact minimization measures as described in section 2.1.3.4. Even with implementation of these measures, if maintenance activities occur along the riverbank, the likelihood for the introduction of sediments into adjacent water bodies is possible. Such sedimentation would have insignificant effects to water quality.

In-water facility operation and maintenance activities include routine maintenance actions that occur below the OHWM and typically occur on an annual basis. Semi-routine activities are also part of the proposed action and include infrequent (e.g., every 5-10 years) activities (e.g., minor weir repairs) that occur only when needed to maintain hatchery operations. Emergency actions, or non-routine major new in-river hatchery structures, such as new hatchery outfall structures or weirs, are not considered in this Opinion. These activities would require a separate section 7 consultation with the Service.

Both routine and semi-routine maintenance actions that necessitate work in the active channel could impact bull trout if present in the vicinity of work sites. Examples of routine in-water maintenance activities include in-stream work such as clearing gravel or debris (e.g., wood) blockages from water intakes, outfalls, or traps after high flow events, and minor weir or ladder maintenance. Examples of semi-routine maintenance activities include minor intake or fish ladder repair and minor bank armoring repairs using materials similar to the original fill that do not require dewatering. All facilities are expected to have some level of routine or semi-routine in-water maintenance.

In-water maintenance activities, particularly those that involve the use of heavy equipment in the active channel, are likely to cause short-term adverse effects on water quality from increased suspended sediment and turbidity. The extent of downstream water quality degradation from turbidity is largely dependent upon flows and velocities at the time of work and substrate composition. In most cases, turbidity plumes will extend no more than 1,000 feet from in-water work area. As an example, during in-stream dredging with a clamshell bucket “in the wet” to remove material from the river in front of the Sawtooth Hatchery intake, increased turbidity was not detectable 450 feet downstream of the work site (USFWS 2015e). For the river systems described herein, similar gravel/cobble substrates with low embeddedness are predominant. For this reason, similar downstream turbidity plumes are anticipated. For this Opinion, a conservative downstream turbidity exposure metric of 1,000 feet was considered in the analysis of effects to bull trout and its critical habitat.

During in-stream work, bull trout may modify their behavior or migratory patterns if they experience elevated turbidity, displacement from habitats, or general disturbance from the presence of construction personnel or equipment (Whitman et al. 1982; Sigler et al. 1984; Berg and Northcote 1985; Gregory and Levings 1998). In potential rearing habitats (i.e., Rapid River, Sawtooth Hatchery reach, East Fork Salmon River Satellite reach), increased suspended sediment could reduce growth and foraging efficiency for juveniles. In-water work could also modify substrates, elevate underwater noise and vibration levels, and displace or kill forage species in the in-water work area. In the case of an accidental spill, bull trout could be impacted from chemical contamination. Effects on redds from increased sedimentation and resulting embeddedness are not anticipated because, with the exception of the Rapid River Fish Hatchery (discussed below), all facilities are located away from spawning habitat.

All in-water maintenance actions would follow standard impact minimization measures (see Section 2.1.3.4) to minimize effects on aquatic resources, including bull trout. The following section presents the anticipated effects on bull trout from the implementation of in-water routine and semi-routine maintenance activities in the Upper Snake RU. The future (ongoing) implementation of these activities is reasonably foreseeable and considered part of the proposed action.

Mid-Columbia Recovery Unit

Facility operation and maintenance activities include routine maintenance actions that occur below the OHWM that typically occur on an annual basis. Semi-routine maintenance activities are not yearly occurrences, but may occur with frequency over a period of 5 to 10 years. Both routine and semi-routine maintenance actions that necessitate work in the active channel could impact bull trout if present in the vicinity of work sites. In general, in-water work and the presence of workers or equipment in the stream would temporarily displace bull trout from in-stream work areas. All in-water maintenance actions would follow standard impact minimization measures (e.g., timing restrictions, see Section 2.1.3.4) to minimize effects on bull trout and their habitat, including effects on water quality from chemical contamination. Heavy equipment use within or adjacent to water bodies occupied by bull trout could result in the accidental spill of fuel, lubricants, hydraulic fluid, or similar contaminants into the riparian zone, or directly into the water where it could adversely affect habitat, injure or kill aquatic food organisms, and/or poison bull trout (USFWS 2014b).

Given the impact minimization measures presented in Section 2.1.3.4, the low likelihood of an accidental fluids release occurring, and the fact that most bull trout will be hazed out of the area prior to any in-water work, potential effects on bull trout from chemical contamination are considered insignificant.

This section presents the anticipated effects on bull trout from the implementation of inwater routine and semi-routine maintenance activities in the Mid-Columbia RU. The future (ongoing) implementation of these activities is reasonably foreseeable and considered part of the proposed action.

Oxbow Fish Hatchery

In-water maintenance may include repairs to various wooden, steel, and concrete structures that are part of water source intakes, discharges, or other systems that may become compromised from long-term exposure to weather conditions or from unique storm events. If minor repairs require work within the active channel (e.g., an excavator enters the channel below OHWM), such work would be conducted in a matter of hours during the typical summer work window. In-stream work within the active channel has the potential to displace bull trout if present in the immediate vicinity of the activity. However, because the Oxbow Fish Hatchery is located along FMO habitat, mobile adults and subadults that may be present during in-water work conducted during summer low flow windows should be able to avoid machinery in the wetted channel. During summer low-flow windows when in-water work would occur, juvenile bull trout are highly unlikely to be present in affected reaches. In the unlikely event that juveniles are present, inwater work would displace them from their habitat and could result in lethal impacts if juveniles do not disperse from the disturbed areas.

If repairs to in-water structures require the short-term (i.e., a matter of hours) use of in-stream machinery, such use could disturb bull trout or startle them from FMO habitat. All in-water maintenance activities would be conducted during the agency-approved in-water work window (Service-, NMFS-, and IDFG-approved), which generally corresponds to periods of low in-stream flows and higher temperatures. Such conditions likely limit the use of affected reaches by bull trout of all life stages, and reduce, but not eliminate, the likelihood of adverse effects through disturbance and displacement for maintenance activities below the OHWM.

Hells Canyon Fish Trap

Routine maintenance activities including minor debris removal and sediment flushing from the trap are highly unlikely to affect bull trout due both to ambient high flows near the trap that dissipate sediment quickly, and the relatively low use of the reach by bull trout.

As described in Section 2.1.3.1.2, high flow events result in the need to remove debris from the trap, on average, once every 5 years. This is considered a semi-routine maintenance operation. During debris removal efforts, effects on bull trout could include disturbance and displacement of individual fish as a result of personnel or heavy equipment working near the river channel. Suitable spawning habitat does not exist in the vicinity of the Hells Canyon Trap, therefore, embryonic life stages would not be affected by these actions. During these activities, no machinery is placed in or near the river channel, thus eliminating any risk of fuel or oil contamination. Due to the large size of the substrate removed from the trap and the high water velocity in the area, the likelihood of transporting fine sediments downstream is low. Although woody debris and rock removed from the trap may be loaded onto trucks for offsite disposal, it may be returned to the mainstem Snake River channel for natural redistribution downstream (in FMO habitat only). Downstream deposition would result in additional disturbance and temporary displacement of bull trout from the affected reach of the mainstem Snake River.

Dworshak and Clearwater Hatcheries

Due to the limited use of the Dworshak National Fish and Clearwater Fish hatcheries to rear fish from Hells Canyon and Salmon River programs, routine and semi-routine in-water operation and maintenance activities directly related to the Salmon River programs under the proposed action are difficult to parse out from overall hatchery activities. Such maintenance activities will be presented and consulted on in a pending Opinion for operation of Clearwater River hatcheries.

Upper Snake Recovery Unit

Rapid River Fish Hatchery and Weir

Routine maintenance includes several in-stream activities that are typically conducted on an annual basis, or at a predicted frequency required to maintain the proper function of hatchery infrastructure. Such routine maintenance activities typically include in-stream excavations to remove sediment from intake sources and the fish weir/ladder. Although material can typically be removed using equipment positioned along the bank outside of the wetted channel, in some cases it may be necessary to operate an excavator in the channel to remove materials. Such work would occur during the established in-water work window for the reach, in coordination with the Service. The operation of in-stream equipment would adhere to the impact minimization measures for such activities, as described in Section 2.1.3.4. All excavated material would be removed from the river, loaded into a truck, and hauled off site for upland disposal.

As discussed previously, the primary spawning areas for fluvial and resident bull trout in the Rapid River begin at the confluence of the mainstem and the West Fork Rapid River (USFS 2003, p. K-7), approximately 3-4 RM upstream of the Rapid River Fish Hatchery. Because of this, no effects on bull trout redds are anticipated from implementation of maintenance activities that require in-water work.

Because resident and fluvial adult and subadult bull trout may be present year-round, direct effects on individuals are possible during implementation of any in-water maintenance activities. Effects could include disturbance and displacement of adults and subadults as a result of personnel or heavy equipment working in or near the river channel, and activities are therefore likely to adversely affect bull trout. Sedimentation resulting from flushing of the fish trap or substrate/streambank disturbance could disturb or displace individuals from the immediate in-water work area as well as downstream habitat affected by sediment plumes. Such plumes would persist for a short distance downstream. Displacement of bull trout from preferred habitats could temporarily disrupt migratory or foraging behavior.

Semi-routine maintenance activities are likely to adversely affect bull trout. Such activities may include minor repairs to existing bank armoring to replace displaced rocks, or minor repairs to infrastructure, including placement of fill. These activities would require in-stream work and would disturb individual bull trout. However, no facilities potentially subject to semi-routine maintenance are located in habitats that are used by spawning or rearing bull trout.

Semi-routine maintenance activities may occur along the bank and require in-water work or the brief (a few hours over 1 day) operation of in-stream equipment. If present, the presence of personnel and/or the potential operation of in-stream equipment (e.g., an excavator over several hours) could displace bull trout from occupied habitat, including a reach of the river downstream of activities for about 450 feet from sedimentation. If juveniles are present and do not actively avoid moving in-stream equipment, they could be crushed by tracks or tires. However, conducting such work during the typical, low-flow summer work window would avoid most adults and subadults, and in-stream summer temperatures would likely preclude use by rearing juveniles. Further, because the reach adjacent to the hatchery is not known to support spawning bull trout, the likelihood that rearing juveniles occur near hatchery facilities is low given the distance (3-4 miles) to upstream spawning areas near the confluence with the West Fork.

Fuel or oil leaking from machinery operated near- or in-stream could be toxic to fish in the immediate area. All machinery entering the river channel would, therefore, be equipped with a containment basin to capture any fluid leaks before they reach the river. Further, as described in Section 2.1.3.4, all equipment operating in-stream would be retrofitted with vegetable-based fuel oil. This would prevent the entry of petroleum-based pollutants should an oil leak occur, thus limiting the likelihood for adverse effects on bull trout and their habitat.

Lower Pahsimeroi Fish Hatchery Weir

Hatchery operators annually (or more frequently, as needed) remove accumulated materials from the Lower Pahsimeroi Fish Hatchery Weir, intake, and intake canals following periods of high flow. Materials are removed using a variety of techniques ranging from a clamshell-style excavation bucket mounted to a crane, to a tracked or rubber-tired excavator operating from the bank. At times, it may be necessary to operate an excavator in the active channel.

Such in-water maintenance activities may affect bull trout that may be present in the reach of the Pahsimeroi River near the weir. Because the weir and fish ladder are located within FMO habitat that primarily functions as a bull trout migration corridor, there would be no effects on rearing juveniles or incubating eggs. Direct effects on individual adult or subadult bull trout are possible, although the limited number of bull trout collected at the weir indicates few individuals are likely to be exposed to in-water work stressors. Still, if present, potential adverse effects on adult or subadult bull trout could include disturbance and displacement of fish as a result of personnel or heavy equipment working near the river channel. Further, sediment removal activities could result in a turbidity plume that extends downstream from the activity. Associated sedimentation would likely extend a distance of about 450 feet downstream (USFWS 2014b), which could delay bull trout passage. Such delay is likely to adversely affect individual bull trout, but not measurably affect bull trout on a population level.

Minor repairs to the adult weir are periodically necessary every few years to ensure continued operation and integrity. If such minor repairs cannot be conducted by personnel using hand tools, or via equipment operated from the bank, the use of in-stream heavy machinery over a period of a few hours in one day may be required. The presence of humans and the potential operation of in-stream equipment would displace adults and subadults in the immediate work area. Mobile life stages such as these should be able to avoid lethal impacts from such activities, and downstream sedimentation from a tracked excavator would be minimal. The Pahsimeroi River provides FMO habitat in this reach and the likelihood for juvenile occurrence, and thus impacts to them, is so remote as to be discountable. If coffer damming and in-stream isolation is required to conduct repairs, or if multiple days are required for in-stream operation of heavy equipment, such activities would be considered non-routine and require separate section 7 consultation.

Because the Pahsimeroi River is used as a migratory corridor by adult and subadult bull trout, no impacts to spawning adults, eggs, alevins, or rearing bull trout would occur.

Upper Pahsimeroi Fish Hatchery

Hatchery operators annually remove accumulated materials from the Upper Pahsimeroi Fish Hatchery intake and canal following periods of high flow resulting in sediment deposition. This debris removal effort typically occurs in the last week of April or first week of May. Removal of accumulated sediment or woody debris from the canal is typically accomplished using a bulldozer to move material to an excavator positioned on the canal bank. Prior to in-stream sediment removal from the area in front of the intake, a diver installs a silt fence around the in-water work area and anchors the fence with gravel-filled bags. The silt fence prevents large pulses of sediment from moving downstream. The presence of an excavator bucket, diver, and silt fence would temporarily disturb bull trout that may be present near the intake structure. Because the activity is accomplished in 1-2 days in a reach of the river designated as FMO habitat that has relatively low bull trout occurrence, is it unlikely that bull trout populations in the Pahsimeroi core area would be impacted to a measurable degree during intake debris removal.

Sediment removal from the intake canal can typically be completed when the hatchery is nonoperational. At these times, the slide gates on the intake canals can be closed to isolate the facility from the Pahsimeroi River. This minimizes the likelihood for disturbance of migratory adult or subadult bull trout in the river. During the canal dewatering process, hatchery personnel typically electrofish the canal to capture and safely release all fish to the Pahsimeroi River. It is highly unlikely that bull trout would occur in the canals and the likelihood for handling stress during these efforts is discountable.

If occasional high pressure cleaning of the fish bypass lines is necessary, the activity may release some sediment and woody debris into the river channel. During previous cleaning efforts, the volume of material flushed from the pipe was typically less than 0.25 cubic yard of material. Based on this, and the low occurrence of bull trout in the river channel, the likelihood that this activity would negatively affect adult or subadult migratory bull trout is discountable.

Effects on bull trout from implementation of semi-routine maintenance activities at the Upper Pahsimeroi Hatchery would be similar to those presented above for the Lower Pahsimeroi Hatchery.

South Fork Salmon Satellite and Weir

The South Fork Salmon Satellite facility and weir operate from June through mid-September, and are “re-opened” every season beginning as early as April. Annual facility opening requires standard maintenance to initiate operations. Although most of these activities are routine, the extent and need for maintenance and the subsequent need for in-water work, varies in intensity from year to year. As described in Section 2.1.3.2.2, annual maintenance activities include occasional flushing of sediments and woody debris from the intake, water conveyance line, and weir. Such debris removal activities could take place up to five times per season (from May through September), depending on the extent of flooding and high-flow events. In addition, minor weir repairs and removal of rocks and debris from the weir panels or intake structure are typically required on an annual basis.

As described in Section 2.1.3.2.2, hatchery operators typically use a long-reach excavator positioned from the facility access road on the bank to remove gravel/debris in front of the intake. Although no machinery typically enters the river to conduct these activities, a small sediment plume is generated downstream, typically extending about 450 feet from in-water dredging (USFWS 2014b). This plume would temporarily delay passage and displace bull trout, which could result in temporary reduction in foraging efficiency. Such delay or displacement would be considered harassment, which is likely to adversely affect individual bull trout. A smaller plume is likely during flushing of the trap, which occurs one to two times per season.

If equipment is required to enter the channel, equipment would operate for a matter of hours in the active channel; a similar turbidity plume is anticipated to that described above. Individual bull trout could be displaced if present near the excavator path, or near the arm as it removes accumulated in-stream debris. Such displacement could temporarily disrupt migratory or foraging behavior. The reach of the South Fork Salmon River near the weir provides FMO habitat for bull trout; SR habitat is well upstream of the weir and satellite facility. Because only subadult and adult bull trout are expected to be present in the mainstem South Fork Salmon River (USFWS 2014b), only these life stages would be impacted during periods when in-water sediment removal (dredging) overlaps with March-September migratory periods. Therefore, these activities are likely to adversely affect individual adult or subadult bull trout through disturbance or migratory delay. Because the mainstem South Fork can exceed ideal temperature criteria for bull trout in the summer (primarily August), there is a low likelihood that in-stream gravel removal during warmer summer months will impact bull trout. Long-term impacts are discountable.

Because spawning habitat is not present within or downstream of the South Fork Salmon River satellite facility, in-stream sediment removal operations would have no effect on sensitive life histories (e.g., redds, eggs, alevins, or young-of-the-year) (USFWS 2014b). All in-stream equipment would operate in accordance with impact minimization measures presented in Section 2.1.3.4. The use of vegetable-based synthetic oil would preclude the potential entry of petroleum-based pollutants to the river channel.

Semi-routine maintenance activities may include the replacement of displaced rocks from existing bank armoring or minor repairs to infrastructure, including minor scour hole fills under the adult weir. If such activities cannot be completed by personnel operating hand tools in the stream or by machinery operating from the bank, the use of heavy machinery would be required below the OHWM. If present, the presence of personnel and/or the potential operation of in-stream equipment (e.g., an excavator over several hours) could displace bull trout from occupied habitat, including a reach of the river downstream of activities, for about 450 feet from sedimentation. If juveniles are present and do not actively avoid moving in-stream equipment, they could be crushed by tracks or tires. However, conducting such work during the typical, low-flow summer work window would avoid most adults and subadults, and in-stream summer temperatures may preclude use by rearing juveniles. Further, because the reach adjacent to the facility provides FMO habitat, there is a low likelihood that rearing juveniles would be affected at any time of the year. The reach of the South Fork Salmon River does not provide SR habitat and therefore no redds, eggs, alevins, or young-of-the-year bull trout would be affected during semi-routine maintenance requiring in-stream work.

Fuel or oil leaking from machinery could be toxic to fish in the immediate area. All machinery operating adjacent to or within the river channel would, therefore, be equipped with a containment basin to capture any fluid leaks before they reach the river. Further, as described in Section 2.1.3.4, all equipment operating in-stream would be retrofitted with vegetable-based fuel oil. This would prevent the entry of petroleum-based pollutants should an oil leak occur, thus limiting the likelihood for adverse effects on bull trout and their habitat.

Future upgrades to the intake structure may also be required if the ongoing LSCRP facility review determines the intake is out of compliance with current NMFS (2011) screening criteria. Modifications to the intake structure would likely necessitate isolation of the intake from the river channel to allow intake upgrades to occur in the dry. Such intake renovations are considered non-routine and would require a separate, project-specific section 7 consultation.

Johnson Creek Weir and Screw Trap

Routine maintenance

Routine in-stream maintenance of the weir and screw trap may affect bull trout via disturbance or displacement from the presence of personnel and minor sedimentation from maintenance activities. Routine maintenance could include minor repairs, picket panel replacement, or weir/trap sediment and debris removal.

Because maintenance of the weir and screw trap is typically accomplished by personnel in the river channel, and does not require the use of heavy equipment, maintenance actions are not likely to adversely affect bull trout; effects are insignificant. Larger, mobile juveniles and adults/subadults can avoid potential turbidity plumes and in-stream workers at the weir. Further, any turbidity resulting from minor maintenance of the weir during operation would not span the full channel; therefore, a portion of the channel would remain turbidity-free and provide a zone of passage for migrating bull trout. Johnson Creek does not provide SR habitat and therefore no redds, eggs, alevins, or young-of-the-year bull trout would be affected during routine in-stream maintenance. Juvenile rearing is highly unlikely and therefore effects on juveniles is so remote as to be discountable.

Semi-routine maintenance

As a seasonally-installed facility, no semi-routine maintenance activities occur at the Johnson Creek weir site.

East Fork Salmon River Satellite and Weir

Routine maintenance

The East Fork Salmon Satellite facility and weir operate from March through May, and must be re-opened every season, requiring standard routine maintenance to initiate operations. Although most of these activities are routine, the extent and need for maintenance and the subsequent need for in-water work varies in intensity from year to year. Following periods of high flow, hatchery operators must remove rocks and large woody debris from the weir. This is typically accomplished using a variety of techniques ranging from a clamshell-style excavation bucket mounted to a crane, to a tracked or rubber-tired excavator. During such activities, a small, temporary sediment plume extending about 450 feet downstream is created during the mobilization and excavation process.

The East Fork Salmon River Weir provides bull trout FMO habitat and is about 3 miles downstream of SR habitat. Therefore, no redds, eggs, alevins, or young of year bull trout would be affected during these maintenance actions. However, these activities are likely to adversely affect individual bull trout through disturbance or displacement. Adults and subadults are the most likely to be affected through migratory delay or behavioral modifications. Mobile life stages should be able to avoid in-stream machinery; no lethal impacts from such operations are anticipated.

Semi-routine maintenance activities may include the replacement of displaced rocks from existing bank armoring or minor repairs to infrastructure, including minor scour hole fills under the adult weir. If such activities cannot be completed by personnel operating hand tools in the stream, or by machinery operating from the bank, the use of heavy machinery may be required below the OHWM. If present, the presence of personnel and/or the potential operation of in-stream equipment (e.g., an excavator over several hours) could displace bull trout from occupied habitat, including a reach of the river downstream of activities, for about 450 feet from sedimentation. Therefore, semi-routine maintenance activities may affect and are likely to adversely affect bull trout. Because the East Fork Salmon River at the weir and satellite location is primarily used as a migratory corridor by adult and subadult bull trout, no effects on spawning adults, eggs, alevins, or young-of-the-year would occur. The presence of juveniles is highly unlikely.

Future upgrades to the intake structure may be required if the ongoing LSCRP facility review determines the intake is out of compliance with current NMFS (2011) screening criteria. Intake upgrades would be considered a non-routine maintenance activity requiring a separate, project-specific section 7 consultation.

Sawtooth Fish Hatchery and Weir

Routine, periodic removal of accumulated sand, gravel, rocks, and woody debris is necessary to clear the area in front of the adult fish weir, entrance to the fish ladder and trap, and water supply intake structures. These routine activities typically occur in July or August each year. In 2013, intake cleaning occurred in December. Debris removal using machinery (e.g., excavators) operating in the river channel is required at times and is therefore likely to adversely affect bull trout if present in the affected reach. During such activities, a temporary sediment plume extending about 450 downstream is created during the mobilization and excavation process. During intake material removal, mobilized sediment in the river could degrade water quality. Sediment and organic materials would be suspended in the water column each time an excavator bucket removes material from the streambed. This could result in a turbidity plume that displaces bull trout, including juveniles, and reduces foraging efficiency. Displacement could, in turn, alter migration timing or behavior.

During the summer when intake clean out is typically conducted, bull trout may be moving through the reach of the river adjacent to the hatchery. Bull trout have been captured in the hatchery weir in July and August moving upstream to spawning and rearing habitat (USFWS 2014b). In 2013, intake clean out was required in December. At that time, overwintering adults and subadults could be present at any time.

Because the Salmon River adjacent to the Sawtooth Fish Hatchery and weir provides FMO habitat and is located within a migration corridor for adults and subadults, effects on less mobile juveniles are highly unlikely, though not entirely discountable because juveniles have been collected at the screw trap near the facility. The Salmon River near the hatchery is not identified as SR habitat for bull trout (USFWS 2014b). Therefore, operation of in-stream equipment (i.e., excavators) would not compact spawning gravels, nor impact redds, eggs, alevins, or young-of-the-year during either a summer or winter in-stream work window. Regardless, these activities could disturb or displace individual adults and subadults, or cause migratory delays or modifications to migratory patterns or foraging behaviors. Mobile adults and subadults should be able to avoid in-stream machinery and, therefore, no lethal impacts from such operations are anticipated.

As presented in a recent Biological Opinion (USFWS 2015e) for maintenance dredging at the Sawtooth Hatchery intake, the Salmon River near the Sawtooth Hatchery intake location is over 100 feet wide. Therefore, the entire channel would not be affected by increased turbidity across its width; rather, turbidity would likely be limited to the bank to mid-channel downstream of the intake. Along the bank downstream of the intake, turbidity concentrations are expected to exceed 50 nephelometric unit (NTU) over background, which is generally the threshold used for minor sublethal effects (USFWS 2015e). Therefore, turbidity plumes with concentrations high enough to adversely affect bull trout are expected to extend downstream up to 450 feet, but will affect only a portion of the channel (i.e., the plume will not extend across the entire channel width). Because portions of the channel would not be affected by turbidity caused by intake sediment removal operations, effects on bull trout are expected to be limited to disturbance and displacement.

Semi-routine maintenance activities may include the replacement of displaced rocks from existing bank armoring or minor repairs to infrastructure, including minor scour hole fills under the adult weir. If such activities cannot be completed by personnel operating hand tools in the stream, or by machinery operating from the bank, the use of heavy machinery would be required below the OHWM. If present, the presence of personnel and/or the potential operation of in-stream equipment (e.g., an excavator over several hours) could affect bull trout from occupied habitat, including a reach of the river downstream of activities, for about 450 feet from sedimentation.

Adverse, direct effects on individual adult or subadult bull trout could include disturbance and displacement of fish as a result of personnel or heavy equipment working in or near the river channel. Because the Salmon River at the Sawtooth Fish Hatchery and weir location is primarily used as a migratory corridor by adult and subadult bull trout, no effects on spawning life histories would occur. Further, considering the distance to upstream spawning areas, the likelihood that juveniles may be affected is low, though not entirely discountable because juveniles have been collected at the screw trap near the facility.

Future upgrades to the intake structure may be required if the ongoing LSCRP facility review determines the intake is out of compliance with current NMFS (2011) screening criteria. Modifications to the intake structure would be considered a non-routine maintenance activity requiring a separate, project-specific section 7 consultation.

Streamside Incubation Facilities

Streamside incubators are currently used to support summer Chinook salmon incubation and rearing in Cabin and Curtis creeks, summer steelhead incubation and rearing in Beaver and Indian creeks, and summer steelhead incubation and rearing in various tributaries in Yankee Fork. In-stream boxes are typically anchored to the streambed using a combination of rebar and tie wire.

In Cabin and Curtis creeks, egg boxes are placed in mid-October. Installation methods are similar to those used at the former Dollar Creek site, where egg boxes were typically installed in pool habitat; glides were sometimes selected for placement if deep enough to accommodate the boxes (SBT and IDFG 2010a). Because the timing of egg box placement coincides with the tail-end of bull trout spawning in SR habitat, such placement may affect bull trout. Care is taken to avoid bull trout redds during placement; however, spawning or post-spawn bull trout that are recovering in large pools targeted for egg box installation could be disturbed from increased human presence and flushing from resting habitat. Such disturbance, including increased noise from rebar installation, is likely to adversely affect individual post-spawned bull trout. However, the seasonal loss of pool habitat from the presence of the egg boxes would be insignificant in SR habitat as adults eventually move downstream to FMO habitat. Boxes are removed from Cabin and Curtis creeks in mid-May, and from all other streams in early- to mid-July.

Summer steelhead incubators are placed in bull trout SR habitat in Beaver and Indian creeks from mid-May through mid-June (SBT and IDFG 2010b). Therefore, the timing of placement does not overlap with bull trout spawning periods and occurs after typical emergence periods. Therefore, the likelihood for disturbance from egg box installation is primarily limited to young-of-the-year and age 1+ rearing juveniles. Such life histories are mobile and therefore likely able to avoid personnel and egg box infrastructure during placement. At all sites, rearing juvenile bull trout may experience minor turbidity resulting in temporary disorientation and displacement from rearing habitats; effects would be insignificant. The egg box mesh openings are too small to allow entry of adult and subadult bull trout that may be attracted to them; therefore, the likelihood for entrapment is discountable.

Routine maintenance

Cabin and Curtis creeks egg boxes are monitored monthly (similar to former practices at Dollar Creek per SBT and IDFG 2010a); summer steelhead boxes will be monitored twice weekly (SBT and IDFG 2010b). Staff records water condition, temperature, dissolved oxygen, conductivity, pH, and embryo stage. Staff also cleans and removes debris from screens as needed. Monthly monitoring and sediment removal activities may disturb and displace bull trout, particularly incubating eggs and rearing juveniles in SR habitat in Curtis and Cabin creeks, and rearing juveniles in Beaver Creek, Indian Creeks, and tributaries of the Yankee Fork in close proximity to SR habitat, including Jordan Creek. Because monthly maintenance would be accomplished on foot, without heavy equipment, sediment deposition would likely be low during these activities, and localized to an area less than about 100 feet downstream from the egg box.

Because egg box placement and incubation periods in Curtis and Cabin creeks overlap with the bull trout incubation period in SR habitat, the likelihood exists that some sediment deposition could occur on redds during monitoring. Due to the likely low quantity of sediment and debris to be removed, however, sediment deposition would likely be insignificant. In Curtis and Cabin creeks, egg box monitors would avoid walking near bull trout redds, and minimize disturbance of post-spawning adults that may be resting in local pools by moving slowly during installation activities. All egg box installations would be conducted by experienced fish biologists that can identify bull trout spawning redds.

The egg box incubation period for summer steelhead in all other tributaries would have no effect on redds.

Semi-routine maintenance

No semi-routine maintenance is conducted for this activity.

2.5.2.2 Effects of Interrelated or Interdependent Actions

The Service has not identified any actions that are interrelated and interdependent with the Programs.

2.5.3 Bull Trout Critical Habitat

2.5.3.1 Direct and Indirect Effects of the Ongoing Action

For more detailed information on the effects of each of the Operational Elements of the Hatchery Program see the bull trout effects section (section 2.5.2), above.

2.5.3.1.1 Broodstock Collection

Mid-Columbia Recovery Unit

Adult collection at Oxbow, Dworshak National, and Clearwater fish hatcheries have the likelihood to affect PBF 2 (migration habitat), PBF 7 (flows), and PBF 8 (water quality and quantity). Although the collection of spring/summer Chinook salmon and steelhead broodstock at the Hells Canyon Fish Trap impairs migratory habitat for bull trout (PBF 2), the volitional left bank (facing downstream, Oregon side) Hells Canyon Trap is located immediately downstream of the dam, which precludes all upstream migration. Therefore, effects on migratory habitat from the trap are insignificant. The left bank volitional ladder at the Dworshak National Fish Hatchery does not impair movement past the facility on the North Fork Clearwater River.

Because the Hells Canyon Trap and the Dworshak National Fish Hatchery adult collection facilities require surface water diversions to operate fish ladders and traps, PBFs 7 and 8 could be impaired by reduced flow and increased sediment/turbidity immediately downstream of the collection sites; however, impacts would be insignificant relative to the conservation value of habitat for bull trout. Because both the Hells Canyon Fish Trap and the Dworshak National Fish Hatchery ladder and trap are located downstream of SR habitat, they would have no effect on PBF 6 (spawning habitat). Operation of these trapping facilities would have no effect on PBFs 1, 3, 4, 5, or 9.

Upper Snake Recovery Unit

Adult collection of broodstock at traps in the Rapid, Pahsimeroi, Salmon, South Fork Salmon, Salmon, and East Fork Salmon rivers, as well as Yankee Fork and Johnson Creek (including weir installation and removal), may affect migratory habitat for bull trout (PBF 2). All of the traps are channel-spanning, and therefore, preclude all upstream migration during operational periods. With the exception of Johnson Creek, all facilities withdraw surface water, and operations at all sites may affect PBF 7 and PBF 8. Johnson Creek seasonal weir installation and removal may result in sedimentation that could affect PBF 8; however, effects would be insignificant. Based on the water quantity assessment method presented in Section 2.5.2.1 for hatchery-related water withdrawals, only the Rapid River Hatchery is likely to adversely affect the quantity of habitat in the diversion reach. The remaining sites divert less than 40 percent of average flows and are not likely to adversely affect these PBFs.

With the exception of the Rapid River Trap, all collection sites are downstream of SR habitat, therefore, no effects on PBF 6 (spawning habitat) would occur from the operation of adult traps.

As previously discussed, despite the SR habitat designation for the entire Rapid River (USFWS 2010b), suitable spawning habitat is lacking near the existing hatchery site. Therefore, effects on PBF 6 are anticipated to be insignificant in the vicinity of the adult collection weirs. The operation of trapping facilities would have no effect on PBFs 1, 3, 4, 5, or 9. Seasonal weir installation and removal at Johnson Creek could result in insignificant effects on complex habitats (e.g., pools, PBF 4).

2.5.3.1.2 Acclimation and Release

Mid-Columbia Recovery Unit

Hatchery programs operated by IDFG in the mainstem Snake River CHU release hatchery juveniles into the Snake River below Hells Canyon Dam. These fish outmigrate rapidly during April and May into the mainstem Snake River and Columbia River CHUs, with limited residence time in release tributaries. The rapid outmigration of smolts from the Rapid River Hatchery suggests limited residency in release tributaries, further reducing the likelihood for predation on bull trout juveniles. The median travel time to the Lower Granite Dam for Rapid River Chinook over the last 10 years is 25 days (Fish Passage Center 2017).

Releases of spring Chinook salmon and steelhead may affect PBF 2, relative to adult bull trout migration, because an increase in prey availability (PBF 3) may cause migration delays. An increase in prey abundance (PBF 3) is considered a beneficial, though insignificant, effect. Additional beneficial (though likely insignificant) effects from increased salmonid production in subject streams could increase water quality (PBF 8) due to greater primary productivity from marine-derived nutrients from adult returns.

Upper Snake Recovery Unit

Hatchery programs operated by IDFG in the CHUs designated in the Upper Snake RU incubate and release hatchery juveniles into the Little Salmon River, Rapid River, Salmon River, South Fork Salmon River, East Fork Salmon River, Johnson Creek, and Yankee Fork. Streamside incubation and release of hatchery spring/summer Chinook salmon and steelhead may impact PBF 2, relative to adult bull trout migration, because an increase in prey availability (PBF 3) may cause migration delays. An increase in prey abundance (PBF 3) at and immediately downstream of release and incubation sites is considered a beneficial effect. Additional beneficial effects may include increased primary productivity (PBF 8, water quality) from the addition of marine-derived nutrients introduced from adult Chinook and steelhead carcasses for adults that may spawn naturally in the Upper Salmon RU for spawning

2.5.3.1.3 Research, Monitoring, and Evaluation

NPT

As an in-river flow through seasonal operation in FMO habitat,the Johnson Creek screw trap would not divert surface water or modify in-stream temperatures (PBFs 5, 7), or affect hyporheic interchanges or spawning habitat (PBFs 1, 6). Operation would adversely affect migratory corridors (PBF 2) since the trap is a barrier to passage if an individual enters. This, in turn, could impact forage species (PBF 3), albeit temporarily, resulting in discountable effects on bull trout prey items. Bull trout collected in the trap have been observed foraging on juvenile salmonids. Occasional maintenance of the trap to replace worn parts or anchoring systems could result in minor degradations to downstream water quality in the form of sedimentation. This, in turn, could affect PBF 4 (complex habitats) and PBF 8 (water quality), although impacts would be insignificant and not likely detectable about 450 feet downstream of the activity (see USFWS 2015e). If maintenance activities require in-stream work and presence of personnel, minor displacement may occur along the migratory corridor (PBF 2); such effects would be insignificant. Hatchery-related RM&E would have no effect on PBF 9.

SBT

Rotary Screw Trap

Installation and removal of the rotary screw trap in March and November, respectively causes minor, short-lived changes in physical habitats. The installation and removal process includes assembling the trap while in the stream (river right facing downstream) next to the Yankee Fork road. This action includes up to four people working in up to 25 percent of the width of the stream for a maximum of 8 hours. The rotary screw trap is checked daily, where one or two technicians traverse 1-6 m of streambed to access the trap. Effects on critical habitat may include changes in water quality (PBF 8) and stream bank characteristics (PBF 4).

Sediment: The installation, operation, and removal of the rotary screw trap may generate minor amounts of sediment in a portion of the action area. Effects of the action will be short term during installation and near non-existent post-installation. Walking in the stream (up to 4 people) is likely to create small plumes of suspended fines up to 6 m downstream, however, sediment pulses will be narrow and volume so small that they will rapidly disperse or fall-out.

Turbidity increases associated with the project work is expected to last less than 24 hours and then return to pre-installation /operation/ removal levels. Given the limited time in which installation or removal occurs, it is extremely unlikely that sediment delivery to the stream channel would occur in sufficient quantities to measurably increase turbidity within the action area. Effects to water quality (PBF 8) from possible increased sediment/turbidity will be insignificant.

Width:Depth Ratio, Streambank Condition, and Riparian Conservation Areas: The installation, operation, and removal of the rotary screw trap has the potential to affect the width: depth ratio, streambank condition, and riparian vegetation only at the proposed site and will not affect these indicators elsewhere in the action area. These indicators will primarily be affected by installation and removal activities and to a lesser extent by daily operation. No significant impacts are expected to the in-stream and riparian habitat during installation and operation. No major vegetation removal is anticipated, but very minor riparian vegetation degradation may occur during installation, operation, and removal. Technicians travel from the road, down the streambank and into the river. Over previous years of operation, a distinct path has formed and erosion is minimized by the placement of gravel-filled bags to act as steps. Therefore, the effects of the proposed action on these indicators of habitat complexity (PBF 4) are expected to be insignificant.

Similarly, while sediment delivery is expected, it is extremely unlikely that sediment delivery to the stream channel would occur in sufficient quantities to measurably degrade the width:depth ratio within the action area given the limited extent of in-channel activities.

Operation of the screw trap would adversely affect migratory corridors (PBF 2) since the trap is a barrier to passage if an individual enters. This, in turn, could impact forage species (PBF 3), albeit temporarily, resulting in discountable effects on bull trout prey items.

Adult Chinook enumeration – Pole Flat weir

Installation and removal of the picket weir at Pole Flat in June and September, respectively causes minor, short-lived changes in physical habitats. The installation process includes assembling the weir while in the stream by up to 10 people for 2 days. During this process, large metal pieces are assembled across the streambed, which occasionally requires levelling large panels in the stream by moving large rocks with a pry bar. The weir is checked daily, where one or two technicians access the trap using a catwalk and thus do not influence the streambed. Removal of the weir involves two to four people removing individual pieces for short periods over multiple days. Operation of the picket weir is expected to impede migratory movements of bull trout. Construction of the permanent weir is being addressed through a separate consultation effort and will not be addressed here; operation effects are expected to impact migratory movements of bull trout. Effects on critical habitat may include changes in sediment delivery affecting water quality (PBF 8) and stream bank characteristics associated with complex habitat (PBF 4), as well delaying migratory movements (PBF 2).

Sediment: The installation and removal of the weir may generate minor amounts of sediment in a portion of the action area. Effects of the action will be short term during installation and near non-existent post-installation. Walking in the stream (up to10 people) is likely to create small plumes of suspended fines up to 6 m downstream that persists for 8 h per day for 2 days, however, sediment pulses are so small that they will rapidly disperse or fall-out.

Turbidity increases associated with the project work is expected to last less than 24 hours total and then return to pre-installation/removal levels. Given the limited time in which installation or removal occurs, it is extremely unlikely that sediment delivery to the stream channel would occur in sufficient quantities to measurably increase turbidity within the action area. Effects to water quality (PBF 8) from possible increased sediment/turbidity will be insignificant and immeasurable.

Width:Depth Ratio, Streambank Condition, and Riparian Conservation Areas: The installation and removal of the picket weir has the potential to affect width: depth ratio, streambank condition, and riparian vegetation only at the proposed site and will not affect these indicators elsewhere in the action area. These indicators will primarily be affected by installation and removal activities and to a lesser extent by daily operation. No significant impacts are expected to the riparian habitat during installation and operation. No major vegetation removal is anticipated, but very minor riparian vegetation degradation may occur during installation, operation, and removal. Technicians travel from the road, down the streambank and into the river during installation and removal or onto the catwalk during daily operation. Over previous years of operation, a distinct path has formed and erosion is minimized by the placement of gravel-filled bags to act as steps. Levelling of weir panels and the trapbox changes instream habitat for a 1 m wide transect of the river. Overall, the effects of the proposed action on these indicators are expected to be insignificant.

Similarly, while sediment delivery is expected, it is extremely unlikely that sediment delivery to the stream channel would occur in sufficient quantities to measurably degrade the width:depth ratio within the action area given the limited extent of in-channel activities.

Migratory Movements: Operation of the weir (picket or permanent) adversely affects migration habitats (PBF 2) by impeding volitional movements of bull trout during Chinook salmon collection time frames (late upstream migration and early downstream migration). These delays may impact reproductive efforts in upstream SR habitats and predispose adults to sub-optimal water conditions, or prevent timely movements to downstream FMO habitats where food sources are more abundant.

Adult Chinook and steelhead enumeration – Permanent PIT array

The Yankee Fork PIT array was installed in 2012. Its future effects on in-stream and riparian habitat are limited to occasional adjustments and evaluation of array panels. The evaluation and adjustment process includes temporary disturbance of the streambed by one to two people over a couple of hours once per year, typically after peak run-off. Effects on critical habitat may include changes in water quality (PBF 8) from sediment delivery and stream bank characteristics (PBF 4).

Sediment: The adjustment and evaluation of array panels may generate minor amounts of sediment in a portion of the action area. Effects of the action will be short term. Walking in the stream is likely to create small plumes of suspended fines up to 6 m downstream that persists for up to 2 h once per year, however, sediment pulses are so small that they will rapidly disperse or fall-out.

Turbidity increases associated with the project work is expected to last less than 24 hours total and then return to pre-adjustment/ evaluation levels. Given the limited time in which this action occurs, it is extremely unlikely that sediment delivery to the stream channel would occur in sufficient quantities to measurably increase turbidity within the action area. Effects to PBF 8 from possible increased sediment/turbidity will be insignificant and immeasurable.

Width:Depth Ratio, Streambank Condition, and Riparian Conservation Areas: The adjustment and evaluation of the PIT array has the potential to affect the width: depth ratio, streambank condition, and riparian vegetation only at the proposed site and will not affect these indicators elsewhere in the action area. No significant impacts are expected to the riparian habitat during adjustment and evaluation. No major vegetation removal is anticipated, but very minor riparian vegetation degradation may occur during this activity. Technicians travel from the road, down the streambank and into the river to check the array. Some forbs and streamside grasses could be trampled by operators, but these plants will likely grow back or rebound immediately. Therefore, the effects of the proposed action on these indicators of habitat complexity (PBF 4) are expected to be insignificant.

Similarly, while sediment delivery is expected, it is extremely unlikely that sediment delivery to the stream channel would occur in sufficient quantities to measurably degrade the width:depth ratio within the action area given the limited extent of in-channel activities.

Electrofishing

The electrofishing in the Yankee Fork includes temporary disturbance of the streambed by up to eight people over a couple of hours once per year in various areas of mainstem and tributary habitats, typically during September and October. Effects on critical habitat may include changes in sediment delivery affecting water quality (PBF 8) and stream bank characteristics associated with habitat complexity (PBF 4).

Sediment: Walking in the stream during sampling may generate minor amounts of sediment in a portion of the action area. Effects of the action will be short term. Walking in the stream is likely to create small plumes of suspended fines up to 6 m downstream that persists for up to 8 hrs in a location once per year, however, sediment pulses are so small that they will rapidly disperse or fall-out.

Turbidity increases associated with the project work is expected to last less than 24 hours total and then return to pre-sampling levels. Given the limited time in which this action occurs, it is extremely unlikely that sediment delivery to the stream channel would occur in sufficient quantities to measurably increase turbidity within the action area. Effects to water quality (PBF 8) from possible increased sediment/turbidity will be insignificant.

Width:Depth Ratio, Streambank Condition, and Riparian Conservation Areas: Sampling by electrofishing has the potential to affect the width: depth ratio, streambank condition, and riparian vegetation only at the proposed site and will not affect these indicators elsewhere in the action area. No significant impacts are expected to the riparian habitat during sampling. No major vegetation removal is anticipated, but very minor riparian vegetation degradation may occur during this activity. Technicians travel in and out of the stream at set points and across the floodplain to sample processing areas. Some forbs and streamside grasses could be trampled by samplers, but these plants will likely grow back or rebound immediately. Therefore, the effects of the proposed action on these indicators are expected to be insignificant.

Similarly, while sediment delivery is expected, it is extremely unlikely that sediment delivery to the stream channel would occur in sufficient quantities to measurably degrade the width:depth ratio within the action area given the limited extent of in-channel activities.

Spawning Ground Surveys

Spawning ground surveys in the Yankee Fork include temporary disturbance of the streambed by one to two people over a longitudinal section of stream bed between 4 and 10 km depending on the section typically during August and September. Effects on critical habitat may include changes in sediment delivery affecting water quality (PBF 8) and stream bank characteristics associated with habitat complexity (PBF 4). Changes in sediment delivery will occur during in-stream travel over a 2-6 hour period on each of 4-6 days per section and will be similar in magnitude to a single moose walking down the river. Effects to indicators of habitat complexity (PBF 4) and water quality (PBF 8) are expected to be insignificant.

Physical habitat monitoring

Physical mainstem Yankee Fork habitat monitoring activities are unlikely to influence bull trout populations in this basin but may adversely affect individual bull trout because these activities occur in FMO habitat when bull trout may be present. Habitat monitoring consists of walking in the stream and making observations of habitat system, stream width, and channel gradient. There will be no physical disturbance of habitat; however, bull trout may be temporarily displaced from their preferred habitats when technicians are in the stream channel taking measurements. The SBT do not know how many bull trout have been displaced by past habitat monitoring activities. Effects on critical habitat are similar to spawning ground surveys, that is, effects to indicators of habitat complexity (PBF 4) and water quality (PBF 8) are expected to be insignificant.

Carcass nutrient supplementation

Chinook carcasses from Sawtooth hatchery are distributed throughout sections of lower and middle Yankee Fork below 5-Mile Creek. The goal of carcass outplants is to mitigate the effects of low Chinook salmon returns on the food webs in the Yankee Fork. Generally, these carcass outplants occur in FMO habitat and are used as a food source for migrating pre- and post-spawn bull trout. Carcasses are dumped off of bridges into the river, adding nutrients and enhancing aquatic invertebrate populations, thus providing beneficial effects to prey availability (PBF 3).

2.5.3.1.4 Water Withdrawals

Mid-Columbia Recovery Unit

Water diversions at Oxbow, Dworshak National and Clearwater fish hatcheries may affect PBF 2 (migration habitat), PBF 7 (flows), and PBF 8 (water quality and quantity). Because all facilities are sited on mainstem rivers with year-round flow quantities that are suitable for supporting FMO habitat, effects on these PBFs from water diversion are insignificant. The facilities are located below primary SR habitat for bull trout and, therefore, would have no effect on PBF 6 (spawning). Given the quantity of water remaining in each diversion reach, effects on in-stream temperatures (PBF 5) from solar heating in the reaches are discountable. Water diversions at the facilities are expected to have a no effect on the remaining PBFs (1, 3, 4, 9). With the exception of the Dworshak National Fish Hatchery, water diversions at all facilities are screened to meet NMFS juvenile salmonid screening criteria (NMFS 2011) and, therefore, do not impact migratory habitat (PBF 2) for juvenile life histories.

Upper Snake Recovery Unit

Water diversions at hatchery facilities in the Upper Snake River RU may affect PBF 2 (migration habitat), PBF 5 (in-stream temperature), PBF 7 (flows), and PBF 8 (water quality and quantity). Water diversion intakes at all facilities are screened to meet the 2008 NMFS juvenile salmonid screening criteria. An ongoing LSCRP facility review is underway to determine if existing LSRCP-funded facility intakes are out of compliance with current NMFS (2011) screening criteria. If facilities are out of compliance, operational effects on juvenile migration (PBF 2) may occur through impingement.

Most facilities that divert surface water return the water to the river a short distance from the diversion point. Because the uses are nonconsumptive, occur primarily in FMO habitat, and are proportionally small (i.e., less than 1 percent of average flow) for all facilities except the Rapid River Hatchery, these withdrawals would not significantly affect migration (PBF 2), temperature (PBF 5), or water quality/quantity (PBF 8). Therefore, water diversions are not likely to adversely affect critical habitat PBFs for all hatcheries except Rapid River Hatchery.

At the Rapid River Fish Hatchery, water diversions exceed 40 percent of average streamflow during January and February and are therefore likely to adversely affect PBF 2. Along the reach of Rapid River adjacent to the hatchery, effects on delineated SR habitat (PBF 6) would be insignificant given the timing of maximum flow diversions with respect to bull trout spawning and incubation. Further, according to IDFG, suitable spawning habitat does not exist in the vicinity of the hatchery or water supply intake and primary spawning habitats are 3-4 miles upstream, near the confluence with the West Fork Rapid River (USFS 2003, p. K-7).

Operation of the seasonally-installed Johnson Creek weir and trap and streamside incubation boxes would not divert surface water from streams and would therefore have no effect on bull trout critical habitat PBFs.

2.5.3.1.5 Hatchery Effluent

Mid-Columbia Recovery Unit

Effluent discharge from each facility that rears juveniles as part of the Hells Canyon and Salmon River programs may affect water quality (PBF 8) in localized areas immediately downstream of each facility outfall. With the exception of the Dworshak National Fish Hatchery, where applicable, all facilities meet or exceed State and Federal NPDES water quality standards for effluent and fish health protocols. Effluent discharges have the likelihood to increase nutrient loading and, therefore, decrease water quality downstream of project sites. At the Dworshak National Fish Hatchery, direct discharge of unsettled effluent may impair PBF 8 (water quality and quantity) and reduce optimal use of FMO downstream of the outfall in the Clearwater River. However, given the volume of flow in the North Fork Clearwater, effects on critical habitat are likely insignificant.

All Hells Canyon and Salmon River hatchery programs included under the proposed action in the Mid-Columbia RU occur below bull trout SR habitat. Effects on PBF 8 (water quality and quantity) would be insignificant given the lack of good water quality and seasonally high water temperatures in mainstem areas (which provide poor rearing habitat). Further, because facility withdrawal and discharge are relatively small compared to the volume of river water present at most sites, the impacts of effluent discharge on critical habitat would be insignificant. Bartholomew (2013, as cited in NMFS 2016) showed effluent discharge effects to be short- lived and extending downstream for less than 200 meters (656 ft) before they became undetectable.

At Oxbow and Clearwater fish hatcheries, water treatment systems remove a large percentage of aquaculture pollutants from the hatchery drain system prior to discharge through facility outfalls. Further, at the Oxbow Fish Hatchery, surface water diversions and subsequent water returns to the Snake River represent much less than 1 percent of monthly flows. Therefore, effects on water quality would be insignificant considering the minor amount of discharge compared to Snake River flows. Water travel time through the facilities is of short duration and would not measurably affect river temperature (PBF 5) below the outfalls. As reported by Kendra (1991), because benthic macroinvertebrates that are sensitive to organic wastes may be replaced by more tolerant species downstream of hatchery outfalls, released effluent may affect PBF 3 (prey availability). The effect is likely insignificant because such benthic prey items are typically forage for juvenile bull trout that are highly unlikely to occur in FMO habitat near the subject facilities. Effluent release would have no effect on PBFs 1, 2, 4, 6, 7, and 9.

In summary, although effluent is likely to dissipate quickly due to the higher background stream flows, water quality (PBF 8) may decrease slightly in the immediate vicinity of outfalls during facility operations. However, effluent-related effects on critical habitat are likely to be insignificant. This conclusion is supported by the NMFS (2016). In its Biological Opinion for continued operation and maintenance of the Northeast Oregon and Southwest Washington hatchery programs funded under the LSRCP and Northwest Power Act (USFWS 2016b), the Service determined that, “effluent from facilities regulated by the NPDES permits will not be noticeable or measurable over background conditions or result in effects on bull trout”. Based on the similarities of actions and permit terms and conditions described in NEOR/SEWA action, effluent impacts from these facilities similarly are expected to result in insignificant effects on bull trout critical habitat. As applicable, all hatchery facilities would continue to follow NPDES and IHOT criteria, monitor effluent (unless exempt from NPDES monitoring requirements), and make any modifications required to meet standards.

Upper Snake Recovery Unit

Effluent discharges have the likelihood to increase nutrient loading and, therefore, decrease water quality immediately downstream of hatchery outfalls. All facilities in the Salmon River CHU meet or exceed State and Federal NPDES water quality standards for effluent and fish health protocols.

Water withdrawals at most facilities generally comprise a small proportion of the total surface water volume during surface water diversion periods. Thus, any contaminants in the effluent would be diluted further when mixed with the remaining water in the creek or river, leading to discountable changes in water quality or quantity (PBF 8) relative to bull trout use of FMO habitat. Bartholomew (2013, as cited in NMFS 2016) showed effluent discharge effects to be short-lived and extending downstream for less than 200 meters (656 ft) before they became undetectable.

Despite using a larger proportion of surface water to supply the Pahsimeroi and Rapid River fish hatcheries, the effluent is diverted into pollution abatement ponds before being discharged back to the rivers, minimizing pollution risk. This, in addition to compliance with NPDES discharge permit requirements, minimizes potential effects on water quality downstream of each facility. Thus, the effects on water quality in designated critical habitat are anticipated to be insignificant. Water travel time through the facilities is of short duration (typically a day or less) and would not significantly affect river temperature (PBF 5) below the outfalls.

As reported by Kendra (1991), because benthic macroinvertebrates that are sensitive to organic wastes may be replaced by more tolerant species downstream of hatchery outfalls, released effluent may affect PBF 3 (prey availability). The effect is likely insignificant because such benthic prey items are typically forage for juvenile bull trout that are highly unlikely to occur in FMO habitat near the subject facilities. Effluent release would have no effect on PBFs 1, 2, 4, 6, 7, and 9.

2.5.3.1.6 Fish Health/Disease

Mid-Columbia Recovery Unit

Hatchery programs may affect PBF 8 (water quality and quantity), through transmission of disease into designated critical habitat via effluent or pathogen transmission in open water. Little evidence suggests that diseases are routinely transmitted from hatchery to natural fish (NMFS

2016). This indicates that pathogen-related effects on PBF 8 are most likely insignificant. In-hatchery fish health monitoring and disease management procedures diminish the likelihood for pathogen effects on water quality. 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 the likelihood of water quality effects on bull trout habitat. Existing protocols employed to minimize the likelihood of effects on bull trout from disease exposure from hatchery practices should similarly reduce impacts on PBFs 3 (prey fish species) and 9 (nonnative fish species) to insignificant levels; there would be no effect on the remaining PBFs (1, 2, 4, 5, 6, and 7).

Upper Snake Recovery Unit

Hatchery facilities and streamside incubators in CHUs designated in the Upper Snake RU may affect PBF 8 (water quality and quantity) through transmission of disease into critical habitat from hatchery effluent. Hatchery-released smolts and in-stream incubating eggs may also horizontally transfer diseases in the natural environment. Elevated levels of disease and pathogen are typically concentrated near the hatchery effluent outfall and then are diluted by water as they discharge downstream (NMFS 2016). The higher concentration of disease and pathogens associated with hatcheries is typically localized and short-lived (Bartholomew 2013, as cited in NMFS 2016).

Little evidence suggests that diseases are routinely transmitted from hatchery to natural fish (NMFS 2016). This indicates that pathogen-related effects on PBF 8 are likely insignificant. Fish health monitoring and disease management procedures diminish the likelihood for pathogens to impact water quality. 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 water quality effects on critical habitat. Existing protocols employed to minimize the likelihood for adverse effects on bull trout from hatchery-related disease exposure should similarly reduce any potential impacts to PBFs 3 (prey fish species) and 9 (nonnative fish species) to insignificant levels; there would be no effect on the remaining PBFs (1, 2, 4, 5, 6, and 7).

2.5.3.1.6 Facility Maintenance

Mid-Columbia Recovery Unit

Routine operation and maintenance above the OHWM at facilities in the Clearwater River CHU (Dworshak National and Clearwater fish hatcheries) and the mainstem Snake River CHU (Hells Canyon Fish Trap and the Oxbow Fish Hatchery) would be conducted in adherence to impact minimization measures (Section 2.1.3.4) intended to reduce the likelihood of effects on bull trout critical habitat. Existing protocols employed to minimize the likelihood for effects on bull trout during maintenance operations should reduce the likelihood for effects on PBF 8 to insignificant levels; there would be no effect on the remaining PBFs from upland maintenance actions.

Routine and semi-routine in-water maintenance actions that occur below the OHWM have the potential to affect PBF 2 (migration habitat), and PBF 4 (complex river channels areas) in the Clearwater or mainstem Snake River CHUs. Water quality (PBF 8) could also be temporarily affected during any maintenance activities that require in-water work involving excavation and resulting sedimentation. These types of actions are not expected to occur frequently and would be localized at the work site. Further, these actions would occur in areas that have been previously degraded from existing hatchery infrastructure and would be conducted during agency-approved in-stream work windows. Because all in-water work would adhere to impact minimization measures (Section 2.1.3.4), measurable long-term effects on PBF 8 are highly unlikely to result in a loss of habitat conservation value to bull trout. However, short-term adverse effects on water quality (PBF 8) via sediment mobilization, substrate compaction, and potential chemical contamination from operation of in-stream equipment are likely to adversely affect critical habitat for bull trout.

In-water maintenance actions at Hells Canyon Fish Trap and at Oxbow, Dworshak National, and Clearwater fish hatcheries could result in minor sedimentation that could impact prey species (PBF 3) and complex habitats (PBF 4). If materials are removed from water bodies, a short term minor, localized alteration of flow (PBF 7) would occur in the affected reach. Effects on PBFs 3, 4, and 7 would be insignificant. In-water maintenance actions would have no effect on the remaining PBFs (1, 5, 6, 9) identified for bull trout.

Upper Snake Recovery Unit

Routine operation and maintenance above the OHWM at facilities in the Little Lower Salmon River CHU (Rapid River Fish Hatchery and Weir), South Fork Salmon River CHU (South Fork Salmon River Satellite and Weir), Pahsimeroi River CHU (Upper and Lower Pahsimeroi fish hatcheries and Weir), and Upper Salmon River CHU (Sawtooth Fish Hatchery, East Fork Salmon River Satellite and Weir, Yankee Fork future weir site) have limited likelihood to impact bull trout PBFs. Such activities would be implemented according to impact minimization measures (section 2.1.3.4) to reduce the likelihood for adverse effects on bull trout critical habitat. Existing protocols employed to minimize potential effects on bull trout during maintenance operations within the facilities should reduce any effects on bull trout PBFs (1, 2, 3, 4, 5, 6, 7, 8, and 9) to insignificant levels.

Aside from routine maintenance activities, most in-water maintenance actions would not occur frequently and impacts would be minimized by isolating in-water work sites from active flow, limiting the in-water work footprint, conducting work during the established in-stream work windows, and adhering to impact minimization measures presented in Section 2.1.3.4. Because maintenance activities would occur in areas that were previously disturbed during initial facility construction, long-term cumulative effects on PBFs from ongoing and future in-water maintenance would be insignificant.

The construction of new facilities is not included under the proposed action; however, in-water maintenance may require modifications to existing in-stream structures (e.g., debris removal from weirs, replacement of displaced rocks from existing armoring that can be conducted without in-water isolation in 1 day). Further, seasonal installation and removal of infrastructure is required for the Johnson Creek weir and trap boxes and streamside incubators in Cabin, Curtis, Beaver, Indian, and Yankee Fork tributaries. In-water maintenance actions occur below the OHWM and have the likelihood to affect PBF 2 (migration habitat), PBF 4 (complex river channels, pool habitat for seasonal structures [e.g., egg boxes, Johnson Creek weir placement]), and PBF 8 (water quality) in the Upper Snake River RU.

The extent of effect on these PBFs (i.e., insignificant or adverse) is largely dependent upon the portion of the river channel affected by the activity and whether migration around the work area is available. The extent and duration of in-water work is also relevant. See Table 17 for facility-specific effect determinations. In instances where “in the wet” turbidity would affect only a portion of the stream channel, effects on PBF 2 would be adverse only for a short distance downstream. In-water maintenance that involves sediment removal would produce turbidity plumes that could interfere with migration for a distance of about 450 feet downstream of the activity.

Adverse impacts to PBF 4 (complex river channels areas) could occur, particularly at those sites requiring in-water dredging, and where activities occur in proximity to SR habitat (Rapid River, Sawtooth, East Fork Salmon Satellite, South Fork Salmon River). At these sites, the riverbed would be altered as the depth of the river in front of the intake is increased via dredging. This will produce a temporary sediment plume that will flow downstream and settle into the river. This impact is considered significant only in areas that are in close proximity to rearing habitats (i.e., Rapid River, Sawtooth, South Fork and East Fork Salmon rivers). At Pahsimeroi sites, this impact is insignificant with regard to conservation value for bull trout.

During in-water work, short-term effects on water quality (PBF 8) via sediment mobilization, substrate compaction, and chemical contamination from operation of in-stream equipment are likely to adversely affect critical habitat for bull trout. In-water maintenance actions in the Upper Snake River RU could result in minor sedimentation that could impact prey species (PBF 3). Maintenance activities requiring in-water work may result in a minor, localized alteration of flow (PBF 7) through the affected reach for a short term. Effects on PBFs 3 and 7 would be insignificant. In-water maintenance actions would have no effect on the remaining PBFs (1, 5, 6, 9) identified for bull trout.

2.5.3.2 Effects of Interrelated or Interdependent Actions

The Service has not identified any actions that are interrelated or interdependent with the Programs.

2.5.4 Summary of Effects

Tables 18 and 19 summarize the Programs' effects to bull trout and critical habitat. Adverse effects are limited to the Snake River below Hells Canyon dam and the Salmon River Basin, and primarily occur from broodstock collection, juvenile releases, facility water withdrawal/diversion, RM&E (Johnson Creek and Yankee Fork), and in-water facility maintenance. These activities can result in bull trout disturbance, injury, and mortality. The Programs are likely to adversely affect PBFs 2 (migration habitat), 4 (complex habitat), 7 (natural hydrograph), and 8 (water quality and quantity) (Table 19). The potential for bull trout or designated critical habitat to be adversely affected outside the Snake River and Salmon River Basin (i.e., the Lower Columbia River FMO habitat in the Coastal RU) as a result of the Programs' activities is insignificant or discountable.

Table 18. Summary of effects to bull trout from the Programs' activities.

Facility	Broodstock Collection	Juvenile Releases	RME	Water Diver-sion	Effluent	Disease	Maintenance	
							Up-land	Inwater
Oxbow Hatchery	--	--	--	NLAA	NLAA	NLAA	NLAA	LAA
Hells Canyon Trap	LAA	NLAA	--	--	--	--	--	LAA
Dworshak NFH Trap	LAA	--	--	--	NLAA	--	--	--
Clearwater Hatchery	--	--	--	--	NLAA	--	--	--
Rapid River Fish Hatchery	LAA	LAA	--	LAA	NLAA	NLAA	NLAA	LAA
Lower Pahsimeroi Hatchery Weir	LAA	NLAA	--	NLAA	NLAA	NLAA	NLAA	LAA
Upper Pahsimeroi Hatchery	--	NLAA	--	NLAA	NLAA	NLAA	NLAA	LAA
SF Salmon Satellite and Weir	LAA	LAA	--	NLAA	NLAA	NLAA	NLAA	LAA
Cabin and Curtis Creeks Egg Boxes (summer Chinook)	--	NLAA	--	--	--	NLAA	--	NLAA (mainten-ance) LAA for Installation, Monthly Monitoring, and Removal
Johnson Creek Adult Collection Weir and Trap	LAA	NLAA	--	--	--	--	--	NLAA for Seasonal Weir Installation and Removal
Johnson Creek Screw Trap Operations (RM&E)	--	--	LAA	--	--	--	--	NLAA
East Fork Salmon River Trap	LAA	LAA	--	NLAA	NLAA	NLAA	NLAA	LAA
Sawtooth Fish Hatchery Weir	LAA	LAA	--	NLAA	NLAA	NLAA	NLAA	LAA

Facility	Broodstock Collection	Juvenile Releases	RME	Water Diver-sion	Effluent	Disease	Maintenance	
							Up-land	Inwater
Yankee Fork Weir	LAA	NLAA	--	--	--	--	--	NLAA
Yankee Fork RM&E (screw trap, electrofishing, spawning ground surveys, habitat monitoring)	--	--	LAA	--	--	--	--	NLAA
Yankee Fork Streamside Incubators at Jordan, Clearly, Ramey, Greylock, Swift Gulch creeks (summer steelhead)	--	LAA (Jordan Creek only, all others NLAA)	--	--	--	NLAA	--	NLAA
Streamside Incubators at Beaver and Indian Creeks (summer steelhead)	--	LAA	--	--	--	NLAA	--	NLAA
McCall Fish Hatchery	NE – bull trout not present							

LAA=Likely to Adversely Affect; NLAA=Not Likely to Adversely Affect; NE=No Effect; NFH=National Fish Hatchery

Table 19. Summary of effects to bull trout critical habitat from the Programs' activities.

Facility	Broodstock Collection	Juvenile Release	RME	Water Diversion	Effluent	Disease Manage-ment	Maintenance	
							Upland	Inwater
Oxbow Hatchery	--	--	--	NLAA (PBFs 2, 5, 7) NE (all others)	NLAA (PBFs 3, 5, 8) NE (all others)	NLAA PBFs 3, 5, 8) NE (others)	NLAA (PBF 8) NE (others)	LAA (PBFs 4 and 8) NLAA (others)

Facility	**Broodstock Collection**	**Juvenile Release**	**RME**	**Water Diversion**	**Effluent**	**Disease Manage-ment**	**Maintenance**	
							Upland	**Inwater**
Hells Canyon Trap	NLAA (PBFs 2,7, 8) NE (others)	NLAA PBFs 2, 3, 8) NE (others	--	--	--	--	--	LAA (PBFs 4 and 8) NLAA (others)
Dworshack NFH Trap	NLAA (PBFs 2, 7, 8) NE (others)	--	--	--	NLAA (PBFs 3, 5, 8 NE (others)	--	--	--
Clearwater Hatchery	--	--	--	--	NLAA (PBFs 3, 5, 8) NE (all others)	--	--	--
Rapid River Fish Hatchery	LAA (PBF 2) NLAA (PBFs 6, 7, 8) NE (all others)	NLAA (PBFs 2, 3, 8) NE (all others)	--	LAA (PBFs 2, 7) NLAA (PBFs 5, 6, 8) NE (all others)	NLAA (PBFs 3, 5, 6, 8) NE (all others)	NLAA (PBFs 3, 8, 9) NE (all others)	NLAA (PBF 8) NE (all others)	LAA (PBFs 4, 8) NLAA (PBFs 2,3,7) NE (all others)
Lower Pahsimeroi Hatchery Weir	LAA (PBF2) NLAA (PBFs 7, 8) NE (all others)	NLAA (PBFs 2, 3, 8) NE (others	--	NLAA (PBFs2, 5,7, 8) NE (all others)	NLAA (PBFs 3, 5, 6, 8) NE (all others)	NLAA (PBFs 3, 8, 9) NE (all others)	NLAA (PBF 8) NE (all others)	LAA (PBF 8) NLAA (PBFs 2, 3, 4, 7) NE (all others)
Upper Pahsimeroi Hatchery	--	NLAA (PBFs 2, 3, 8) NE (all others)	--	NLAA (PBFs2, 5,7, 8) NE (all others)	NLAA (PBFs 3, 5, 6, 8) NE (all others)	NLAA (PBFs 3, 8, 9) NE (all others)	NLAA (PBF 8) NE (all others)	LAA (PBF 8) NLAA (PBFs 2, 3, 4, 7) NE (all others)

Facility	Broodstock Collection	Juvenile Release	RME	Water Diversion	Effluent	Disease Manage-ment	Maintenance	
							Upland	Inwater
SF Salmon Satellite and Weir	LAA (PBF 2) NLAA (PBFs 7, 8) NE (all others	NLAA (PBFs 2, 3, 8) NE (all others)	--	NLAA (PBFs 2, 5, 7, 8) NE (all others)	NLAA (PBFs 3, 5, 6, 8) NE (all others)	NLAA (PBFs 3, 8, 9) NE (all others)	NLAA (PBF 8) NE (all others)	LAA (PBFs 4, 8) NLAA (PBFs 2, 3, 7) NE (all others)
Cabin and Curtis Creeks Egg Boxes (Summer Chinook)	--	--	--	--	--	--	--	Installation, operation, and removal NLAA (PBFs 2, 3, 4, 6, 8) NE (all others)
Johnson Creek Adult Collection Weir and Trap	LAA (PBF 2) NE (all others)	--	--	--	--	--	--	Seasonal Weir Installation and Removal NLAA (PBFs 2, 4) NE (all others)
Johnson Creek Screw Trap Operations (RM&E)	--	--	LAA (PBF 2) NLAA (PBF 3) NE (all others)	--	--	--	--	NLAA (PBFs 2, 4, 8) NE (all others)
East Fork Salmon River Trap	LAA (PBF 2) NLAA (PBFs 7, 8) NE (all others)	NLAA (PBFs 2, 3, 8) NE (all others)	--	NLAA (PBFs 2, 5, 7, 8) NE (all others)	NLAA (PBFs 3, 5, 8) NE (all others)	NLAA (PBFs 3, 8, 9) NE (all others)	NLAA (PBF 8) NE (all others)	LAA (PBFs 4, 8) NLAA (PBFs 2, 3, 7) NE (all others)
Sawtooth Fish	LAA (PBF 2)	NLAA (PBFs 2, 3, 8)	--	NLAA (PBFs 2, 5, 7, 8)	NLAA (PBFs 3, 5, 8)	NLAA (PBFs 3, 8, 9)	NLAA (PBF 8)	LAA (PBFs 4, 8)

Facility	Broodstock Collection	Juvenile Release	RME	Water Diversion	Effluent	Disease Manage-ment	Maintenance	
							Upland	Inwater
Hatchery Weir	NLAA (PBFs 7, 8) NE (all others)	NE (all others)		NE (all others)	NE (all others)	NE (all others)	NE (all others)	NLAA (PBFs 2, 3, 7) NE (all others)
Yankee Fork Traps	LAA (PBF 2) NLAA (PBFs 7, 8) NE (all others)	NLAA (PBFs 2, 3, 8) NE (all others)	--	--	--	--	--	--
Yankee Fork RM&E			LAA (PBF 2) NLAA (PBFs 3, 4, and 8) NE (all others)					
Streamside Incubators at Yankee Fork and Jordan Creek (Clearly, Ramey, Greylock, Swift Gulch Creeks are not designated critical habitat)	--	--	--	--	--	--	--	Installation, operation, and removal NLAA (PBFs 2, 3, 4, 8) NE (all others)
Streamside Incubators	--	--	--	--	--	--	--	Installation, operation,

Facility	Broodstock Collection	Juvenile Release	RME	Water Diversion	Effluent	Disease Manage-ment	Maintenance	
							Upland	Inwater
at Beaver and Indian Creeks (summer steelhead)								and removal NLAA (PBFs 2, 3, 4, 8) NE (all others)
McCall Fish Hatchery	No Effect							

LAA=Likely to Adversely Affect; NLAA=Not Likely to Adversely Affect; NE=No Effect; NFH=National Fish Hatchery

2.6 Cumulative Effects

The implementing regulations for section 7 define cumulative effects to include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

2.6.1 Bliss Rapids Snail

The implementing regulations for section 7 define cumulative effects to include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this Biological Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Some of the most pertinent cumulative impacts to the Bliss Rapids snail lie on lands adjacent to the Snake River corridor, but affect the water resources that are critical to the continued survival of the snail. As discussed above, the Snake River Plain Aquifer probably represents the most important single resource for the conservation of the Bliss Rapids snail, but it is heavily influenced by human use. Aquifer depletion and contamination are global problems (Foster and Chilton 2003, p. 1957, Loague and Corwin 2005, p. 1) that threaten human welfare as well as biological diversity (Deacon et al. 2007). While most of these impacts to the Snake River Plain Aquifer do not occur within the action area, the resulting impacts affect water resources in the action area via a direct pathway. As illustrated in Kjelstrom (1992), groundwater pumping has resulted in declines of spring discharges over the past 60 years. While aquifer recharge has been suggested as a partial solution to over-pumping (IWRB 2009, pp. 10-11), this may be overstated and may also increase the level or risk or aquifer contamination (Foster and Chilton 2003, pp. 1959-1961; 1967-1970).

Clark et al. (1998, p. 17) found the largest amounts of pesticides to be present in wells adjacent to agricultural areas around the Snake River between Burley and Hagerman, which are also the locations with the highest frequencies and concentrations of nitrates. Nitrate concentrations showed significant increases from 1994 through 1999 at several major springs, most with populations of the Bliss Rapids snail, (Baldwin et al. 2000, Fig. 18, pp. 22-23); these elevated concentrations are linked to heavy agricultural use (Holloway et al. 2004, pp. 4-6). The effects of these contaminants on the Bliss Rapids snail are not known, but in numerous wells these nitrate values have been recorded to exceed human health standards (Neely 2005, p. 2.7). The presence of nitrates and other contaminants (Holloway et al. 2004, pp. 4-6; Carlson and Atlakson 2006, pp. 3-5) illustrate the direct pathway from agricultural areas to the sensitive habitats of the Bliss Rapids snail and other sensitive species.

Agriculture water quality issues within the action area are not restricted to aquifer-spring sources, but are widespread in surface water sources and conveyances (e.g., streams, irrigation return canals) (Clark et al. 1998, p. 17). For that reason, the effects of water quality degradation within the Snake River and some tributaries must be considered on the river-dwelling populations of the Bliss Rapids snail. State programs to meet Total Maximum Daily Load (TMDL) requirements have met with some success, but some portions of the Snake River, including those adjacent to and upstream of known Bliss Rapids snail populations, have not met TMDL standards. In addition, TMDL criteria for the middle Snake River have only been established for a limited number of contaminants (total phosphorous, total suspended solids), and do not include other nutrients or pesticides or consider the synergistic effects of these contaminants with one another (e.g., Hoagland and Drenner 1991). In addition, such agricultural contaminants, either through ground water or irrigation returns, are regarded as nonpoint source pollutants and are not subject to regulation under the Clean Water Act.

Lastly, aquaculture facilities make up a significant amount of non-consumptive water use in the middle Snake River region, and use an estimated 2,500 cfs of groundwater before releasing that water into the Snake River. This use contributes wastes from fish food, fish metabolism, and processing (Clark et al. 1998, p. 9) as well as residual antibiotic and antiseptic compounds to the Snake River (EPA 2002, p. 4-19). While many of these facilities are permitted by the EPA under the NPDES, those facilities producing less than 20,000 pounds of fish (dry weight) per year are exempt from NPDES requirements and are not federally regulated. Most, if not all, of these issues or programs (e.g., aquifer recharge) are derived from private, local, or State initiatives and have little to no Federal oversight. As such, aquifer management and nonpoint source pollutant issues will likely continue to provide challenges into the future.

2.6.2 Bull Trout

Within the action area, there are numerous State, Tribal, local, and private actions that potentially affect bull trout. Many of the categories of on-going activities with potential effects to bull trout and bull trout critical habitat were identified in the Status of the Species and Environmental Baseline sections of this Opinion. These activities include timber harvest, road building, grazing, water diversion, residential development, and agriculture. The Service assumes that future private and State actions will continue within the action area, and will increase as human population density rises. As the human population in the action area continues to grow, demand for agricultural, commercial, and residential development is also likely to grow. The effects of new development caused by that demand are likely to reduce the conservation value of bull trout habitat within the action area.

City, state, and county governments have ongoing weed spraying programs, some with less-stringent measures to prevent water contamination. Unknown amounts of herbicides are sprayed annually (and sometimes several times a year) along road right-of-ways by state and county transportation departments. Private landholders also spray unknown chemicals in unknown amounts. Any private herbicide use could potentially combine with contaminants from other Federal and non-Federal activities, and could contribute to formation of chemical mixtures or concentrations that could kill or harm bull trout. In addition, fish stressed by elevated sediment and temperatures are more susceptible to toxic effects of herbicides. While the mechanisms for cumulative effects are clear, the actual effects cannot be quantified due to a lack of information about chemical types, quantity, and application methods used.

Ongoing actions that result in beneficial effects to fisheries resources include those actions aimed at protecting, enhancing, or restoring aquatic and riparian habitat in the basin. Activities carried out by state, tribal, and local governments under the various salmonid recovery planning efforts will continue in the future throughout the listed species' range, including the action area. For example, the Salmon Recovery Funding Board will continue to provide grants to local organizations in watersheds in the action area to restore and protect salmon habitat, and state salmon recovery plans will continue to provide a recovery framework for various fish populations in the action area. Such future tribal, state, and local government actions adhering to the plans will likely be implemented through legislation, administrative rules, policy initiatives, or permitting. Government and private actions may include changes in land and water uses (including ownership and intensity) and habitat improvements, any of which could impact listed species or their habitat. Watershed assessments and other educational programs may further reduce the adverse effects associated with land uses in the action area by continuing to raise public awareness about the potentially detrimental effects of various land uses (e.g., timber harvest, roads, and grazing) on salmonid habitat.

Although these factors are ongoing to some extent and likely to continue in the future, past occurrence is not a guarantee of a continuing level of activity. That will depend on whether there are economic, administrative, and legal impediments or safeguards in place. Therefore, although the Service finds it likely that the cumulative effects of these activities will have adverse effects commensurate with or greater than those of similar past activities; it is not possible to quantify these effects.

2.6.3 Bull Trout Critical Habitat

Within the action area, there are numerous State, Tribal, local, and private actions that potentially affect bull trout critical habitat. Many of the categories of on-going activities with potential effects to bull trout critical habitat were identified in the Status and Environmental Baseline sections of this Opinion (sections 2.3.4 and 2.4.4). These activities include timber harvest, road building, grazing, water diversion, residential development, and agriculture. The Service assumes that future private and State actions will continue within the action area, and will increase as human population density rises. As the human population in the action area continues to grow, demand for agricultural, commercial, and residential development is also likely to grow. The effects of new development caused by that demand are likely to reduce the conservation value of bull trout critical habitat within the action area.

City, state, and county governments have ongoing weed spraying programs, some with less-stringent measures to prevent water contamination. Unknown amounts of herbicides are sprayed annually (and sometimes several times a year) along road right-of-ways by state and county transportation departments. Private landholders also spray unknown chemicals in unknown amounts. Any private herbicide use could potentially combine with contaminants from other Federal and non-Federal activities, and could contribute to formation of chemical mixtures or concentrations that could impact water quality (PBF 8). While the mechanisms for cumulative effects are clear, the actual effects cannot be quantified due to a lack of information about chemical types, quantity, and application methods used.

2.7 Conclusion

2.7.1 Bliss Rapids Snail

The Service has reviewed the current status of the Bliss Rapids snail, the environmental baseline in the action area, effects of the proposed action, and cumulative effects, and it is our conclusion that the proposed action is not likely to jeopardize the continued existence of the Bliss Rapids snail. No critical habitat has been designated for the species, therefore none will be affected.

While some individuals may be killed and others disturbed as a result of maintenance activities at the spring-fed water intakes for the Hagerman National, Niagara, and Magic Valley hatcheries, any impacts will be limited in duration and spatial extent and will not amount to an appreciable change in the status, distribution, or long-term persistence of the species. The adverse effects are not expected to appreciably reduce the likelihood of survival and recovery of the Bliss Rapids snail, range-wide in terms, of numbers, distribution, or reproduction of the species.

2.7.2 Bull Trout

The Service has reviewed the current status of the bull trout, the environmental baseline in the action area, effects of the Programs, and cumulative effects, and it is our conclusion that the proposed action is not likely to jeopardize the continued existence of the bull trout. The Programs' activities adversely affecting bull trout include broodstock collection, smolt releases, RM&E activities, facility water withdrawals/diversions, and in-water facility maintenance. Some activities may be in downstream proximity to bull trout SR habitat but do not occur in that habitat. Because adverse effects are limited to individual feeding, migrating, or overwintering bull trout, the Service does not expect adverse effects at the larger population, core area, recovery unit, or rangewide levels.

2.7.3 Bull Trout Critical Habitat

The Service has reviewed the current status of bull trout critical habitat, the environmental baseline in the action area, effects of the Programs, and cumulative effects, and it is our conclusion that the ongoing action is not likely to destroy or adversely modify designated critical habitat for bull trout. The Programs are likely to adversely affect PBFs 2 (migration habitat), 4 (complex habitat), 7 (natural hydrograph), and 8 (water quality and quantity). However, the Programs' activities will only impact bull trout FMO habitat, not SR habitat. Because adverse effects are limited to discrete reaches of FMO habitat, we are not expecting adverse effects to bull trout critical habitat at the larger CHSU, CHU, or rangewide designation levels.

2.8 Incidental Take Statement

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened fish and wildlife species, respectively, without specific 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 in the definition of take in the Act means an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to listed species by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering.

Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by LSRCP, BPA, Corps, and NMFS, as the federal action agencies, for the exemption in section 7(o)(2) to apply. These requirements may become binding conditions of any authorizations or funding contracts issued to the program operators (i.e., IDFG, IPC, FWS, SBT, and NPT). The action agencies have a continuing duty to regulate the activities covered by this incidental take statement. If the action agencies (1) fail to assume and implement the terms and conditions, or (2) fail to require the program operators to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the authorization or funding contract documents, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the LSRCP, BPA, Corps, and NMFS shall require that the IDFG, IPC, FWS, SBT, and the NBT report on the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

2.8.1 Bliss Rapids Snail

2.8.1.1 Form and Amount or Extent of Take Anticipated

The Service has determined that the Programs' maintenance activities at the hatchery intake structures in springs occupied by Bliss Rapids snails at the Hagerman National, Niagara, and Magic Valley fish hatcheries are likely to result in the incidental take of snails. Incidental take will be in the form of harassment, harm, and mortality of snails located near, in, or on the intake structures through crushing, burying, desiccation, and habitat loss.

The number of snails that may be subject to incidental take is unknown. Therefore, we assume that all snails located in or on intake structures at Hagerman National and Magic Valley fish hatcheries will be subject to incidental take. Snails are not present at the Niagara Springs fish hatchery intake, but all snails within 300 feet downstream of the hatchery intake (and the intakes at Hagerman National and Magic Valley fish hatcheries) will be subject to take from sediment effects.

The incidental take limits will be exceeded if maintenance activities extend beyond the immediate vicinity of the intake structures at Hagerman National Fish Hatchery or Magic Valley Hatchery, or if sediment effects extend more than 300 feet[17] downstream from the intake structures at Niagara Springs Hatchery and Hagerman National and Magic Valley fish hatcheries. If the authorized level of take is exceeded, contact and coordinate with the Service immediately to assess the feasibility of adjusting the particular activity to allow for its continued operation.

2.8.1.2 Effect of the Take

In the accompanying Opinion, the Service determined that this level of anticipated take is not likely to jeopardize the continued existence of the Bliss Rapids snail across its range.

While some individuals may be killed and others disturbed as a result of maintenance activities at the spring-fed water intakes for the Hagerman National, Niagara, and Magic Valley hatcheries, any impacts will be limited in duration and spatial extent and will not amount to an appreciable change in the status, distribution, or long-term persistence of the species. The adverse effects are not expected to appreciably reduce the likelihood of survival and recovery of the Bliss Rapids snail, range-wide, in terms of numbers, distribution, or reproduction of the species. In addition, the proposed action contains measures to reduce the level of incidental take of Bliss Rapids snails (section 2.1.3.4).

2.8.1.3 Reasonable and Prudent Measures

The Service concludes that the following reasonable and prudent measure is necessary and appropriate to minimize the take of Bliss Rapids snails caused by the proposed action.

- Minimize the potential for harassment, harm and mortality to Bliss Rapids snails from intake maintenance activities.

[17] The Service used 300 feet for the downstream extent of suspended sediment/turbidity (as opposed to 600 feet used for bull trout [see below]) to limit the number of snails impacted by suspended sediment/turbidity. The greatest abundance values for Bliss Rapids snails are in spring habitats, where they frequently reach localized densities in the tens to thousands per square meter (Richards 2004, p. 129; Richards and Arrington 2009, Figures 1-6, pp. 23-24). In addition, compared to bull trout, Bliss Rapids snails are sedentary and unable to avoid sediment effects by swimming away.

2.8.1.4 Terms and Conditions

- Implement the Programs as described in the Assessment and this Opinion, including implementation of all applicable impact minimization measures and described in section 2.1.3.4 of this Opinion.

- During hatchery intake structure maintenance, visually monitor the downstream extent of suspended sediment/turbidity to ensure the plume does not extend further than 300 feet downstream of the intakes. If necessary, adjust maintenance activities to minimize potential sediment impacts to the Bliss Rapids snail.

2.8.2 Bull Trout

2.8.2.1 Form and Amount or Extent of Take Anticipated

The Service has determined that the Programs' broodstock collection, juvenile releases, RM&E, water withdrawals/diversions, and in-stream maintenance are likely to result in the incidental take of bull trout through capture and handling, competition and predation, reductions in available stream habitat, and increases in suspended sediment and turbidity. These effects pathways will result in incidental take of bull trout in the forms of harassment, harm, and mortality (see section 2.5.2.1 for details).

Table 20 shows the Incidental Take Limits for the Programs. The low limits for lethal take shown in Table 20 are not unreasonable to expect based on past reported capture rates, the nature of many of the activities, and the associated stress from capture and handling. We opted to provide some margin for unforeseen circumstances for activities where no or very low take has been reported in the past, without providing for excessive take. The fact that mortality is possible for some of the activities shown in Table 20 is based on reported take for a number of the activities.

Table 20. Annual incidental take limits for bull trout by Program activity (from Assessment Appendix Table A-3).

Activity	Facility/Method	Agency Operators	Funding Source	Dates of Activity	Incidental Take Limits	
					Sub-lethal	Lethal
Broodstock Collection	Hells Canyon Trap	IPC	IPC	Chinook: May-June Steelhead: mid Oct to late Nov, Mar - Apr	10	1

Activity	Facility/Method	Agency Operators	Funding Source	Dates of Activity	Incidental Take Limits	
					Sub-lethal	Lethal
	Dworshak NFH Trap	FWS	Corps	Oct - Apr	5[a]	1[a]
	Rapid River Fish Hatchery	IDFG	IPC	Apr – mid Sep	600	5
	Lower Pahsimeroi Hatchery	IDFG	IPC	Mid Feb – Apr May-Sep Mid Oct – Nov	40	1
	SF Salmon Satellite and Weir	IDFG	LSRCP	Mid Jun – Sept	20	1
	Johnson Creek Adult Collection Weir and Trap	NPT	BPA	Jun – mid Sept	60	6
	EF Salmon River Trap	IDFG	LSRCP	Mar – May	10	1
	Sawtooth Fish Hatchery Weir	IDFG	LSRCP	Mar-Apr Jun-Sep	100[b]	5[b]
	Yankee Fork Steelhead Adult Collection (Present – angling, partial weir, tangle nets : Future – permanent	SBT	LSCRP	Apr-May	5	1

Activity	Facility/Method	Agency Operators	Funding Source	Dates of Activity	Incidental Take Limits	
					Sub-lethal	Lethal
	weir proposed)					
	Yankee Fork Chinook Adult Collection (Present temporary picket weir. Future permanent weir proposed)	SBT	BPA	Jun-Sep	300[c]	15[c]
Acclimation and Release	Rapid River Hatchery	IDFG	IPC	Mar - May	All bull trout in the reach of concern See surrogate #1 below	
	SF Salmon Satellite	IDFG	LSRCP	Mar - May	All bull trout in the reach of concern See surrogate #1 below	
	EF Salmon River Trap	IDFG	LSRCP	Mar - May	All bull trout in the reach of concern See surrogate #1 below	

Activity	**Facility/Method**	**Agency Operators**	**Funding Source**	**Dates of Activity**	**Incidental Take Limits**	
					Sub-lethal	**Lethal**
	Sawtooth Fish Hatchery Weir	IDFG	LSCRP	Mar - May	All bull trout in the reach of concern See surrogate #1 below	
	Yankee Fork Streamside Incubators at Jordan Creek (summer steelhead)	SBT	TBD	Mid May through extent of steelhead rearing	All bull trout in the reach of concern See surrogate #1 below--	
	Streamside Incubators at Beaver and Indian Creeks (summer steelhead)	SBT	TBD	Mid-May - Jul	All bull trout in the reach of concern See surrogate #1 below	
RM&E	Johnson Creek Screw Trap Operations	NPT	BPA	Mar-Nov	60	6
	Yankee Fork juvenile salmonid production monitoring (rotary screw trap)	SBT	LSRCP	Mar-Nov	100	5
	Yankee Fork electrofishing monitoring of juvenile density and habitat use	SBT	LSRCP	Sep-Oct	705	15

<table>
<tr><th rowspan="2">Activity</th><th rowspan="2">Facility/Method</th><th rowspan="2">Agency Operators</th><th rowspan="2">Funding Source</th><th rowspan="2">Dates of Activity</th><th colspan="2">Incidental Take Limits</th></tr>
<tr><th>Sub-lethal</th><th>Lethal</th></tr>
<tr><td>Water Withdrawals/ Diversions</td><td>Rapid River Fish Hatchery</td><td>IDFG</td><td>IPC</td><td>Year-round</td><td colspan="2">All bull trout in the reach of concern
See surrogate #2 below</td></tr>
<tr><td rowspan="5">Maintenance – inwater</td><td>Oxbow Hatchery</td><td>IDFG</td><td>IPC</td><td>Summer work window[d]</td><td colspan="2">All bull trout in the reach of concern
See surrogate #3 below</td></tr>
<tr><td>Hells Canyon Trap</td><td>IPC</td><td>IPC</td><td>Jul 1 – Oct 15</td><td colspan="2">All bull trout in the reach of concern
See surrogate #3 below</td></tr>
<tr><td>Rapid River Fish Hatchery</td><td>IDFG</td><td>IPC</td><td>Summer work window
Nov-Dec (e.g., for intake and diversion work)</td><td colspan="2">All bull trout in the reach of concern
See surrogate #3 below</td></tr>
<tr><td>Lower Pahsimeroi Hatchery</td><td>IDFG</td><td>IPC</td><td>Summer work window</td><td colspan="2">All bull trout in the reach of concern
See surrogate #3 below</td></tr>
<tr><td>Upper Pahsimeroi Hatchery</td><td>IDFG</td><td>IPC</td><td>Summer work window</td><td colspan="2">All bull trout in the reach of concern</td></tr>
</table>

Activity	Facility/Method	Agency Operators	Funding Source	Dates of Activity	Incidental Take Limits	
					Sub-lethal	Lethal
				Apr (intake sediment removal)	See surrogate #3 below	
	SF Salmon Satellite Weir	IDFG	LSRCP	Summer work window	All bull trout in the reach of concern See surrogate #3 below	
	Cabin and Curtis Creeks Egg Boxes (summer Chinook)	SBT	LSCRP	Mid-Oct (Placement) Mid-May (Removal)	All bull trout in the reach of concern See surrogate #3 below	
	EF Salmon River Trap	IDFG	LSRCP	Summer work window	All bull trout in the reach of concern See surrogate #3 below	
	Sawtooth Fish Hatchery Weir	IDFG	LSRCP	Jul – Aug December (intake cleaning)	All bull trout in the reach of concern See surrogate #3 below	
	Yankee Fork Facilities	SBT	LSRCP	Jul - Aug	All bull trout in the reach of concern See surrogate #3 below	

[a]This take is covered in the Biological Opinion for the Clearwater Hatchery Programs (USFWS 2017a) and is identified here for illustrative purposes only; take is not additive between the two Biological Opinions.

[b] These take limits include take resulting from Snake River sockeye broodstock collection, which occurs at the same time as Chinook salmon trapping at Sawtooh Fish Hatchery. Take associated with broodstock collection for both programs is covered in this Opinion rather than the Opinion for the Snake River Sockeye Hatchery Program (USFWS 2017b), but take is not additive between the two Opinions.

[c] This take will be covered in the Biological Opinion for the Crystal Springs Hatchery Programs and is identified here for illustrative purposes only; take is not additive between the two Biological Opinions.

[d]These are the preferred work windows. If a variance to the work windows shown in Table 20 is required, coordinate with the Service.

The action agencies will exceed the authorized level of take if the above incidental take limits are exceeded or if take occurs outside the facilities/methods or the timeframes shown in Table 20.

Due to the difficulty of observing take of bull trout from the release of hatchery salmon and steelhead juveniles, water withdrawals/diversions, and instream facility maintenance the Service will use the observed probability of salmon and steelhead residualism (see Section 2.5.2.1.2), the occurrence of dewatering (see Section 2.5.2.1.4), and suspended sediment (see Section 2.5.2.1.7), respectively, as surrogates for take.

1. For the release of juvenile salmon and steelhead associated with the sites identified in Table 20, the surrogate for take is the percentage of salmon and steelhead from the releases that are observed to be either parr, precociously maturing, or precociously mature, immediately prior to release. Incidental take will be exceeded if this number is greater than 5 percent for each release group averaged over 5 years (after NMFS 2017).
2. For water withdrawals/diversions at Rapid River hatchery, authorized take will be exceeded if Rapid River is dewatered within the 1,700-foot reach between the intake and the return during critical periods (March through June and August through October) when bull trout are migrating to and from SR habitat.
3. For in-stream maintenance activities with the potential for generating suspended sediment/turbidity shown in Table 20, authorized take will be exceeded if the downstream extent of any visible sediment plume extends further than 600 feet and lasts more than 5 continuous hours.

If the authorized level of take is exceeded, contact and coordinate with the Service immediately to assess the feasibility of adjusting the particular activity or work window to allow for its continued operation.

This Incidental Take Statement remains valid until NMFS's authorizations expire.

2.8.2.2 Effect of the Take

In the accompanying Opinion, the Service determined that this level of anticipated take is not likely to jeopardize the continued existence of the bull trout across its range.

The Programs activities occur in FMO habitat[18] at the facilities shown in Table 20; as such only adult, subadult, and outmigrating/rearing juvenile bull trout will be subject to incidental take. Because adverse effects are limited to individual feeding, migrating, and overwintering/rearing bull trout, we are not expecting adverse effects at the larger population, core area, recovery unit,

[18]As discussed previously, Rapid River Hatchery is located in designated SR critical habitat; however, spawning habitat is located 3-4 miles upstream of the hatchery. No spawning occurs in the vicinity of the hatchery.

or rangewide levels. Impact minimization measures incorporated into the Programs are expected to reduce the level of incidental take.

2.8.2.3 Reasonable and Prudent Measures

The Service concludes that the following reasonable and prudent measure is necessary and appropriate to minimize the take of bull trout caused by the proposed action.

- Minimize the potential for harm and mortality to bull trout from trapping related stress and injury, competition and predation from juvenile releases, and migration delays.

2.8.2.4 Terms and Conditions

1. Implement the Programs as described in the Assessment and this Opinion, including implementation of all applicable impact minimization measures, as described in Section 2.1.3.4.
2. For the release of juvenile salmon and steelhead at sites associated with the locations shown in Table 20, visually monitor each release group and ensure that, immediately prior to release, the percentage of parr, precociously maturing, or precociously mature salmon and steelhead does not exceed 5 percent using a five-year running average, beginning with the 2018 release. If it is apparent from the numbers observed in years prior to the fifth year, that the average will exceed 5 percent before five years, the operators will contact the Service in the year the likely exceedance occurs (after NMFS 2017).
3. For water withdrawals/diversions at Rapid River, ensure that dewatering does not occur within the 1,700 feet between the intake and the return during critical periods (March through June and August through October) when bull trout are migrating to and from upstream SR habitat.
4. For suspended sediment generating activities during in-stream maintenance, visually monitor the sediment plume and adjust maintenance activities, as needed, to ensure that the plume does not extend more than 600 feet downstream or last for a duration of more than 5 continuous hours. If during a maintenance activity a sediment plume is detected 600 feet downstream of the activity, the maintenance activity shall be stopped and delayed until turbidity levels subside and methods to reduce the turbidity are implemented.

2.8.3 Reporting and Monitoring Requirement

In order to monitor the impacts of incidental take, the Federal agency or any applicant must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [(50 CFR 402.14 (i)(3)]. The LSRCP, BPA, Corps, and NMFS shall ensure through the respective funding agency's binding language that the operators annually report on compliance with this Opinion's terms and conditions.

2.8.3.1 Bliss Rapids Snail

1. Annually by March 31, for the previous calendar year, the appropriate lead agencies shall provide, as supplied by program operators, a report to the Service documenting the area

of spring habitat impacted by maintenance activities at Hagerman National Fish Hatchery and Magic Valley hatchery, and the downstream extent of suspended sediment at Niagara Springs, Hagerman National, and Magic Valley fish hatcheries The report shall include a description of the maintenance activities and the dates those activities occurred. Submit all reports to: U.S. Fish and Wildlife Service, Idaho Fish and Wildlife Office, 1387 S. Vinnell Way, Suite 368, Boise, Idaho 83709.

2.8.3.2 Bull Trout

1. Annually by March 31, for the previous calendar year, the LSRCP, BPA, Corps, and NMFS shall provide, as required through the annual contracting process, and supplied by program operators, a report to the Service documenting the number of bull trout captured and handled during implementation of the activities shown in Table 20. The report shall include the date each bull trout was captured and released, as well as general information on life history stage and condition at capture (e.g., presence of injuries). The report shall also contain the results of (1) monitoring the percentage of parr, precociously maturing, or precociously mature juvenile salmon and steelhead observed immediately prior to releases at the sites shown in Table 20; (2) visual monitoring of stream levels in Rapid River, between the hatchery intake and return, during critical times when bull trout are migrating to and from SR habitat (July – October); and (3) visual monitoring of the extent and duration of turbidity plumes generated during instream maintenance work. Submit all reports to: U.S. Fish and Wildlife Service, Idaho Fish and Wildlife Office, 1387 S. Vinnell Way, Suite 368, Boise, Idaho 83709.
2. In the event that the number of bull trout incidentally killed by broodstock collection and RM&E activities exceeds the limits set forth in Table 20, immediately cease the activity resulting in death, and notify the Service's Idaho Fish and Wildlife Office (IFWO) (208-378-5253). Such notification must be followed up in writing to the IFWO within 3 working days, at which time the agency or operator must provide a report of the circumstances that led to the mortality, including: date, time, and precise location; disposition of the dead or injured bull trout[19]; and a description of the changes in activity protocols that will be implemented to reduce the likelihood of such injury or mortality from reoccurring. The incident should also be discussed in the annual report that is subsequently submitted.

2.9 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 programs, or to develop new information on listed species.

[19] Designated depository: The Idaho Museum of Natural History, Dr. C. R. Peterson, Curator of Fish, Campus Box 8007, Idaho State University, Pocatello, Idaho 83209.

2.9.1 Bliss Rapids Snail

1. Work with partners on securing, restoring, and maintaining free-flowing mainstem habitats between the C.J. Strike Reservoir and American Falls Dam, and securing, restoring, and maintaining existing cold-water spring habitats.
2. Work with partners on rehabilitating, restoring, and maintaining watershed conditions (specifically cold, unpolluted, well-oxygenated flowing water with low turbidity in spring and mainstem habitats).
3. Monitoring populations and habitat to further define life history, population dynamics, and habitat requirements.

2.9.2 Bull Trout

1. Coordinate bull trout recovery with listed anadromous fish species recovery in the Salmon River Geographic Region.
2. In order to increase our understanding of bull trout movements in the mainstem lower Snake and Columbia rivers and interactions between subbasin bull trout populations, work with partners to collect genetic samples (e.g., fin clips) from all un-marked bull trout that are handled in the mainstem (e.g., Lower Granite Dam adult trap) or lower reaches of tributary subbasins to establish origin. In addition, these same fish should be PIT-tagged if possible so their movements could be determined from the wide array of PIT detection sites at the mainstem dams and within tributary subbasins (Barrows et al. 2016, pp. 199-200).

2.10 Reinitiation Notice

This concludes formal consultation on the continued operation of the Snake River Sockeye Salmon Hatchery Program. 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 maintained (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 that was not considered in this Opinion.
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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4. APPENDICES

4.1 Appendix A. Addendum to the Hells Canyon and Salmon River Steelhead and Spring/Summer Chinook Salmon Program Biological Assessment

Additions to sections of "Hells Canyon and Salmon River Steelhead and Spring/ Summer Chinook Salmon Programs" Biological Assessment

Jonathan D. Ebel, Research Biologist, Shoshone-Bannock Tribes' Fish and Wildlife Department

Notes:

(1) Sections where changes or additions are described are indicated in the bolded/ italicized/ underlined text. When only small additions are made, the original paragraph is copied into this document and suggested additions are in bold text.
(2) Tables 1, 2, and 3 at the end of this document summarize bull trout data collected during activities funded Lower Snake River Compensation Plan from 2013-2016. These data are used to determine the take request outlined in Table 4, which elaborates on Appendix Table A-3 in the original document.

Table 6-3:

Row – Yankee Fork Weir/Trap, Column - Upper Salmon River Salmon A – Run/ B-Run/ Chinook (i.e., 3 columns)

Add: Natural production monitoring with Rotary screw traps

Section 8.2.2 (p. 117, third paragraph)

Disturbance of Bull Trout may occur from hatchery operation activities (adult collection, holding, and spawning; incubation; juvenile rearing; routine on-station maintenance), fish health activities, water withdrawals, discharge of effluent, releases of juvenile spring Chinook and steelhead, installation, removal and operation of streamside incubators, and upland or in-water maintenance actions. The only research, monitoring and evaluation activities (RM&E) that are part of the proposed action are those directly-related to monitoring of hatchery success for the Johnson Creek spring/summer Chinook Salmon collection, and subsequent juvenile screw trap operations. **SBT also conducts RM&E related to the success of hatchery programs including the Yankee Fork Chinook Program and the Upper Salmon River B-Run Steelhead Program. SBT operates a weir to enumerate returning adults spring Chinook (YF Chinook Program), a rotary screw trap to monitor natural juvenile production and hatchery juvenile success (YF Chinook and B-run steelhead programs), and regular electrofishing to monitor the success of steelhead streamside incubation projects (B-run steelhead program) and trends in natural origin fish abundance.** The IDFG-operated Hells Canyon and Salmon River Programs are not directed at the take of Bull Trout, however, there is a low likelihood for incidental take of Bull Trout from the operation of hatchery programs.

Table 8-4 (p 138)

Row for Yankee Fork (facility), Column -> Activity: Add "monitoring natural production with rotary screw trap" to both USR B-run steelhead and Upper salmon Chinook salmon.

Section 8.2.4.8 (p. 177)

The Shoshone-Bannock Tribes' (SBT) Fish and Wildlife Department conducts extensive research, monitoring, and evaluation programs in the Yankee Fork Salmon River basin. The lower section of Yankee Fork is contains FMO habitat and the upper section and tributaries of Yankee Fork contain SR habitat. Yankee Fork programs include physical habitat monitoring, Chinook and steelhead smolt releases, juvenile salmonid production monitoring, adult Chinook enumeration, spawning ground surveys, salmon carcass nutrient supplementation, and adult steelhead brookstock collection.

Rotary screw trap

Juvenile production monitoring in the Yankee Fork is conducted with a rotary screw trap for measuring juvenile salmonid out-migration of fish species in the basin and to estimate habitat-specific juvenile production. A rotary screw trap (RST) is typically operated from March – November (Table 1) with operation stoppages during high flows and smolt releases. The live box of the RST is checked daily and both target and non-target fish are transported in river water and transported to a nearby trailer where salmonid individuals >70mm fork length are aneasthetized with Eugenol, measured for weight and length and marked with PIT tags. Operation of the rotary screw trap probably adversely affects bull trout. Juvenile bull trout are captured in the trap during summer and fall operation, which delays their passage downstream and exposes them to handling and tagging. Young -of-the-year are rarely, if ever, captured in the RST suggesting that these individuals remain in their tributary habitats until later in life and are uninfluenced by SBTs' juvenile trapping activities. Individuals > 250mm (i.e., individuals assumed to be adults) were captured in the RST only during 2015 (Table 1). While no lethal take has been recorded in past data collection, lethal take may occur in the future due to a variety of factors.

Effects on Critical Habitat

Installation and removal of the rotary screw trap in March and November, respectively causes minor, short-lived changes in physical habitats. The installation/ removal process includes assembling the trap while in the stream (river right facing downstream) next to the Yankee Fork road. This action includes up to four people working in up to 25% of the width of the stream for a maximum of eight hours. The rotary screw trap is checked daily, where one or two technicians traverse 1-6m of streambed to access the trap. Effects on critical habitat (PBF #8) may include changes in sediment delivery and stream bank characteristics (PBF #4).

> <u>Sediment</u>: The installation, operation and removal may generate minor amounts of sediment in a portion of the action area. Effects of the action will be short term during installation and near non-existent post-installation. Walking in the stream (≤ 4 people) is likely to create small plumes of suspended fines up to 6 m downstream, however, sediment pulses will be narrow and volume so small that it will rapidly disperse or fall-out.
>
> Turbidity increases associated with the project work is expected to last less than 24 hours and then return to pre-installation /operation/ removal levels. Given the limited time that installation or removal occurs, it is extremely unlikely that sediment delivery to the

stream channel would occur in sufficient quantities to measurably increase turbidity within the action area. Effects to fish from possible increased sediment/turbidity will be insignificant and immeasurable.

Width:Depth Ratio, Streambank Condition, and Riparian Conservation Areas: The installation / operation/ and removal of the rotary screw trap has the potential to affect the width: depth ratio, streambank condition, and riparian vegetation only at the proposed site and will not affect these indicators elsewhere in the action area. These indicators will primarily be affected by installation / removal activities and to a lesser extent by daily operation. No significant impacts are expected to the in-stream and riparian habitat during installation and operation. No major vegetation removal is anticipated, but very minor riparian vegetation degradation may occur during installation, operation, and removal. Technicians travel from the road, down the streambank and into the river. Over previous years of operation, a distinct path has formed and erosion is minimized by the placement of gravel-filled bags to act as steps.Therefore, the effects of the proposed action on these indicators are expected to be insignificant.

Similarly, while sediment delivery is expected, it is extremely unlikely that sediment delivery to the stream channel would occur in sufficient quantities to measurably degrade the width/max depth ratio within the action area given the limited extent of in-channel activities.

Adult Chinook enumeration – Pole Flat weir

SBT operates a portable picket weir from June – September to monitor returns of natural and hatchery origin adult Chinook salmon to the Yankee Fork (Table 2). The weir is located near Pole Flat Campground, about 5.2 km upstream from the confluence of the Yankee Fork and the mainstem Salmon River. The weir is checked at least once daily and all fish captured in the weir trap, including bull trout are anaesthetized with a low concentration Eugenol solution in a large insulated cooler filled with fresh river water, visually inspected for existing marks and general physical condition, scanned for internal tags, and measured for weight and length. Fish are placed in a live well until they have recovered from handling before being released upstream of the weir. Bull trout tagged at the Pole Flat weir have been recaptured or detected on the Valley Creek PIT array and Redfish Lake trap in autumn and often return to the Yankee Fork in late June-early July. PIT tags detected at, or placed in bull trout from 2013-2016 resulted in 1092 detections of bull trout throughout the upper Salmon River basin. When fully analyzed, this movement data corroborates earlier ratio telemetry data from bull trout and will be useful for future monitoring of the effects of the proposed action on bull trout populations using the Yankee Fork Salmon River. Bull trout captures at SBTs' portable picket weir are summarized in Table 2. In addition, SBT plans to construct a permanent weir as part of the Crystal Springs Hatchery (Chinook hatchery program) between 2018 and 2020. The construction of this weir is included in proposed actions under separate consultation; the effects of construction are not considered here. However, operational effects of this weir and the associated M&E activity do fall under the purview of this proposed action. Operation of the picket weir adversely affects bull trout by delaying passage and exposing individuals to handling and tagging stress. Additional effects of the picket weir are summarized in Table 2.

Effects on Critical Habitat

Installation and removal of the picket weir at Pole Flat in June and September, respectively causes minor, short-lived changes in physical habitats. The installation process includes assembling the weir while in the stream by ≤ 10 people for two days. During this process, large metal pieces are assembled across the streambed, which occasionally requires levelling large panels in the stream by moving large rocks with a pry bar. The weir is checked daily, where one or two technicians access the trap using a catwalk, thus do not influence the streambed. Removal of the weir involves two to four people removing individual pieces for short periods over multiple days. Operation of the picket weir is expected to impede migratory movements of bull trout. Construction of the permanent weir is being addressed through a separate consultation effort and will not be addressed here; operation effects are expected to impact migratory movements of bull trout. Effects on critical habitat may include changes in sediment delivery (PBF #8) and stream bank characteristics (PBF #4), as well delaying migratory movements (PBF #2).

> <u>Sediment</u>: The installation and removal of the weir may generate minor amounts of sediment in a portion of the action area. Effects of the action will be short term during installation and near non-existent post-installation. Walking in the stream (≤ 10 people) is likely to create small plumes of suspended fines up to 6 m downstream that persists for 8 h per day for two days, however, sediment pulses are so small that it will rapidly disperse or fall-out.
>
> Turbidity increases associated with the project work is expected to last less than 24 hours total and then return to pre-installation / removal levels. Given the limited time that installation or removal occurs, it is extremely unlikely that sediment delivery to the stream channel would occur in sufficient quantities to measurably increase turbidity within the action area. Effects to fish from possible increased sediment/turbidity will be insignificant and immeasurable.
>
> <u>Width:Depth Ratio, Streambank Condition, and Riparian Conservation Areas</u>: The installation and removal of the picket weir has the potential to affect width: depth ratio, streambank condition, and riparian vegetation only at the proposed site and will not affect these indicators elsewhere in the action area. These indicators will primarily be affected by installation / removal activities and to a lesser extent by daily operation. No significant impacts are expected to the riparian habitat during installation and operation. No major vegetation removal is anticipated, but very minor riparian vegetation degradation may occur during installation, operation, and removal. Technicians travel from the road, down the streambank and into the river during installation and removal or onto the catwalk during daily operation. Over previous years of operation, a distinct path has formed and erosion is minimized by the placement of gravel-filled bags to act as steps. Levelling of weir panels and the trapbox changes instream habitat for a 1 m wide transect of the river. Overall, the effects of the proposed action on these indicators are expected to be insignificant.
>
> Similarly, while sediment delivery is expected, it is extremely unlikely that sediment delivery to the stream channel would occur in sufficient quantities to measurably degrade the width/max depth ratio within the action area given the limited extent of in-channel activities.

Migratory Movements: Operation of the weir (picket or permanent) adversely affects migration habitats by impeding volitional movements of bull trout during Chinook salmon collection time frames (late upstream migration and early downstream migration). These delays may impact reproductive efforts in upstream SR habitats and predispose adults to sub-optimal water conditions, or prevent timely movements to downstream FMO habitats where food sources are more abundant.

Adult Chinook and steelhead enumeration – Permanent PIT array

In conjunction with the portable Chinook weir, the SBT collaborates with BioMark to operate a permanent stream-wide PIT array on the lower Yankee Fork. This piece of equipment allows SBT to monitor real time movements of salmonids into and out of the Yankee Fork. This piece of equipment has shown that bull trout move between Yankee Fork and Redfish Lake/ Valley Creek, arriving in the Yankee Fork at the same time year after year, nearly to the day. PIT array maintenance may adversely affect bull trout by displacing them during instream adjustments of array panels; however this maintenance is rare, constrained in time, occurring immediately after peak snowmelt, and occurring in FMO habitat.

Effects on Critical Habitat

The Yankee Fork PIT array was installed in 2012. Its future effects on in-stream and riparian habitat are limited to occasional adjustments and evaluation of array panels. The evaluation and adjustment process includes temporary disturbance of the streambed by 1-2 people over a couple of hours once per year, typically after peak run-off. Effects on critical habitat may include changes in sediment delivery (PBF #8) and stream bank characteristics (PBF #4).

Sediment: The adjustment and evaluation of array panels may generate minor amounts of sediment in a portion of the action area. Effects of the action will be short term. Walking in the stream is likely to create small plumes of suspended fines up to 6 m downstream that persists for up to 2 h once per year, however, sediment pulses are so small that it will rapidly disperse or fall-out.

Turbidity increases associated with the project work is expected to last less than 24 hours total and then return to pre-adjustment/ evaluation levels. Given the limited time that this action occurs, it is extremely unlikely that sediment delivery to the stream channel would occur in sufficient quantities to measurably increase turbidity within the action area. Effects to fish from possible increased sediment/turbidity will be insignificant and immeasurable.

Width:Depth Ratio, Streambank Condition, and Riparian Conservation Areas: The adjustment and evaluation of the PIT array has the potential to affect width: depth ratio, streambank condition, and riparian vegetation only at the proposed site and will not affect these indicators elsewhere in the action area. No significant impacts are expected to the riparian habitat during adjustment and evaluation. No major vegetation removal is anticipated, but very minor riparian vegetation degradation may occur during this activity. Technicians travel from the road, down the streambank and into the river to check the array. Some forbs and streamside grasses could be trampled by operators, but these plants will likely grow back or rebound immediately. Therefore, the effects of the proposed action on these indicators are expected to be insignificant.

Similarly, while sediment delivery is expected, it is extremely unlikely that sediment delivery to the stream channel would occur in sufficient quantities to measurably degrade the width/max depth ratio within the action area given the limited extent of in-channel activities.

Steelhead broodstock collection

SBT began collecting adult steelhead during April and early May to provide broodstock of A-run and B-run steelhead to Pahsimeroi Fish Hatchery in 2016. For this effort, SBT constructs two temporary picket weirs on side channel habitats. Due to the inefficacy of these weirs, SBT also uses tangle nets in side channel habitats to collect adult steelhead. These actions may adversely affect bull trout in the immediate vicinity by disturbing or capturing individuals; however, SBT has not encountered bull trout during these activities to date. Yet, that does not mean SBT will never will encounter bull trout.

In addition, SBT plans to construct a permanent weir as part of the Crystal Springs Hatchery (Chinook hatchery program) between 2018 and 2020. The construction of this weir is included in proposed actions under separate consultation; the effects of construction are not considered here. However, operational effects of this weir and the associated M&E activity do fall under the purview of this proposed action. This weir will allow SBT to enumerate adult steelhead moving into the Yankee Fork to spawn and allow SBT to collect a greater number and diversity of individuals for use as locally adapted broodstock. The weir will capture fish moving into the Yankee Fork at higher efficiencies than previous collection activities, including bull trout. Evidence from PIT array detections of bull trout suggests that few bull trout are migrating through this area during steelhead collection activities. Steelhead collection occurs in March and April, whereas bull trout movements begin in early June and cease in late September. Thus, steelhead broodstock collection may adversely affect bull trout if they are migrating outside their normal migration window by delaying their migration and subjecting them to handling and tagging stress.

Effects on Critical Habitat

Critical habitat analysis for this activity is similar to the installation, operation, and removal of the Pole Flat weir (see above) including temporary sediment plumes (PBF #8), minor localized trampling of riparian vegetation around streamside habitats (PBF #4), and temporary delays in migration (PBF #2).

Electrofishing

Electrofishing in the mainstem Yankee Fork and its tributaries occurs during some years as part of long term population trend monitoring and to ask specific questions such as “what is the effect of carcass outplants on salmonid growth and density?” or “what factors determine the spatial distribution of native fishes in the Yankee Fork?” Electrofishing consists of single pass survey sampling, two pass mark-recapture technique, and triple-pass depletion techniques depending on the question being asked. Typically, adverse effects to bull trout are more frequent due to capture by electrofishing when SBT samples tributary habitats (Table 3). There is substantial inter-annual variability in number of bull trout handled explained by interannual variability in the amount and type of electrofishing effort and the river segments sampled.

Effects on Critical Habitat

The electrofishing in the Yankee Fork includes temporary disturbance of the streambed by ≤ 8 people over a couple of hours once per year in various areas of mainstem and tributary habitats, typically during September and October. Effects on critical habitat may include changes in sediment delivery (PBF #8) and stream bank characteristics (PBF #4).

> Sediment: Walking in the stream during sampling may generate minor amounts of sediment in a portion of the action area. Effects of the action will be short term. Walking in the stream is likely to create small plumes of suspended fines up to 6 m downstream that persists for up to 8 hrs in a location once per year, however, sediment pulses are so small that it will rapidly disperse or fall-out.
>
> Turbidity increases associated with the project work is expected to last less than 24 hours total and then return to pre-sampling levels. Given the limited time that this action occurs, it is extremely unlikely that sediment delivery to the stream channel would occur in sufficient quantities to measurably increase turbidity within the action area. Effects to fish from possible increased sediment/turbidity will be insignificant and immeasurable.
>
> Width:Depth Ratio, Streambank Condition, and Riparian Conservation Areas: Sampling by electrofishing has the potential to affect width: depth ratio, streambank condition, and riparian vegetation only at the proposed site and will not affect these indicators elsewhere in the action area. No significant impacts are expected to the riparian habitat during sampling. No major vegetation removal is anticipated, but very minor riparian vegetation degradation may occur during this activity. Technicians travel in and out of the stream at set points and across the floodplain to sample processing areas. Some forbs and streamside grasses could be trampled by samplers, but these plants will likely grow back or rebound immediately. Therefore, the effects of the proposed action on these indicators are expected to be insignificant.
>
> Similarly, while sediment delivery is expected, it is extremely unlikely that sediment delivery to the stream channel would occur in sufficient quantities to measurably degrade the width/max depth ratio within the action area given the limited extent of in-channel activities.

Spawning Ground Surveys

SBT conducts annual spawning ground surveys of the mainstem Yankee Fork from the confluence of 12-mile Creek and Yankee Fork to the confluence of Yankee Fork with the mainstem Salmon River, as well as surveying the lower two miles of 8-Mile Creek. Spawning ground surveys consist of walking in the stream or stream margins while counting and geo-referencing Chinook redds and carcasses. These surveys are conducted in both SR habitat (i.e., upper Yankee Fork and 8-Mile Creek) and FMO habitat (i.e., lower Yankee Fork). Spawning ground surveys in SR habitat may temporarily disturb bull trout adults and juveniles encountered while walking. Number of bull trout redds encountered are not recorded, but are anecdotally rare and technicians are advised to walk stream margins when redds are encountered. Thus, disturbance-related adverse effects are short-lived and occur at the level of the individual rather than the population.

Effects on Critical Habitat

Spawning ground surveys in the Yankee Fork include temporary disturbance of the streambed by 1-2 people over a longitudinal section of stream bed between 4 and 10 km depending on the section typically during August and September. Effects on critical habitat may include changes in sediment delivery (PBF #8) and stream bank characteristics (PBF #4). Changes in sediment delivery will occur during in-stream travel over a 2-6 hour period on each of 4-6 days per section and will be similar in magnitude to a single moose walking down the river. Effects on riparian habitats are limited to minor vegetation trampling when it is unsafe to walk in the stream, but these plants will likely grow back or rebound immediately.

Physical habitat monitoring

Physical mainstem Yankee Fork habitat monitoring activities are unlikely to influence bull trout populations in this basin and may adversely affect individual bull trout because these activities occur in FMO habitat when bull trout may be present. Habitat monitoring consists of walking in the stream and making observations of habitat system, stream width, and channel gradient. There is no physical disturbance of habitat; however bull trout may be temporarily displaced from their preferred habitats when technicians are in the stream channel taking measurements. SBT does not know how many bull trout have been displaced by past habitat monitoring activities. Effects on critical habitat are similar to spawning ground surveys.

Carcass nutrient supplementation

Chinook carcasses from Sawtooth hatchery are distributed throughout sections of lower and middle Yankee Fork below 5-Mile Creek. The goal of carcass outplants is to mitigate the effects of low Chinook salmon returns on the food webs in the Yankee Fork. Generally, these carcass outplants occur in FMO habitat and are used as a food source for migrating pre- and post-spawn bull trout. Carcass outplants probably have a positive effect on bull trout by providing additional food resources. Carcasses are dumped off of bridges into the river, adding nutrients and enhancing aquatic invertebrate populations, thus providing beneficial effects to PBF #3.

Table 1. Summary of bull trout data collected at the rotary screw trap in Yankee Fork from 2014-2016.

Capture method	Year	Dates in operation	Size class	No. bull trout captured	Fork length (mm; mean ± 1SD)	No. of individuals recaptured	No. of individuals PIT tagged	No. of known mortalities
Rotary screw trap	2016	31 Mar – 07 Nov	< 250mm	68	212 ± 35	0	63	0
			> 250mm	0	N/A	N/A	N/A	N/A
	2015	25 Mar – 11Nov	< 250mm	21	228 ± 25	0	21	0
			> 250mm	23	365 ± 96	0	23	0
	2014	04 Apr – 04 Nov	< 250mm	33	173 ± 29	0	32	0
			> 250mm	0	N/A	N/A	N/A	0

Table 2: Bull trout captured at adult Chinook weir in the Yankee Fork from 2013-2016.

Year	Dates in operation	No. of individuals captured	Fork length (mm; mean ± 1SD)	No. of individuals recaptured	No. of individuals PIT tagged	No. mortalities[1]
2013	13Jun-24Sep	207	440 ± 99	30	177	2
2014	19Jun – 19Sep	124	471 ± 54	34	90	10
2015	09Jun-20Sep	21	482 ± 74	7	14	3
2016	15Jun-11Sep	105	480 ± 80	20	85	5

[1]Mortalities are not directly associated with tagging efforts. Bull trout mortalities are found on the upstream side of the weir fence an average of 1 week after being handled at the weir. Some mortalities from 2013-2016 were recaptured fish. Based on SBT observations, these fish are moving back downstream when they try to force themselves through the weir pickets and consequently die. To avoid mortalities by this mechanism, SBT actively monitors the weir face twice daily to allow these fish to pass by lifting the pickets on the fence when they occur.

Table 3. Summary of bull trout data collected by electrofishing in the mainstem Yankee Fork and tributaries.

Section	Year	No. of individuals captured	Fork length (mm; mean ± 1SD)	No. of individuals PIT tagged	No. of mortalities
Mainstem Yankee Fork	2013	167	125 ± 41	81	1
	2014	-	-	-	-
	2015	9	180 ±28.3	9	0
	2016	5	153 ± 30	5	0
Yankee Fork Tributaries	2013	-	-	-	-
	2014	470	107 ± 48	258	9
	2015	-	-	-	-
	2016	44	95 ± 31	20	0

Table 4. Additional information for "Summary of effects determination on bull trout populations in core areas of the Upper Snake River Recovery Unit affected by the proposed action" (Appendix Table A-3). Sublethal take was determined as ca. 150% of the maximum number of bull trout handled during that activity in any year from 2013-2016. Lethal take was determined as 150% of the maximum number of bull trout mortalities occurring in any year.

Core Area	Facility	Activity	Dates of Activity	Effects	Determination	Bull Trout Take Estimate LAA activities
Upper Salmon Core Area	Yankee Fork	Physical habitat monitoring	June - Sept	Temporary displacement of bull trout due to in-stream measurements of habitat	LAA	Request sublethal take of 300 bull trout per year.
		Chinook adult collection (Present – temporary picket weir: Future – permanent weir)	June - Sept	Migratory delay, handling and tagging stress, modification of migration pattern	LAA	Request sublethal take of 300 bull trout per year, maximum lethal take of 15 individuals
		Steelhead adult collection (Present: temporary picket weirs on side channel habitats and tangle nets/ Future – permanent weir)	April – May	Bull trout are rarely encountered in the lower Yankee Fork during April and early May, but individuals captured during Steelhead adult collection would be subject to handling stress and tagging.	LAA	Request sublethal take of 5 bull trout, maximum lethal take of 1 bull trout.
		Juvenile salmonid production monitoring (rotary screw trap)	March-Nov	Handling stress, tagging stress, migration delay.	LAA	Request sublethal take of 100 bull trout per year, maximum lethal take of 5 bull trout

	Acclimation / release of Chinook and steelhead smolts	March-May	FMO habitat only; releases below SR habitat	NLAA	NA
	Carcass nutrient supplementation	Aug-Sept	FMO habitat only; provides additional resources which probably benefit bull trout	NLAA	NA
	Electrofishing monitoring of juvenile density and habitat use	Sept - Oct	Both FMO and SR habitat depending on the year. Electrofishing exposes fish to shocking stress and handling stress.	LAA	Request sublethal take of 705 bull trout, maximum lethal take of 15 bull trout
	Spawning ground surveys	Aug-Sept	Both FMO and SR habitats. Exposes individual fish to temporary displacement.	LAA	NA
Yankee Form streamside incubators @ Jordan, Cearly, Ramey, Greylock, Swift Gulch creeks	Installation and Removal (Section 8.2.4.6)	May – July	At Jordan Creek placement in proximity to SR habitat for bull trout may temporarily displace rearing juveniles; minor turbidity associated with anchoring of egg boxes to substrate. Placement does not overlap with spawning incubation periods No SR habitat in other creeks; FMO habitat not indicated in USFWS (2010b). However, proximity to SR habitat in Yankee Fork for Greylock and Swift Gulch indivates potential effects similar to Jordan Creek.	NLAA	NA

	Impacts to bull trout insignificant in Ramey and Cleary creeks

4.2 Appendix B. Bull Trout Protocol at Dworshak National Fish Hatchery

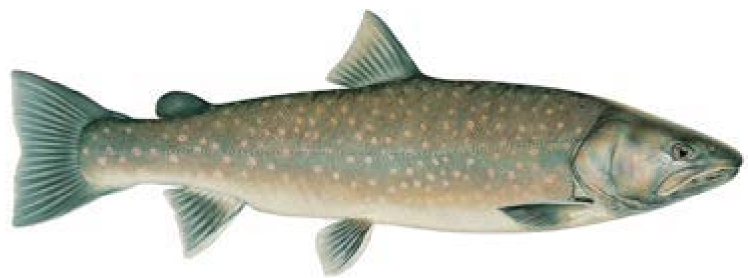
Bull Trout Protocol – DNFH

Updated September 28 2017

Bull Trout Protocol at Dworshak National Fish Hatchery

1. Please familiarize yourself with the September 28, 2017 memorandum from the DNFH Complex Manager entitled; "*Bull Trout Trapping at DNFH Guidance 9 28 17*" so you fully understand the importance of this protocol. Also, please ensure you are able to identify a bull trout by knowing its morphological characteristics. There is a picture of a bull trout in the vicinity of the sorting table and at the bottom of this protocol.
2. All fish species spawned at Dworshak Fish Hatchery will be anesthetized in the loading basket according to label as appropriate. Once sufficiently docile, the basket of fish is lifted up and spilled onto the sorting table.
3. As the anesthetized fish are raised in the basket begin looking immediately for any bull trout. Bull trout are to be removed and processed first.
4. Note and record the following onto the paper *Bull Trout Log* posted in the spawning area:
    a. Date and time;
    b. Fork length;
    c. Fish condition at handling (Excellent, Good, Poor);
    d. If condition is "Poor" describe why;
    e. Visible marks or tags, and any other pertinent information;
    f. Fish condition at release (added to the log after released).

5. Processing the bull trout should take less than a minute. After collecting and recording data, place the fish into the tub of fresh water located at the end of the CWT scanner. Take one of the red plastic fish transport tubes and fill it three-quarters with fresh water. Gently and quickly place the fish into the transport tube.
6. Immediately carry the bull trout in the transport tube to the fence gate located north of the System 1 Clarifiers. Carefully navigate the rip rap and gently release the fish into the North Fork Clearwater River, noting its condition at release. Add this information to the *Bull Trout Log*.
7. After spawning is concluded, enter the information from the *Bull Trout Log* into the FINS or other appropriate database, and into the appropriate file in the hatchery shared drive. Paper copies of the *Bull Trout Log* should be retained as well.
8. The Production Biologist in charge of the specie and brood year being trapped (or their designee) should send an email describing the bull trout incidental take with all data collected on the same day it occured. The email should be sent to both of the Assistant Hatchery Managers, the Hatchery Manager, the SRBA Coordinator, the Idaho FWCO Project Leader, and the Dworshak Fisheries Complex Manager. This redundant record keeping and communication will ensure all bull trout collections are properly documented and shared.



Bull Trout: Note the light spots on a dark background and clear fins with no markings.