United States Department of the Interior

FISH AND WILDLIFE SERVICE
Idaho Fish and Wildlife Office - Chubbuck
4425 Burley Drive, Suite A
Chubbuck, Idaho 83202
fws.gov/Idaho

In Reply Refer to:
FWS/R1/ES/IFWO/2023-0094359-S7-001

Date: 08/02/2023

Johnathan LeBlanc, District Ranger
Salmon-Challis National Forest
Lost River Ranger District
716 West Custer
Mackay, Idaho 83251

Subject: Warm Creek Bull Trout Protection Project – Lemhi County, Idaho – Biological Opinion

Dear Johnathan LeBlanc:

This letter transmits the U.S. Fish and Wildlife Service's (Service) biological opinion (Opinion) on the effects of the subject action to species and habitats listed under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.; [Act]). In a letter dated May 2, 2023, and received by the Service on May 3, 2023, the Salmon-Challis National Forest (Forest) requested consultation under section 7 of the Act. Your letter included a biological assessment describing effects of the subject action to bull trout (*Salvelinus confluentus*) and its designated critical habitat.

Through the Assessment, the Forest determined the subject action may affect, and is likely to adversely affect, bull trout. Our Opinion concludes the subject action will not jeopardize the continued existence of bull trout. The Forest also determined the subject action may affect, and is likely to adversely affect, bull trout designated critical habitat. Our Opinion concludes the subject action will not destroy or adversely modify bull trout designated critical habitat.

Thank you for your continued interest in the conservation of threatened and endangered species. If you have any questions regarding this consultation, please contact Alicia Parlette of this office at (208) 237-6975 or alicia_parlette@fws.gov.

Sincerely,

ELLIOT TRAHER

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Date: 2023.08.02 12:54:59 -06'00'

for Lisa Ellis
State Supervisor

cc: SCNF, Mackay (Gamett, Krieger, Comer)

BIOLOGICAL OPINION
FOR THE
WARM CREEK BULL TROUT PROTECTION PROJECT
2023-0094359

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

___________**Elliot Traher for**_____________
Lisa Ellis
State Supervisor

Date ____________08/02/2023_______________

Table of Contents

List of Tables

List of Figures

1. BACKGROUND

1.1 Introduction

This document represents the U.S. Fish and Wildlife Service's (Service) biological opinion (Opinion) on the effects to bull trout (*Salvelinus confluentus*) and its designated critical habitat from the proposed bull trout protection project. In a letter dated May 2, 2023, and received May 3, 2023, the Salmon-Challis National Forest (Forest) requested formal consultation with the Service under section 7 of the Endangered Species Act of 1973, as amended (16 USC 1531 et seq.; [Act]).

This Opinion is primarily based on the Forest's biological assessment entitled *Fish Species Biological Assessment for the Warm Creek Bull Trout Protection Project* (USFS 2023, entire), dated May 1, 2023, and other sources of information cited herein. The biological assessment (Assessment) is incorporated by reference in this Opinion.

1.2 Consultation History

A chronology of this consultation is presented below. A complete decision record for this consultation is on file at the Service's Idaho Fish and Wildlife Office in Chubbuck, Idaho.

April 3, 2023	The Forest sends the draft biological assessment to the Service for review.
April 18, 2023	The Service sends comments back to the Forest.
April 25, 2023	The Forest provides comment responses back to the Service.
April 26, 2023	The Service discusses the draft biological assessment at the Level 1 meeting and accepts it as final.
May 3, 2023	The Service receives the final biological assessment and a letter from the Forest requesting formal consultation on the proposed action.

2. PROPOSED ACTION

This section describes the proposed Federal action, including any measures that may avoid or minimize adverse effects to listed species or critical habitat, and the extent of the geographic area affected by the action. 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" (50 CFR 402.02).

2.1 Action Area

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” (50 CFR 402.02). An action includes activities or programs “directly or indirectly causing modifications to the land, water, or air” (50 CFR 402.02). In this case, the area where land, water, or air is likely to be affected includes the 5 meter (m) section of stream where the barrier will be installed and the 120 m section of Warm Creek between the barrier and the confluence with Sawmill Creek in Lemhi County, Idaho (Assessment, p. 4) (Figures 1-3).

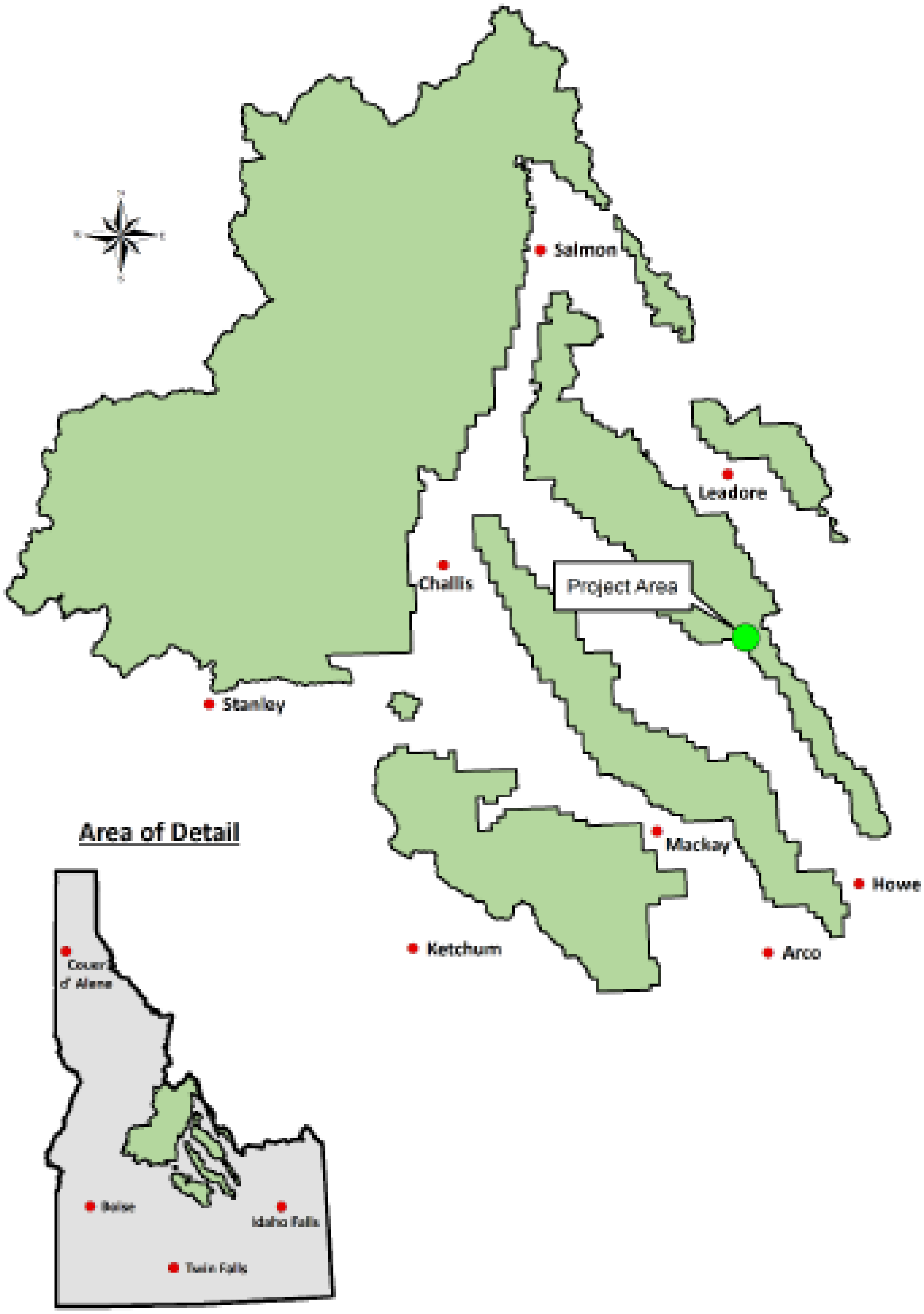

Figure 1. General location of the project relative to the Salmon-Challis National Forest (green shaded area) and local communities.

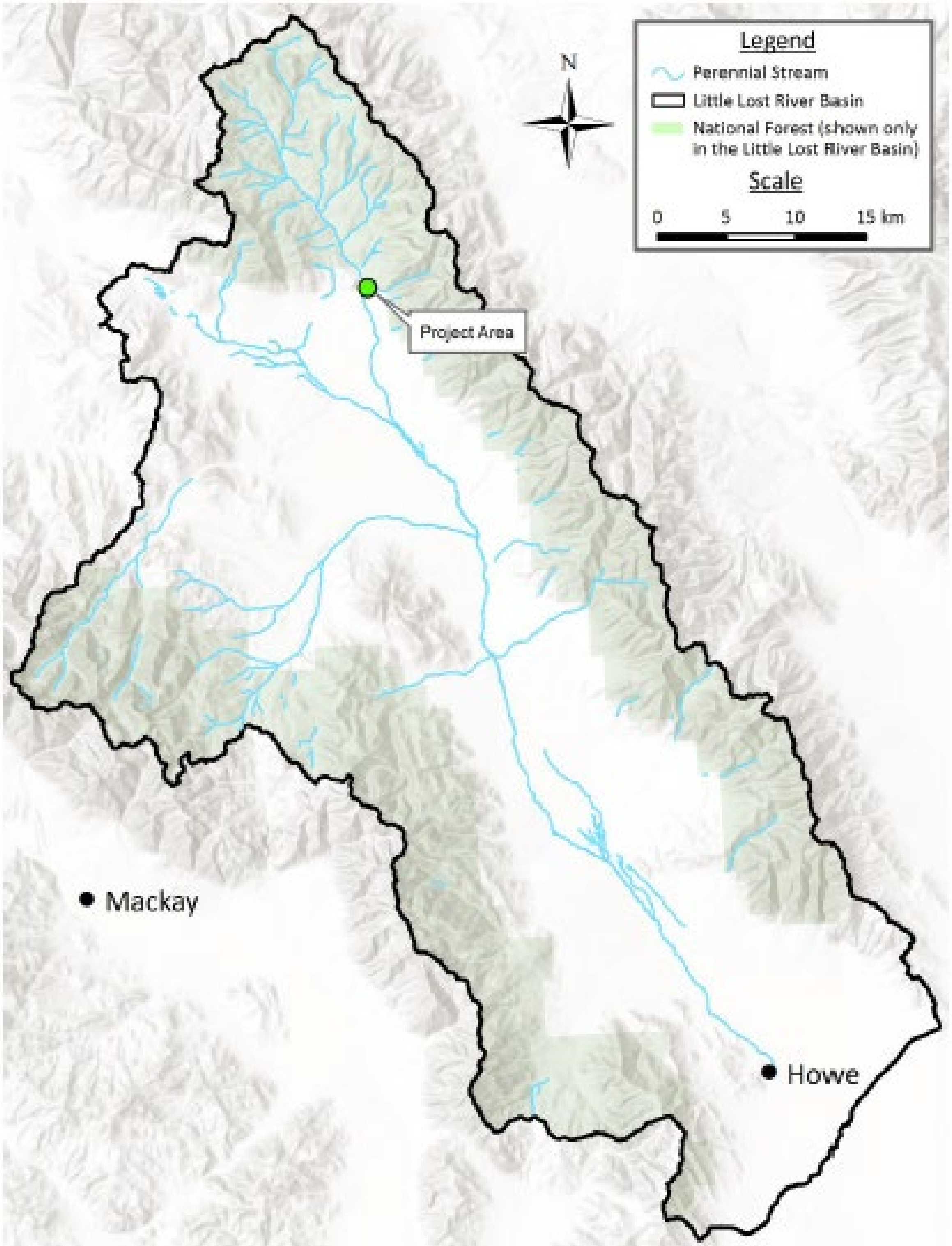

Figure 2. General location of the project relative to the Little Lost River basin and local communities.

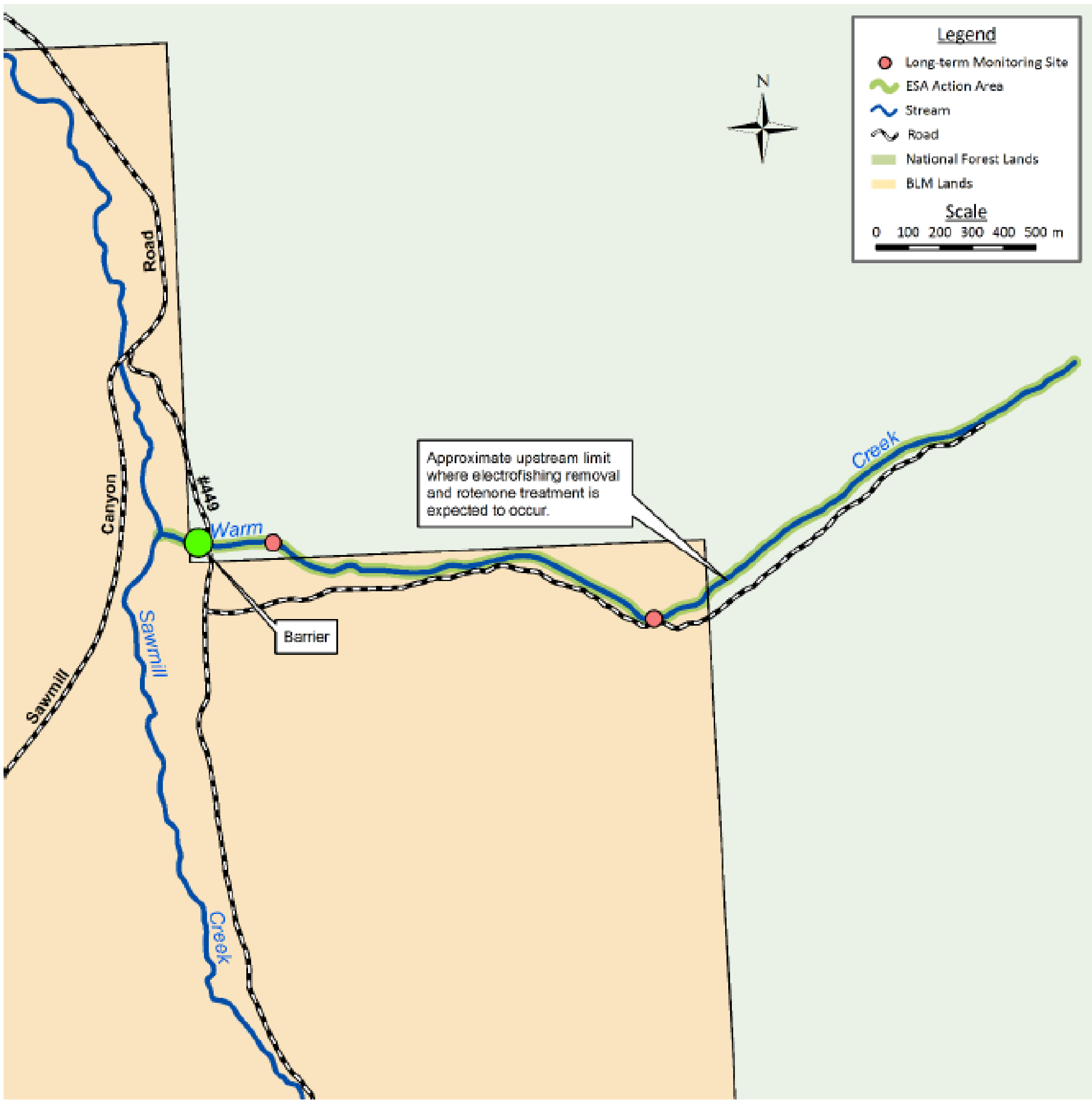

Figure 3. Close up view of the action area including the barrier location and long-term monitoring sites.

2.2. Description of the Proposed Action

The Forest, in collaboration with Idaho Department of Fish and Game (IDFG), Bureau of Land Management (BLM), Trout Unlimited, and the Service, proposes to implement a bull trout protection effort which includes four components. The Forest would authorize the first component of the project: installation of a fish passage barrier to prevent brook trout and bull trout-brook trout hybrids from accessing sections of Warm Creek upstream of the barrier. The fish passage barrier would prevent all fish from moving up Warm Creek past it (Assessment, pp.

2-4). Most bull trout are expected to successfully pass downstream over the barrier, but a few bull trout larger than 100 mm could become trapped and die on the screen. Topography of the action area limits barrier design options, resulting in an unavoidable potential for mortality.

Fish Barrier Installation

The first component of the project would involve installing a fish barrier in the lower portion of Warm Creek. This barrier would prevent all fish from moving up Warm Creek past the barrier. The barrier would be installed in Warm Creek on Forest lands approximately 130 m upstream of the confluence of Warm Creek and Sawmill Creek. An upland area, approximately 0.2 acre in size just north of the barrier site, would be used as a staging area. The project site would generally be accessed from the Sawmill Canyon Road via the Warm Creek Road (Assessment, p. 3).

The barrier would consist of a concrete weir and flume with a metal horizontal screen (Figures 4-6). The structure would be approximately 4 m long, 3 m wide, and 1 m high. The structure would have space at the downstream end for a fish trap that could be easily installed and removed. This trap would be used to help bull trout pass upstream past the barrier (the third project component). The structure would be fabricated at an offsite location and transported to the site by truck. The area where the barrier is to be placed would then be excavated with a backhoe or similar piece of equipment. The barrier would then be placed in the stream with mechanized equipment (Assessment, p. 3).

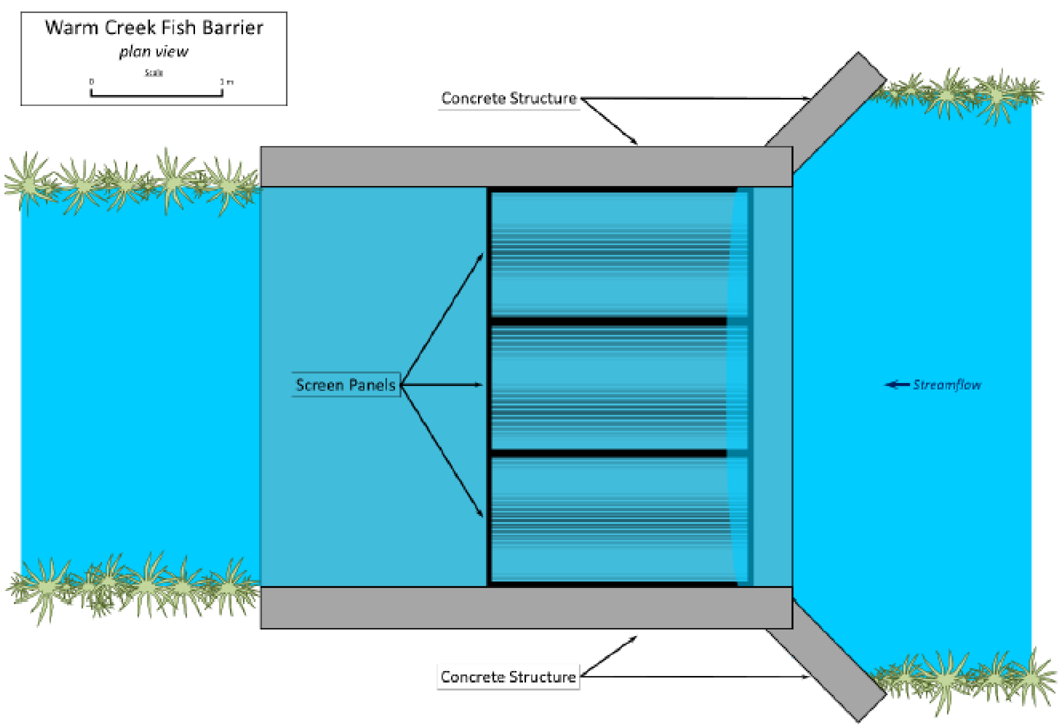

Figure 4. Warm Creek barrier design – plan view. The barrier could undergo some modifications in design during construction.

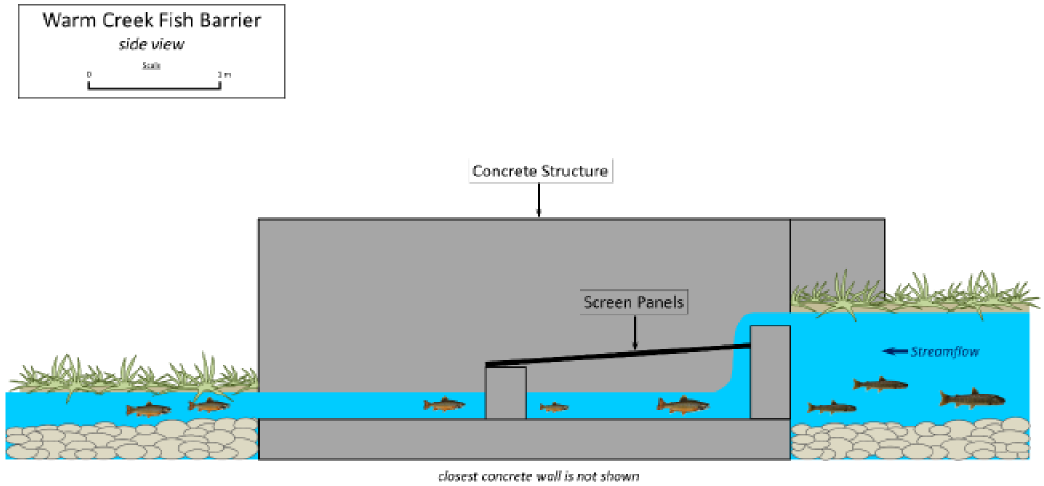

Figure 5. Warm Creek barrier design – side view. The barrier could undergo some modifications in design during construction.

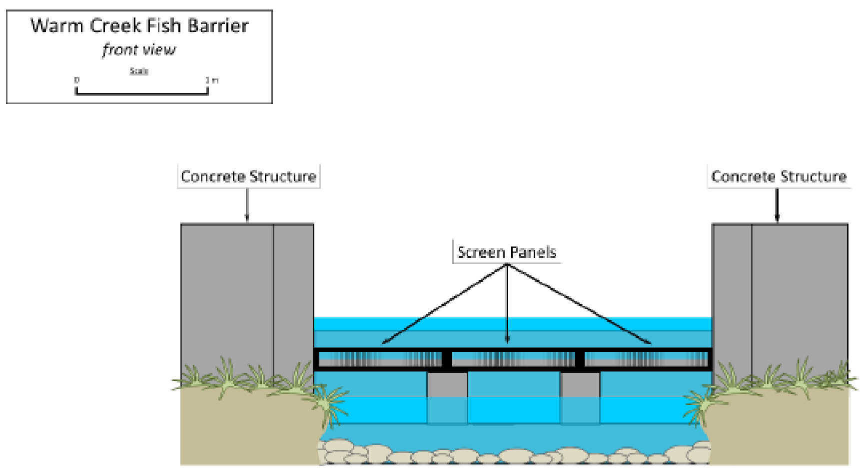

Figure 6. Warm Creek barrier design – front view. The barrier could undergo some modifications in design during construction.

Dewatering

Approximately 10 m of stream, where the barrier would be placed, would be dewatered prior to the barrier being placed in the stream. This would be accomplished by constructing a bypass channel parallel to the natural channel (approximately 20 m long). The bypass channel would be constructed with a backhoe or similar piece of equipment. The excavated material would be placed on the south side of the channel which is the side of the bypass channel opposite of the natural channel. The entire bypass channel would then be lined with canvas. The construction of the bypass channel would take approximately 4 hours. The stream would then be diverted into the bypass channel with a canvas dam (Assessment, p. 3).

Fish Handling

Immediately after the stream is diverted into the bypass channel, the dewatered segment of stream would be visually searched for fish. Any fish observed would be collected with dip nets and placed in buckets. All bull trout would be placed in Warm Creek approximately 50 m upstream of the work area. Rainbow trout would be placed in Sawmill Creek and brook trout and brook trout-bull trout hybrids would be removed. The search would take approximately 15 minutes and the fish would be in buckets less than 10 minutes (Assessment, p. 3).

Remediation

After the barrier is installed, disturbed portions of the channel would be wetted down with water to minimize the ability of sediment to be mobilized when the stream is returned to the natural channel. This would be accomplished with buckets using water from the stream. Stream flows would then be gradually returned to the natural channel to minimize the mobilization of sediment (Assessment, p. 3).

Any disturbed areas, including the bypass channel, would be naturalized. This would include seeding, scattering natural material, and placing biodegradable coir logs or similar material along the sections of bank impacted by the bypass channel. A fence with sides that are approximately 15 m long would be placed around the barrier to prevent livestock from damaging the structure (Assessment, p. 3).

Subsequent Components

Following the installation of a fish barrier by the Forest, Warm Creek Bull Trout Protection Project partners have committed to the following future activities:

2. Removing brook trout, brook trout-bull trout hybrids, and rainbow trout from Warm Creek upstream of the barrier.
3. Using a fish trap and/or electrofishing to move bull trout upstream of the barrier.
4. Using electrofishing and possibly eDNA techniques to monitor project effectiveness (Assessment, p. 2).

2.3 Term of the Action

The proposed action is anticipated to be completed in 2023. All instream work associated with this component of the project would take less than five days and would occur between June 16 and August 15. Any instream work after August 15 would only occur if surveys, which would be conducted daily, indicated a lack of bull trout redds in Warm Creek downstream of the work area (Assessment, p. 3).

2.4 Proposed Conservation Measures

The Forest has identified specific measures and design features to reduce the degree of impact from the proposed action to bull trout and its habitat. No instream work would occur if bull trout redds are present at or downstream of the construction site. Disturbed portions of the channel would be wetted down with water and stream flows would be gradually returned to the natural channel to minimize the mobilization of sediment. The design criteria to be implemented as part of the proposed action are described in the Assessment (pp. 2-4).

3. ANALYTICAL FRAMEWORK

3.1 Jeopardy Determination

In accordance with our regulations (50 CFR 402.02, 402.14(g)), the jeopardy analysis in this Opinion relies on the following four components:

1. The *Status of the Species* evaluates the species' current rangewide condition relative to its reproduction, numbers, and distribution; the factors responsible for that condition; its survival and recovery needs; and explains if the species' current rangewide population retains sufficient abundance, distribution, and diversity to persist and retains the potential for recovery (Endangered Species Consultation Handbook; USFWS and NMFS 1998, pp. 4-33-4-37).
2. The *Environmental Baseline* section evaluates the past and current condition of the species in the action area relative to its reproduction, numbers, and distribution absent the effects of the proposed action; including the anticipated condition contemporaneous to the term of the proposed action; 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* section evaluates all consequences to the species that are reasonably certain to be caused by the proposed action, including the consequences of other activities that are caused by the proposed action (i.e., the consequences would not occur but for the proposed action and are reasonably certain to occur) and how those consequences are likely to influence the survival and recovery of the species.
4. The *Cumulative Effects* section evaluates the consequences of future State or private activities, not including Federal activities, reasonably certain to occur in the action area of the Federal action subject to consultation, on the species and its habitat, and how those effects are likely to influence the survival and recovery of the species.

In accordance with policy and regulation, the jeopardy determination is made by formulating the Service's opinion as to whether the proposed Federal action, including its consequences, taken together with the status of the species, environmental baseline, and cumulative effects, reasonably would be expected to reduce appreciably the likelihood of both the survival and recovery of the species in the wild by reducing the reproduction, numbers, or distribution of that species.

Interim recovery units were defined in the final listing rule for bull trout for use in completing jeopardy analyses (64 FR 58910, November 1, 1999). Subsequently, six recovery units (RUs) for the bull trout were defined in the final Recovery Plan for the Coterminous United States

Population of Bull Trout (USFWS 2015a, entire). Pursuant to Service policy (USFWS 2006, *in litt*.), when a proposed Federal action impairs or precludes the capacity of a RU from providing both the survival and recovery function assigned to it, that action may represent jeopardy to the species. When using this type of analysis, the biological opinion describes how the proposed action affects not only the capability of the RU, but the relationship of the RU to both the survival and recovery of the listed species as a whole.

3.2 Destruction/Adverse Modification Determination

In accordance with regulations and regional implementation guidance, the destruction or adverse modification analysis in this biological opinion relies on the following four components:

1. The *Status of Critical Habitat* section evaluates the rangewide condition of the critical habitat in terms of essential habitat features, primary constituent elements, or physical and biological features that provide for the conservation of the listed species; the factors responsible for that condition; and the intended value of the critical habitat for the conservation of the listed species.
2. The *Environmental Baseline* section analyzes the past and current condition of the critical habitat in the action area absent the effects of the proposed action; including the anticipated condition of the species and its critical habitat contemporaneous to the term of the proposed action; the factors responsible for that condition; and the conservation value of the critical habitat in the action area for the conservation of the species.
3. The *Effects of the Action* section evaluates all consequences to critical habitat that are reasonably certain to be caused by the proposed action (i.e., the consequences would not occur but for the proposed action and are reasonably certain to occur) and how those consequences are likely to influence the conservation value of the affected critical habitat for the species in the action area.
4. The *Cumulative Effects* section evaluates the effects to critical habitat of future State or private activities, not including Federal activities, reasonably certain to occur in the action area of the Federal action subject to consultation, and how those effects are likely to influence the conservation value of the affected critical habitat for the species in the action area.

In accordance with regulation, the destruction or adverse modification determination is made by formulating the Service's opinion as to whether the proposed Federal action, taken together with the status of the critical habitat, environmental baseline, and cumulative effects, reasonably would be expected to result in a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of the species.

4. BULL TROUT

4.1 Status of Bull Trout

This section provides information about the bull trout's life history, habitat preferences, geographic distribution, population trends, threats, and conservation needs. This includes a description of the effects of past human activities and natural events that have led to the current status of the bull trout. This information provides the background for analyses in later sections of the biological opinion. The proposed and final listing rules contain a physical species description (63 FR 31647, June 10, 1998; 64 FR 58910).

4.1.1 Listing Status and Current Range

The coterminous United States population of the bull trout was listed as threatened on November 1, 1999 (64 FR 58910). The threatened bull trout occurs in the Klamath River basin of south-central Oregon; Jarbidge River in Nevada; Willamette River basin in Oregon; Pacific Coast drainages of Washington, including Puget Sound; major rivers within the Columbia River basin in Idaho, Oregon, Washington, and Montana; and Saint Mary-Belly River, east of the Continental Divide in northwestern Montana (Bond 1992, p. 2; Brewin and Brewin 1997, p. 215; Cavender 1978, pp. 165-166; Leary and Allendorf 1997, pp. 716-719; 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 in accordance with the requirements of section 7 of the Act relative to this species and established five interim RUs for each of these DPSs for the purposes of consultation and recovery (64 FR 58930).

The final Recovery Plan for the Coterminous Bull Trout Population (bull trout recovery plan) established six RUs (USFWS 2015a, pp. 36-43) (see Figure 3). 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. These RUs are needed to ensure a resilient, redundant, and representative distribution of bull trout populations throughout the range of the listed entity.

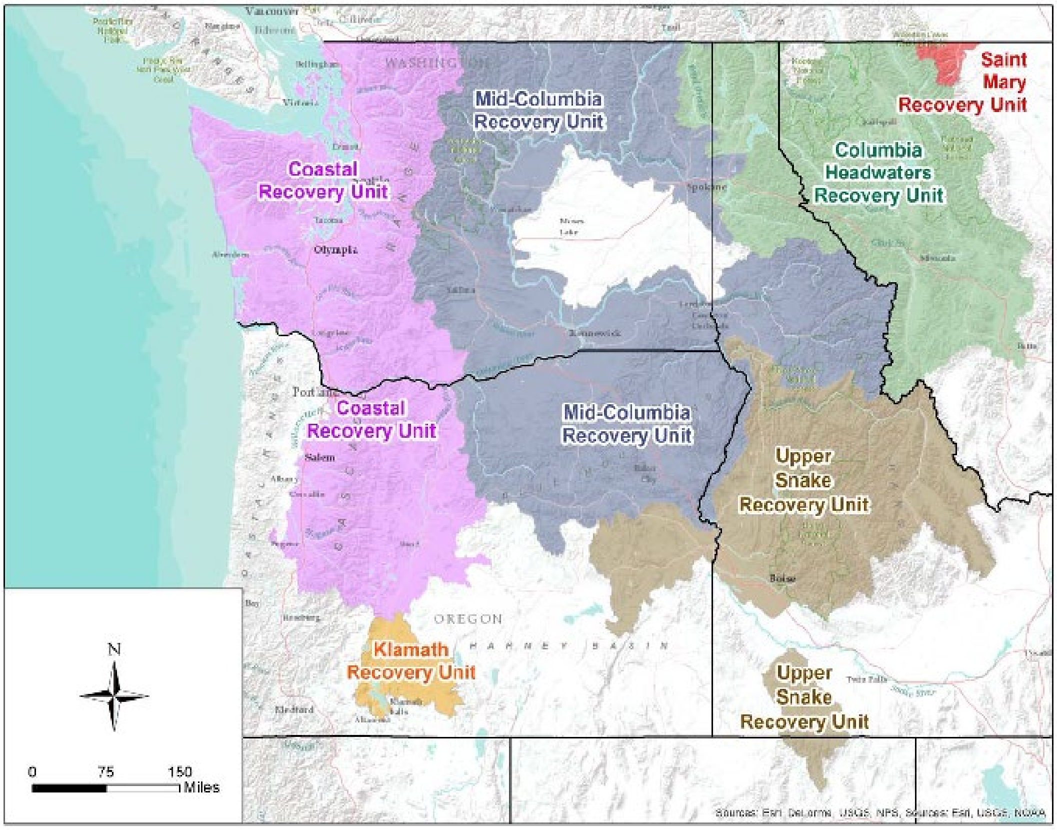

Figure 7. Locations of the six bull trout recovery units in the coterminous United States.

4.1.2 Reasons for Listing and 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 nonnative species (63 FR 31647; 64 FR 58910). Poaching and incidental mortality of bull trout during other targeted fisheries are identified and described in the bull trout recovery plan (see Threat Factors B and D) as additional threats (USFWS 2015a, p. 150). Since the time of coterminous listing of the species (64 FR 58910) and designation of its critical habitat (69 FR 59996, October 6, 2004; 70 FR 56212, September 26, 2005; 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 2005b, entire; USFWS 2009, entire), Conservation Status Assessment (USFWS 2005a, entire), and 5-year reviews (USFWS 2008, entire; USFWS 2015a, entire) have provided additional information about threats and status. The final recovery plan lists other documents and meetings that compiled information about the status of bull trout (USFWS 2015a, p. 3). The 2015 5-year status review also maintains the listing status as threatened based on the information compiled in the final bull trout recovery plan (USFWS 2015a, p. 3) and the Recovery Unit Implementation Plans (RUIPs) (USFWS 2015b; 2015c; 2015d; 2015e; 2015g; 2015h).

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; USFWS 2004a, entire; USFWS 2004b, entire) included detailed information on threats at the RU scale (i.e., similar to subbasin or regional watersheds), thus incorporating the metapopulation concept with core areas and local populations. In the 2008 5-year review, 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 wildfire) (USFWS 2008, entire). In the final recovery plan, threats and recovery actions are described for all 109 core areas for the species, forage/migration and overwintering areas, historical core areas, and research needs areas in each of the six RUs (USFWS 2015a, pp. 10-11). Primary threats are described in three broad categories – Habitat, Demographic, and Nonnative Fish – for all RUs and core areas within the listed range of the species. The 2015 5-year status review references the final recovery plan and the RUIPs and incorporates by reference the threats described therein (USFWS 2015a, entire). 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 2015a, entire).

New or Emerging Threats

The bull trout recovery plan describes new or emerging threats, climate change, and other threats (USFWS 2015a, entire). Climate change was not addressed as a known threat when bull trout was listed. The 2015 bull trout recovery plan and RUIPs (USFWS 2015b, entire; 2015c, entire; 2015d, entire; 2015e, entire; 2015g, entire; 2015h, entire) 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 small populations, isolation, and effects of climate change (USFWS 2015f, p. 48). The recovery plan 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, p. vii and pp. 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 (Koopman et al. 2009, entire; Poff et al. 2002, entire; Point Reyes Bird Observatory Conservation Science 2011, entire). 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 2015d, p. B10). 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 coldwater habitat (Isaak et al. 2015, p. 2549,

Figure 7), and increase competition with other fish species [lake trout (*Salvelinus namaycush*), brown trout (*Salmo trutta*), brook trout (*Salvelinus fontinalis*), and northern pike (*Esox lucius*)] 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 elevation shift in distribution) due to the effects from climate change (Isaak et al. 2014, p. 114).

4.1.3 Life History and Population Dynamics

Distribution

The historical range of bull trout includes major river basins in the Pacific Northwest at about 41 to 60 degrees North latitude, from the southern limits in the McCloud River in northern California and the Jarbidge River in Nevada to the headwaters of the Yukon River in the Northwest Territories, Canada (Bond 1992, p. 2; Cavender 1978, pp. 165-166). To the west, the bull trout's range includes Puget Sound, various coastal rivers of British Columbia, Canada, and southeast Alaska (Bond 1992, p. 2). Bull trout occur in portions of the Columbia River and tributaries within the basin, including its headwaters in Montana and Canada. Bull trout also occur in the Klamath River basin of south-central Oregon. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta and Montana and in the MacKenzie River system in Alberta and British Columbia, Canada (Brewin and Brewin 1997, entire; Cavender 1978, pp. 165-166).

Reproductive Biology

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

Growth varies depending upon life-history strategy. Resident adults range from 15 to 30 centimeters (6 to 12 inches) total length, and migratory adults commonly reach 61 centimeters (24 inches) or more (Goetz 1989, p. 30; Pratt 1984, pp. 28-34). The largest verified bull trout is a 14.5 kilograms (32 pounds) specimen caught in Lake Pend Oreille, Idaho, in 1949 (Simpson and Wallace 1982, p. 95) .

Bull trout typically spawn from August through November during periods of increasing flows and decreasing water temperatures. Preferred spawning habitat consists of low-gradient stream reaches with loose, clean gravel (Fraley and Shepard 1989, p. 141). Redds are often constructed in stream reaches fed by springs or near other sources of cold groundwater (Goetz 1989, pp. 15-

16; Pratt 1992, pp. 6-7; Rieman and McIntyre 1996, p. 133). Depending on water temperature, incubation is normally 100 to 145 days (Pratt 1992, p. 1). After hatching, fry remain in the substrate, and time from egg deposition to emergence may surpass 220 days. Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows (Pratt 1992, p. 1; Ratliff and Howell 1992, p. 10). Early life stages of fish, specifically the developing embryo, require the highest inter-gravel dissolved oxygen (IGDO) levels, and are the most sensitive life stage to reduced oxygen levels. The oxygen demand of embryos depends on temperature and on stage of development, with the greatest IGDO required just prior to hatching.

A literature review conducted by the Washington Department of Ecology (2002, p. 9) indicates that adverse effects of lower oxygen concentrations on embryo survival are magnified as temperatures increase above optimal (for incubation). Normal oxygen levels seen in rivers used by bull trout during spawning ranged from 8 to 12mg/L (in the gravel), with corresponding instream levels of 10 to 11.5mg/L (Stewart et al. 2007, p. 10). In addition, IGDO concentrations, water velocities in the water column, and especially the intergravel flow rate, are interrelated variables that affect the survival of incubating embryos (Oregon Department of Environmental Quality 1995, Ch. 2 pp. 23-24). Due to a long incubation period of 220+ days, bull trout are particularly sensitive to adequate IGDO levels. An IGDO level below 8mg/L is likely to result in mortality of eggs, embryos, and fry.

Population Structure

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 one to four 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; Washington Department of Fish and Wildlife et al. 1997, p. 16). Bull trout normally reach sexual maturity in four to seven years and may live longer than 12 years. They are iteroparous (they spawn more than once in a lifetime). Repeat- and alternate-year spawning has been reported, although repeat-spawning frequency and post-spawning mortality are not well documented (Fraley and Shepard 1989, 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 (Swanberg 1997, entire; Brenkman and Corbett 2005, pp. 1075-1076; Goetz et al. 2004, p. 105; Starcevich et al. 2012, entire). 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). Some river systems have retained habitat conditions that allow free movement between spawning and rearing areas and the mainstem rivers. In these areas with connectivity, bull trout can migrate between large rivers, lakes, and spawning tributaries. Other migrations in Central Washington have shown that fluvial and adfluvial life forms travel long distances, migrate between core areas, and mix together in many locations where there is connectivity (Ringel et al. 2014, pp. 61-64). 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; Montana Bull Trout Scientific Group 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 sized 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:

1. "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.
2. "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.
3. "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 Taylor and Costello (2006, p. 1165-1170), 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, p. 18). Based on a recommendation in the Service's 5-year review of the species' status (USFWS 2008, p. 45), the Service reanalyzed the 27 RUs 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 Service and NMFS DPS policy (61 FR 4722, February 7, 1996) and subsequently identified six draft RUs 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 RUs were used to inform designation of critical habitat for bull trout by providing a context for deciding what habitats are essential for recovery (75 FR 63898). These six RUs, which were identified in the final bull trout recovery plan (USFWS 2015a, entire) and described further in the RUIPs (USFWS 2015b, entire; 2015c, entire; 2015d, entire; 2015e, entire; 2015g, entire; 2015h, entire), include: Coastal, Klamath, Mid-Columbia, Columbia Headwaters, Saint Mary, and Upper Snake. A number of additional genetic analyses within core areas have been completed to understand uniqueness of local populations (DeHaan and Neibauer 2012, entire).

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).

Metapopulation concepts of conservation biology theory have been suggested relative to the distribution and characteristics of bull trout, although empirical evidence is relatively scant (Dunham and Rieman 1999, entire; Rieman and McIntyre 1993, p. 15; Rieman and Dunham 2000, entire). A metapopulation is an interacting network of local populations with varying frequencies of migration and gene flow among them (Meffe 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 (Dunham and Rieman 1999, p. 645; Rieman and Clayton 1997, pp. 10-12; Rieman and Dunham 2000, p. 55; Spruell et al. 1999, pp. 118-120).

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. 5-57). 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), while Whitesel et al. (2004, pp. 18-21) summarizes metapopulation models and their applicability to bull trout.

Habitat Characteristics

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

Bull trout have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993, p. 4). Habitat components that influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrate, and migratory corridors (Fraley and Shepard 1989, entire; Goetz 1989, pp. 23, 25; Hoelscher and Bjornn 1989, pp. 19, 25; Pratt 1992, entire; Rich 1996, p. 17; Rieman and McIntyre 1993, pp. 4-6; Rieman and McIntyre 1995, entire; Sedell and Everest 1991, entire; Watson and Hillman 1997, entire). Watson and Hillman (1997, pp. 247-250) concluded that watersheds must have specific physical characteristics to provide the habitat requirements necessary for bull trout to successfully spawn and rear and that these specific characteristics are not necessarily present throughout these watersheds. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993, pp. 4-6), bull trout should not be expected to simultaneously occupy all available habitats.

Migratory corridors link seasonal habitats for all bull trout life histories. The ability to migrate is important to the persistence of bull trout (Rieman and McIntyre 1993, p. 2). Migrations facilitate gene flow among local populations when individuals from different local populations interbreed or stray to non-natal streams. Local populations that are extirpated by catastrophic events may also become reestablished by bull trout migrants. However, it is important to note that the genetic structuring of bull trout indicates there is limited gene flow among bull trout populations, which may encourage local adaptation within individual populations, and that reestablishment of extirpated populations may take a long time (Rieman and McIntyre 1993, p. 2; Spruell et al. 1999, entire). Migration also allows bull trout to access more abundant or larger prey, which facilitates growth and reproduction. Additional benefits of migration and its relationship to foraging are discussed below under *Diet*.

Cold water temperatures play an important role in determining bull trout habitat quality, as these fish are primarily found in colder streams, and spawning habitats are generally characterized by temperatures that drop below 9˚C in the fall (Fraley and Shepard 1989, p. 137; Pratt 1992, p. 5; Rieman and McIntyre 1993, p. 2).

Thermal requirements for bull trout appear to differ at different life stages. Spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Pratt 1992, pp. 7-8; Rieman and McIntyre 1993, p. 7). Optimum incubation temperatures for bull trout eggs range from 2˚C to 6˚C, whereas optimum water temperatures for rearing range from about 6˚C to 10˚C (Buchanan and Gregory 1997, p. 4; Goetz 1989, p. 22). In Granite Creek, Idaho, Bonneau and Scarnecchia (1996, entire) observed that juvenile bull trout selected the coldest water available in a plunge pool, 8˚C to 9˚C, within a temperature gradient of 8˚C to 15˚C. In a landscape study relating bull trout distribution to maximum water temperatures, Dunham et al. (2003, p. 900) found that the probability of juvenile bull trout occurrence does not become high (i.e., greater than 0.75) until maximum temperatures decline to 11˚C to 12˚C.

Although bull trout are found primarily in cold streams, occasionally these fish are found in larger, warmer river systems throughout the Columbia River basin (Buchanan and Gregory 1997, p. 2; Fraley and Shepard 1989, pp. 133, 135; Rieman and McIntyre 1993, pp. 3-4; Rieman and McIntyre 1995, p. 287). Availability and proximity of cold water patches and food productivity can influence bull trout ability to survive in warmer rivers (Myrick et al. 2002, pp. 6, 13).

All life history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Fraley and Shepard 1989, p. 137; Goetz 1989, p. 19; Hoelscher and Bjornn 1989, p. 38; Pratt 1992, entire; Rich 1996, pp. 4-5; Sedell and Everest 1991, entire; Sexauer and James 1997, entire; Thomas 1992, pp. 4-6; Watson and Hillman 1997, p. 238). Maintaining bull trout habitat requires stable and complex stream channels and stable stream flows (Rieman and McIntyre 1993, pp. 5-6). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997, p. 364). These areas are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns. For example, altered stream flow in the fall may disrupt bull trout during the spawning period, and channel instability may decrease survival of eggs and young juveniles in the gravel from winter through spring (Fraley and Shepard 1989, p. 141; Pratt 1992, p. 6; Pratt and Huston 1993, p. 70). Pratt (1992, p. 6) indicated that increases in fine sediment reduce egg survival and emergence.

Diet

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy. Fish growth depends on the quantity and quality of food that is eaten, and as fish grow, their foraging strategy changes as their food changes in quantity, size, or other characteristics. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, and small fish (Boag 1987, p. 58; Donald and Alger 1993, pp. 242-243; Goetz 1989, pp. 33-34). Subadult and adult migratory bull trout generally feed on various fish species (Donald and Alger 1993, pp. 241-243; Fraley and Shepard 1989, pp. 135, 138; Leathe and Graham 1982, pp. 13, 50-56). Bull trout of all sizes other than fry have been found to eat fish half their length (Beauchamp and Van Tassell 2001, p. 204). In nearshore marine areas of western Washington, bull trout feed on Pacific herring (*Clupea pallasi*), Pacific sand lance (*Ammodytes hexapterus*), and surf smelt (*Hypomesus pretiosus*) (Goetz et al. 2004, p. 105; Washington Department of Fish and Wildlife et al. 1997, p. 23).

Bull trout migration and life history strategies are closely related to their feeding and foraging strategies and their environment. Migration allows bull trout to access optimal foraging areas and exploit a wider variety of prey resources both within, and between, core areas. Connectivity between the spawning, rearing, overwintering, and forage areas maintains this diversity. There have been recent studies documenting movement patterns in the Columbia River basin that document long distance migrations (Barrows et al. 2017, entire; Schaller et al. 2014, entire). For example, a data report documented a juvenile bull trout from the Entiat River made over a 322-kilometer (200-mile) migration between spawning grounds in the Entiat River to foraging and overwintering areas in the Columbia and Yakima Rivers near Prosser Dam (PTAGIS 2015, Tag Code 3D9.1C2CCD42DD). In the Skagit River system, anadromous bull trout similarly make migrations as long as 195 kilometers (121 miles) between marine foraging areas in Puget Sound and headwater spawning grounds, foraging on salmon eggs and juvenile salmon along their migration route (Washington Department of Fish and Wildlife et al. 1997, p. 25). Anadromous bull trout also use marine waters as migration corridors to reach seasonal habitats in non-natal watersheds to forage and possibly overwinter (Brenkman and Corbett 2005, pp. 1078-1079; Goetz et al. 2004, entire).

4.1.4 Conservation Needs

The 2015 recovery plan 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; (2) 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) work cooperatively with partners to develop and implement bull trout recovery actions in each of the six RUs; and (4) account for new information and future climate effects, apply adaptive management principles and focus on actions, and potentially locations, that provide the greatest resilience to climate-based threats (USFWS 2015a, p. 24).

Information presented in prior draft recovery plans published in 2002 and 2004 (USFWS 2002a, entire; 2004a, entire; 2004b, entire) provided information that identified the original list of threats and recovery actions across the range of the species and provided 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 recovery plan in 2015.

The 2015 bull trout recovery plan (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 range of the coterminous bull trout listing.

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, pp. 45-46).

To implement the recovery strategy, the bull trout recovery plan establishes the recovery of bull trout will entail effectively managing threats to ensure the long-term persistence of populations and their habitats, ensuring the security of multiple interacting groups of bull trout, and providing habitat conditions and access to them that allow for the expression of various life history forms within each of the six RUs (USFWS 2015a, pp. 50-51). The recovery plan defines four categories of recovery actions that, when implemented and effective, should:

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; and
4. Result in actively working 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 (USFWS 2015a, pp. 50-51).

Bull trout recovery is based on a geographical hierarchical approach. Bull trout are listed as a single DPS within the five-state area of the coterminous United States. The single DPS is subdivided into six biologically-based RUs: (1) Coastal Recovery Unit; (2) Klamath Recovery Unit; (3) Mid-Columbia Recovery Unit; (4) Upper Snake Recovery Unit; (5) Columbia Headwaters Recovery Unit; and (6) Saint Mary Recovery Unit (USFWS 2015a, p. 23). A viable RU 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 RUs contain multiple bull trout recovery areas which are non-overlapping watershed-based polygons, and each core area includes one or more local population(s). Currently there are 109 occupied core areas, which comprise 611 local populations (USFWS 2015a, p. 3, 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, Appendix F). Core areas can be further described as complex or simple (USFWS 2015a, pp. 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 foraging, migration, and overwintering (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 RU. 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.

4.1.5 Population Units

The final bull trout recovery plan (USFWS 2015a, entire) designates six bull trout RUs as described above. These units replace the five interim RUs previously identified (64 FR 58910). The Service will address the conservation of these final RUs in our section 7(a)(2) analysis for proposed Federal actions. The recovery plan (USFWS 2015a, entire) identified threats and factors affecting the bull trout within these units. A detailed description of recovery implementation for each RU is provided in separate RUIPs (USFWS 2015b, entire; 2015c, entire; 2015d, entire; 2015e, entire; 2015g, entire; 2015h, entire), which identify recovery actions and conservation recommendations needed for each core area, FMO areas, historical core areas, and research needs areas. Each of the following RUs below is necessary to maintain the bull trout's numbers and distribution, as well as its genetic and phenotypic diversity, all of which are important to ensure the species' resilience to changing environmental conditions. For more details on Federal, State, and tribal conservation actions in this unit, see the actions since listing, contemporaneous actions, and environmental baseline discussions below.

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 geographic 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 historical Clackamas River core area where bull trout had been extirpated and were reintroduced in 2011. This RU also has four historically-occupied core areas that could be re-established (USFWS 2015b, p. A2; USFWS 2015a, p. 47).

Although population strongholds do exist across the three regions, populations in the Puget Sound region generally have better demographic status while the Lower Columbia River region exhibits the least robust demography (USFWS 2015b, p. A6). Puget Sound and the Olympic Peninsula currently support the only anadromous local populations of bull trout. This recovery unit also contains 10 shared FMO habitats which allow for the continued natural population dynamics in which the core areas have evolved (USFWS 2015b, p. A5). There are four core areas within the Coastal RU that have been identified as current population strongholds: Lower Skagit, Upper Skagit, Quinault, and Lower Deschutes Rivers (USFWS 2015b, p. A3; USFWS 2015a, p. 79). These are the most stable and abundant bull trout populations in the RU. The Puget Sound region supports at least two core areas containing a natural adfluvial life history.

The demographic status of the Puget Sound populations is better in northern areas. Barriers to migration in the Puget Sound region are few, and significant amounts of headwater habitat occur in protected areas (USFWS 2015b, p. A7). The current condition of the bull trout in this RU is attributed to the adverse effects of climate change, loss of functioning estuarine and nearshore marine habitats, development and related impacts (e.g., flood control, floodplain disconnection, bank armoring, channel straightening, loss of instream habitat complexity), agriculture (e.g., diking, water control structures, draining of wetlands, channelization, and the removal of riparian vegetation, livestock grazing), fish passage (e.g., dams, culverts, instream flows), residential development, urbanization, forest management practices (e.g., timber harvest and associated road building activities), connectivity impairment, mining, and the introduction of nonnative species (USFWS 2015b, pp. A1-A25). Conservation measures or recovery actions implemented or ongoing 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 (USFWS 2015b, pp. A33-A34).

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 2015d, entire). The Klamath 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 2015d, p. B1; USFWS 2015a, p. 47). Nine historical local populations of bull trout have become extirpated (USFWS 2015d, p. B1). All three core areas have been isolated from other bull trout populations for the past 10,000 years (USFWS 2015d, p. B3). 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 (USFWS 2015d, pp. B13-B14). Conservation measures or recovery actions implemented include removing nonnative fish (e.g., brook trout, brown trout, and hybrids), acquiring water rights for instream flows, replacing diversion structures, installing fish screens, constructing bypass channels, installing riparian fencing, replacing culverts, and restoring habitat (USFWS 2015d, pp. B10-B11).

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 2015e, 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, 2 historically-occupied core areas, 1 research needs area, and 7 FMO habitats (USFWS 2015e, pp. C1-C4; USFWS 2015a, p. 47). 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 (USFWS 2015e, pp. C9-C34). Conservation measures or recovery actions implemented include road removal, channel restoration, mine reclamation, improved grazing management, removal of fish barriers, and instream flow requirements (USFWS 2015e, pp. C37-C40).

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 2015c, entire). The Columbia Headwaters RU is located in western Montana, northern Idaho, and the northeastern corner of Washington. The Columbia Headwaters RU is divided into five geographic regions: Upper Clark Fork, Lower Clark Fork, Flathead, Kootenai, and Coeur d'Alene geographic regions (USFWS 2015c, pp. D2-D4). 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 2015c, p. D1). Fish passage improvements within the RU have reconnected some previously fragmented habitats (USFWS 2015c, p. D42), while others remain fragmented. Unlike the other RUs in Washington, Idaho, and Oregon, the Columbia Headwaters RU does not have any anadromous fish overlap (USFWS 2015c, p. D42). Therefore, bull trout within the Columbia Headwaters RU do not benefit from the recovery actions for salmon (USFWS 2015c, p. D42). 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 instream flows, migratory barriers (e.g., dams), habitat fragmentation, forest practices (e.g., logging, roads), agriculture practices (e.g., irrigation, livestock grazing), and residential development (USFWS 2015c, pp. D10-D25). Conservation measures or recovery actions implemented include habitat improvement, fish passage, and removal of nonnative species (USFWS 2015c, pp. D42-D43).

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 2015h, 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, with almost 60 percent being present in the Salmon River Region (USFWS 2015a, p. 47; USFWS 2015h, pp. E1-E2). 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) (USFWS 2015h, pp. E15-E18). Conservation measures or recovery actions implemented include instream habitat restoration, instream flow requirements, screening of irrigation diversions, and riparian restoration (USFWS 2015h, pp. E19-E20).

Saint Mary Recovery Unit

The Saint 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, entire). 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 Saint Mary River 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 and seven local populations (USFWS 2015g, p. F1) in the U.S. headwaters. 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, instream flows), and, to a lesser extent, habitat impacts from development and nonnative species (USFWS 2015g, pp. F7-F8). Conservation measures or recovery actions implemented or ongoing are not identified in the Saint Mary RUIP; however, the Service is conducting interagency and tribal coordination to accomplish conservation goals for the bull trout (USFWS 2015g, p. F9).

4.1.6 Federal, State, and Tribal Actions Since Listing

Since listing of the 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 affected 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; instream 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, it is necessary to continue ongoing fisheries management efforts to suppress the effects of nonnative fish competition, predation, or hybridization (particularly brown trout, brook trout, lake trout, and northern pike) (DeHaan and Godfrey 2009, entire; Fredenberg et al. 2007, entire).

4.1.7 Previously Consulted-on Effects

Rangewide

Consulted-on effects are effects that have been analyzed in section 7 consultations and reported in a biological opinion. In 2003, the Service reviewed all of the biological opinions issued by the Region 1 and Region 6 Service offices from the time of bull trout listing until August 2003; this summed to 137 biological opinions. The Service completed section 7 consultations on many programs and actions that benefit bull trout. While some of the beneficial programs were small-scale actions such as removing passage barriers and installing 'fish friendly' crossing structures, some were large, such as restoring habitat conditions in degraded streams and riparian areas. Three consultations that had broad and long-term benefits to bull trout were consultations on documents that amended Forest Plans and provided standards and guidelines related to federally listed anadromous and native inland fish on National Forest Service lands in Idaho.

The majority of consultations on projects that resulted in adverse effects were for effects that were short-term and very local. Overall, our review showed that we consulted on a wide array of actions which had varying levels of effect and that none were found to appreciably reduce the likelihood of survival and recovery of the bull trout. Furthermore, no actions that have undergone consultation were anticipated to result in the loss of local populations of bull trout.

Between August 2003 and July 2006, the Service issued 198 opinions that included analyses of effects to the bull trout. These opinions also reached "not likely to jeopardize" determinations, and the Service concluded that the continued long-term survival and existence of the species had not been appreciably reduced rangewide due to these actions. Since July 2006, a review of the data in our national Tracking and Integrated Logging System reveals only one opinion did not reach a "not likely to jeopardize" determination. This jeopardy opinion was issued to the Environmental Protection Agency (EPA) for Idaho water quality standards for numeric water quality criteria for toxic pollutants. The EPA is implementing the reasonable and prudent alternatives (RPAs) identified in the opinion to avoid jeopardizing the continued existence of the bull trout.

Eastern Idaho

For this Opinion, the Eastern Idaho Office examined the record for biological opinions issued since 2003 for those action areas that overlap any, or all of, the following eight bull trout core areas: Upper Salmon River, Pahsimeroi River, Lemhi River, Middle Salmon River-Panther, Little Lost River, Middle Fork Salmon River, Lake Creek, and Opal Creek (USFWS 2023, entire).

Approximately 102 biological opinions have been issued across the eight bull trout core areas. Seven of them are broad-scale, program-level opinions. In three of those seven, no take was anticipated or none has occurred. In the remaining opinions, varying amounts of lethal and nonlethal take of adult bull trout, juvenile bull trout, and bull trout redds were anticipated. In each of those actions, less take than was anticipated has been detected (USFWS 2023, p. 1). One opinion for Idaho water quality standards concluded that the proposed action would likely jeopardize the coterminous U.S. population of bull trout. The RPAs identified in that opinion are being implemented to avoid jeopardizing the continued existence of the bull trout.

4.2 Environmental Baseline of the Action Area

The term "environmental baseline" is defined in the regulations implementing the Act as "the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal actions in the action area that have already undergone formal or early section 7 consultation, and the impact of State and private actions which are contemporaneous with the consultation in process. The consequences to the listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline" (50 CFR 402.02).

4.2.1 Status of Bull Trout in the Action Area

Upper Snake Recovery Unit

The action area for this consultation lies within the Little Lost River Core Area, one of the 22 core areas within the Upper Snake Recovery Unit. The Upper Snake Recovery Unit encompasses portions of central Idaho, northern Nevada, and eastern Oregon, and includes the Salmon River, Malheur River, Jarbidge River, Little Lost River, Boise River, Payette River, and Weiser River drainages. Three major bull trout life history expressions are present in the Upper Snake Recovery Unit: adfluvial, fluvial, and resident. Historically, the Upper Snake Recovery Unit is believed to have largely supported the fluvial life history form; however, many core areas are now isolated or have become fragmented watersheds, resulting in replacement of fluvial life history with resident or adfluvial forms. The Upper Snake Recovery Unit includes a total of 206 local populations, with almost 60 percent being present in the Salmon River basin (USFWS 2015h, pp. El-E2).

Little Lost River Core Area

The Little Lost River Core Area encompasses 622,440 acres, and lies within the Little Lost River basin, a closed basin bordered by the Lost River and Lemhi Mountain Ranges, within the Upper Snake River basin (USFWS 2015, p. E107). The Little Lost River core area has at least 10 local populations, and supports both resident and fluvial bull trout populations (USFWS 2015, p. E107).

In 2005, IDFG reported population numbers for the Little Lost River Core Area (IDFG 2005, p. 32) that were based on an extensive modeling effort (IDFG 2005 and High et al. 2008). A corrected table (K. Meyer, IDFG, pers. comm., March 11, 2009) showed an approximate population of 45,124 (± 23,772) bull trout (adults and young) for the core area. Using an assumption that 10 percent of the total number is comprised of adult fish (K. Meyer, IDFG, pers. comm., March 11, 2009), that would suggest an adult population in the core area of approximately 4,500 adults (±2,300). Although bull trout density has declined in some areas, available data indicate a stable to increasing population trend in this core area (USFWS 2002a, p. 30; Schoby and Garren, IDFG data, 2011; USFWS 2015, p. E107).

In the 2005 conservation status assessment (USFWS 2005) the Little Lost River Core Area final rank was "at risk". While not the most imperiled (at high risk), the core area was considered at risk because of very limited and/or declining numbers, range, and/or habitat, making bull trout in this area vulnerable to extirpation. The bull trout 5-year review (USFWS 2008) also determined the core area to be "at risk" overall.

The Service has issued three biological opinions addressing ongoing Federal actions specific to this core area: one for a water diversion (Sawmill Creek), one for livestock grazing (Mill Creek Allotment), and one for a fish passage barrier (Wet Creek). Each of these opinions found that the actions analyzed were not likely to jeopardize the coterminous U.S. population of the bull trout. The aggregate amount or extent of take of bull trout and bull trout redds caused by these Federal actions is estimated by the Service to be at the scale of three to eight bull trout, and 16 bull trout redds. Take of redds was anticipated to result from livestock trampling, while take of adult and juvenile bull trout was anticipated to result from entrainment or stranding at water diversions. Surveys conducted from 2010 to date have not found any take of bull trout redds caused by the actions addressed in the opinions. Limited surveys have found take (nonlethal) of 26 bull trout due to entrainment, and subsequent salvage, at a diversion.

Bull trout habitat conditions in the Little Lost River basin have been altered through time by influences including stream channelization, water diversion, and livestock grazing, which have occurred in the basin since the late 1800s (USFWS 2002a, pp. 13-15). Timber harvest and road construction are more recent anthropogenic influences (USFWS 2002a, pp. 12, 15). Overall road density in the core area is 0.4 mi/mi^2 (USFWS 2005, p. 48), although road density is much higher is some parts of the core area. Natural disturbances, such as wildfires, have also occurred (USFWS 2002a, p. 13).

Action Area

Bull trout in Warm Creek within the action area belong to the Warm Creek local population, one of ten local populations in the Little Lost River Core Area. The 2015 bull trout recovery plan is silent on the specific role of this bull trout local population in the survival and recovery of the listed species, but the recovery approach identified in the plan is intended to ensure adequate, long-term conservation of genetic diversity, life history features, and broad geographical representation of bull trout populations, while acknowledging that a small number of local population extirpations could occur without preventing recovery of the species (USFWS 2015a, p. 45).

Warm Creek exists within the Sawmill Canyon sub-watershed. Bull trout occur throughout the action area. Fish population data have been collected at two long-term monitoring sites on Warm Creek. Data collected at these sites indicate that bull trout abundance in Warm Creek has fluctuated somewhat over the last several decades while brook trout and brook trout-bull trout hybrid abundance has increased. In 2021, data indicate there were approximately 170 bull trout, 120 brook trout, and 155 brook trout-bull trout hybrids in Warm Creek (fish ≥ 70 mm) (Assessment, p. 5). It is likely that most of the bull trout in Warm Creek are resident fish, but it is also possible that a migratory form is present (Assessment, p. 6).

Most fish habitat within the action area is in good to excellent condition. Management improvements in livestock grazing by both the Forest and BLM have reduced the impacts of livestock and drastically improved the condition of the stream and riparian vegetation. Additionally, an abandoned canal historically disrupted the connection between Warm Creek and Sawmill Creek; however, in 2004, the Forest, BLM, and Trout Unlimited implemented a reconnection project. Given these improvements, there are no longer significant anthropogenic factors impacting fish habitat in the action area. However, brook trout pose a significant risk to bull trout, and threaten to eliminate bull trout in the action area unless corrective measures are taken (Assessment, pp. 5-6).

4.5 Effects of the Proposed Action

Implementing regulations define “effects of the action” as “all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action" (50 CFR 402.02).

4.5.1 Effects of the Proposed Action

Analytical Approach and Assumptions

In the following evaluation, the Service in part relied upon the Forest's effects analysis in their Assessment, which is based on a series of assumptions about bull trout distribution, density, and habitat use in the action area. Because of the construct of these assumptions, the analysis is more likely to result in an overestimate, rather than underestimate, of the impacts of the proposed action on bull trout. When examining the potential impacts to a species that is listed as threatened under the Act, and there is substantial imprecision or uncertainty in some of the information, using assumptions that are more likely to overestimate, rather than underestimate, effects is a reasonably cautious and prudent approach for assessing impacts to populations of that species. Absent the consideration of the full potential of effects, detrimental impacts to the species can go unrecognized (National Research Council 1995, p. 167).

The Service also relied on our previous experience with these types of actions and the published scientific literature regarding potential construction impacts to fish and their habitat to analyze the information presented in the Assessment and the anticipated impacts of the proposed action. The Forest has established many project design features that would reduce the degree and/or likelihood of potential impacts translating to adverse effects to bull trout and its habitat. These measures include no instream work would occur if bull trout redds are present at or downstream of the construction site, disturbed portions of the channel would be wetted down with water and stream flows would be gradually returned to the natural channel to minimize the mobilization of sediment, and work would occur within, or close to, instream work windows.

Channel Dewatering and Fish Salvage

Impacts to bull trout could occur from channel dewatering and fish salvage. Approximately 10 meters of stream would be dewatered prior to the barrier being placed in the stream. Bull trout that do not passively relocate outside of the work isolation area on their own during dewatering would be salvaged via dip nets and placed in buckets. The search would take approximately 15 minutes and the fish would be in buckets for less than 10 minutes (Assessment, p. 3).

Project activities would be overseen by fish staff from the Forest and IDFG. It is expected that all instream work associated with this component of the project would take less than five days and would occur between June 16 and August 15. Any instream work after August 15 would only occur if surveys, which would be conducted daily, indicated a lack of bull trout redds in Warm Creek downstream of the work area (Assessment, p. 3).

Bull trout that are collected during salvage efforts would be temporarily moved from the reduced habitat area and relocated to Warm Creek 50 m upstream of the barrier site. Bull trout distribution is unlikely to be altered as all fish would remain in the same stream they were captured from and released quickly near their capture location. As a result of being moved, bull trout may suffer from stress and reduced predator avoidance. These behavioral effects may be resolved quickly if habitat space is readily available, or fish may be forced to seek out appropriate habitat. Overall, the effects of relocation are expected to be temporary, short-term, and low intensity; bull trout are expected to adjust to their new habitat quickly.

Based on the estimated bull trout population present in Warm Creek, the Service estimates that less than 10 bull trout will be salvaged, resulting in no more than 1 mortality (Assessment, pp. 3, 8).

Disturbance and Displacement

Installation of the concrete barrier is likely to disturb and displace bull trout in the action area. Disturbance would be minimal because construction activities are spatially and temporally limited. A substantial portion of bull trout habitat in Warm Creek would be free of project-related disturbance, so any fish present would be able to easily move away to other suitable areas. The expected level of disturbance is unlikely to impair breeding, feeding, or sheltering behavior. Therefore, the Service expects effects to bull trout from disturbance and displacement to be insignificant.

Subpopulation Size and Growth and Survival

The proposed action will have a long-term beneficial effect on subpopulation size and growth and survival of bull trout by eliminating brook trout from the action area. If the proposed action did not occur, it is likely that brook trout would eliminate bull trout from the action area. Recent data indicate approximately 170 bull trout are likely to occur in the action area (Assessment, p. 6). The elimination of brook trout is expected to allow Warm Creek to support at least 200 bull trout greater than 70 mm in length. However, as discussed above, installation of the passage barrier is likely to involve fish salvage which is expected to result in a very low level of mortality to bull trout. A very low level of mortality to bull trout is also expected from annual operation of the passage barrier. Therefore, the Service expects effects to bull trout subpopulation size and growth and survival to be beneficial overall, but there will be unavoidable adverse effects.

Life History Diversity and Isolation

The installation of the concrete barrier will eliminate the upstream movement of bull trout. Without additional action, this would prevent bull trout, including any migratory fish that are present, from moving into Warm Creek upstream of the barrier. However, project partners believe that the isolation of this resident bull trout population is essential for its continued existence, as brook trout and brook trout x bull trout hybrids far outnumber bull trout in the stream. Therefore, the Service anticipates the passage barrier would adversely affect bull trout by decreasing life history diversity and increasing isolation above the barrier.

Persistence and Genetic Integrity

The proposed action would eliminate brook trout from the action area, allowing bull trout to persist in the action area. The absence of brook trout will help preserve the genetic integrity of bull trout in the action area by eliminating the production of hybrids, thereby producing a beneficial effect on persistence and genetic integrity (Assessment, p. 8). However, the passage barrier would also prevent bull trout downstream of the action area from accessing the area, which could impact genetic diversity in the long term. The timeframe for when genetic integrity would begin to be negatively affected by the barrier is unknown. The Service anticipates that effects to bull trout from impacts to the persistence and genetic integrity indicator be both beneficial and adverse.

Sediment

Sediment is an important stressor to salmonids and can affect them in both direct and indirect ways. The potential negative impacts of increased sediment on bull trout and other salmonids have been well documented and depend on the timing, concentration, and duration of exposure (Newcombe and MacDonald 1991, entire; Newcombe and Jensen 1996, entire; Bash et al. 2001, entire). However, fish can, and do, easily disperse, which is evidenced by Henley et al. (2000, p. 132) observing juvenile coho salmon, arctic grayling, and rainbow trout avoiding turbidity; therefore, bull trout would also be able to relocate when sediment load is increased to avoid elevated turbidity.

The proposed action could increase turbidity and the amount of sediment introduced into the stream. Sediment deposition may occur because of exposed, cleared ground and soil disturbance when installing the concrete barrier and during flow reintroduction. Sediment plumes may also occur during flow reintroduction. The concrete structure may result in slower stream velocities at the upstream end of the structure, or increased velocities at the downstream end of the barrier structure. This will likely result in some sediment accumulating in the upstream end of the structure or some scouring in the stream channel immediately below the structure. Most of the disturbance would likely last less than an hour and be mostly gone within a few days (Assessment, p. 9).

Potential effects to bull trout from sediment and turbidity include behavior disruption, reduced habitat availability for foraging and sublethal responses; however, any suspended sediment and turbidity caused by the proposed action is expected to be of short duration and low intensity (Assessment, p. 9). Project design features, such as work occurring in the dry, dewatering, wetting down disturbed areas before flow reintroduction, and slowing reintroducing flow would minimize the amount of sediment and turbidity generated by the proposed action (Assessment, pp. 3, 9). Therefore, the Service expects effects to bull trout from sediment and turbidity to be insignificant.

Water Quality

The action requires use of heavy equipment. Usage of equipment adjacent to the stream introduces the risk of pollutants entering the water. These risks may include an accidental spill of fuel, chemical, lubricant, or similar contaminant into the riparian zone or directly into the water where it could negatively affect habitat or injure and kill aquatic food organisms. However, the work area would be dewatered prior to any work, making it unlikely that bull trout would be directly impacted by any pollutants. Furthermore, a staging area will be utilized, reducing the possibility of petroleum-based products reaching occupied waters, and it is unlikely that any fluids would be spilled in volumes or concentrations large enough to negatively affect bull trout downstream (Assessment, p. 3). Therefore, the Service expects effects to bull trout from chemical contaminants to be discountable.

Physical Barriers

The installation of the concrete barrier will be a complete barrier to the upstream movement of bull trout. However, project partners believe that the isolation of this resident bull trout population is essential for its continued existence, thus providing a beneficial effect. However, the passage barrier would also prevent bull trout downstream of the action area from accessing the area, which could impact genetic diversity in the long term.

The operation of the barrier could also cause some bull trout mortality. Although most bull trout are expected to successfully pass downstream over the barrier, a few fish larger than 100 mm could become trapped and die on the screen. This cannot be avoided with this type of barrier. A vertical barrier, which would not result in this type of mortality, cannot be used in this setting due to topographic limitations. It is expected that bull trout mortality associated with the operation of the barrier will be less than 10 fish annually (Assessment, p. 8). Due to the impacts of a passage barrier, and potential mortality of larger fish, the Service expects effects to bull trout to be adverse.

Pool Frequency and Quality, Streambank Condition, Riparian Conservation Area

Impacts to pool frequency and quality, streambank condition, and the riparian conservation area (RCA) would occur within a limited area of Warm Creek. The impacts would be minimal because construction activities are spatially and temporally limited. The installation of the barrier would convert 4 m of natural channel to a concrete structure, which represents only approximately 0.1 percent of Warm Creek. The barrier structure could result in some scouring and the formation of a pool immediately below the structure. This could provide a resting area for bull trout (Assessment, p. 9).

Additionally, a fence will be constructed around the barrier, which will encompass approximately 15 m of Warm Creek (11 m of the natural channel). The purpose of the fence is to prevent livestock from damaging the barrier structure. However, the fence will also prevent livestock from accessing Warm Creek inside the fence and will eliminate the impacts caused by livestock grazing to this section of stream, providing a beneficial effect on pool frequency and quality, streambank condition, and RCA. Therefore, due to the minimal extent of impacts to pool frequency and quality, streambank condition, and RCA and the beneficial effect of the fence, the Service expects effects to bull trout caused by impacts to pool frequency and quality, streambank condition, and RCA to be insignificant.

4.5.2 Summary of Effects

The proposed project would likely have adverse effects to bull trout within the action area during dewatering and fish salvage efforts and the long-term operation of the barrier. Project design features for fish salvage would be incorporated to minimize adverse effects to bull trout; however, the potential for disturbance, injury, or mortality to bull trout still exists.

Dewatering and fish salvage is expected to result in injury or mortality if bull trout are present. If fish are injured, their injuries may reduce individual swimming behavior, foraging ability, predator avoidance, and long-term survival. The Service estimates fish salvage could result in 10 bull trout being captured and handled, with up to 1 bull trout experiencing injuries or mortality. Additionally, the operation of the barrier is expected to result in injury or mortality of some bull trout larger than 100 mm. This cannot be avoided with this type of barrier. The Service estimates that bull trout mortality associated with the operation of the barrier will be less than 10 fish annually. The loss of 1 bull trout initially, and then 10 bull trout annually, would reduce the population size, the number of available spawners, and genetic diversity within the core area to some extent. Although current population trend information and total abundance for local populations within the Little Lost River is unknown, the Service expects that the loss of 10 bull trout annually from Warm Creek would not substantially affect numbers, reproduction, or distribution of bull trout at the local, core area, or RU scales. Habitat impacts resulting from the action are expected to be localized and temporary. Bull trout reproduction within the majority of the core area would not be affected by the action.

Fish near construction activities in the action area may be disturbed by the activity and noise and avoid the construction area. However, the majority of the stream would not be impacted by project activities and bull trout would be able to easily move to suitable habitat. Effects to bull trout breeding, feeding, or sheltering are expected to be minimal because the disturbance would be short term and temporary.

Chemical contaminants have the potential to enter live water during instream work. However, the work area would be dewatered prior to any work, reducing the risk of bull trout coming into direct contact with any pollutants. Furthermore, a staging area will be utilized, reducing the likelihood of effects to bull trout even more.

Temporary increases in sediment and turbidity may result from instream work and construction activities. Sediment plumes could cause bull trout to alter their behavior to avoid turbid areas. Bull trout are expected to temporarily relocate and forage in alternative areas during increased turbidity. Project design, including the wetting of disturbed areas, use of canvas, and slow rewatering is expected to minimize impacts.

The installation of the concrete barrier will be a complete barrier to the upstream movement of bull trout. However, project partners believe that the isolation of this resident bull trout population is essential for its continued existence, thus providing a beneficial effect. However, the passage barrier would also prevent bull trout downstream of the action area from accessing the area, which could impact genetic diversity in the long term.

4.6 Cumulative Effects

The implementing regulations for section 7 define cumulative effects to include the effects of future State or private activities that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). 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.

Future State activities that are reasonably certain to occur within the action area have been identified in this consultation. Following the installation of a fish barrier by the Forest, Warm Creek Bull Trout Protection Project partners have committed to the following future activities: removing brook trout, brook trout-bull trout hybrids, and rainbow trout from Warm Creek upstream of the barrier; using a fish trap and/or electrofishing to move bull trout upstream of the barrier; and using electrofishing and possibly eDNA techniques to monitor project effectiveness (Assessment, p. 2).

Removing brook trout, brook trout-bull trout hybrids, and rainbow trout from Warm Creek upstream of the barrier is expected to have a beneficial effect to bull trout above the barrier by reducing or removing the potential for hybridization and reducing competition with other species. Bull trout in the upper 1,225 m of Warm Creek would not be affected by electrofishing, as only the lower 2,000 m would be electrofished. Electrofishing in those 2,000 m would be conducted in a manner to minimize impacts to any bull trout that may be encountered (Assessment, pp. 22-23). This action is expected to maintain the genetic integrity of the bull trout population above the barrier. It is expected that 150 bull trout may be captured and handled during electrofishing. Because electrofishing would be conducted by an experienced and highly trained crew, only a small percentage of these fish (less than 5) are expected to be injured or killed.

Using a fish trap and/or electrofishing to capture and move bull trout below the barrier to above the barrier is expected to have beneficial effects to bull trout by maintaining or increasing the genetic diversity of the bull trout population above the barrier. Additionally, migratory bull trout may be trapped and moved above the barrier which would increase life history diversity of the population. Fish trap operation and/or electrofishing would continue for at least three years. Need for continued trapping would be evaluated at that time. Up to 100 bull trout are expected to be captured and handled each year. A small percentage of these fish (up to 3) are expected to be injured or killed.

Overall, the activities IDFG has committed to would be beneficial to the bull trout population in Warm Creek. A small number of bull trout are expected to be injured or killed while these activities are conducted. However, removing brook trout and hybrids and moving bull trout above the barrier are expected to have overall positive effects to the bull trout population. These activities are expected to increase the persistence, genetic integrity, and life history diversity of the population.

No other cumulative effects have been identified in this consultation.

4.7 Conclusion

After reviewing the current status of bull trout, the environmental baseline in the action area, effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of bull trout. The Service's rationale for this conclusion is presented below.

The Service concludes that adverse effects to bull trout are likely to occur from fish salvage activities and the operation of the fish passage barrier. Trained staff would be present during the short dewatering and fish salvage process. Project design is expected to minimize adverse effects to bull trout from handling and salvage. Capture and handling is expected to impact 10 bull trout in the action area and no more than 1 bull trout being injured or killed. Additionally, approximately 10 bull trout are expected to be killed from the operation of the barrier. This cannot be avoided. If 1 bull trout initially, and then 10 bull trout annually, are removed from the local population because of the proposed action, local population size would be slightly reduced in the short term, but it is not expected to have measurable effects into the future. Bull trout distribution in Warm Creek is expected to be reduced to some degree. Bull trout can pass downstream over the barrier, but it is expected that most of the bull trout in the stream would be above the barrier. Removal of brook trout, hybrids, and rainbow trout from above the area is expected to allow for increased numbers of bull trout in that habitat. Bull trout reproduction would benefit from the proposed action and cumulative effects. Genetic integrity of the bull trout population is expected to be maintained by installing the barrier and improved by the removal of brook trout and hybrids. Habitat impacts resulting from this action are expected to be localized and small in scale. The Service does not expect the loss of 1 bull trout initially, and 10 bull trout annually, to have measurable effects on the local population, core area, or RU in the short- or long-term, nor does the Service expect any injuries or deaths associated with the proposed action to have measurable effects to the conservation or recovery of the species. Future State activities are expected to improve the status of bull trout in Warm Creek.

Ground-disturbing activities that are instream, near surface water, or on streambanks can affect bull trout by increasing sediment input into streams. Sediment inputs are expected to be of short duration, with a minor amount of sediment and turbidity generated; however, sediment inputs could temporarily disturb or displace fish in localized areas, temporarily altering bull trout distribution within the stream. Turbidity is not expected to affect bull trout redds; Warm Creek would be surveyed prior to work if construction activities occur outside the instream work windows.

The Service concludes the anticipated level of effect caused by the proposed action and cumulative effects would not reduce appreciably the likelihood of both survival and recovery of bull trout in the wild. The proposed action is likely to have adverse effects to small numbers of bull trout from fish salvage and the operation of the barrier, but these effects are not likely to substantially change numbers and distribution of bull trout in the action area, the core area, or the local population. In the long term, growth and survival of the bull trout in Warm Creek are likely to be improved under the proposed action because of the beneficial effects likely to result from the installation of the barrier and the elimination of brook trout.

4.8 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 is defined by the Service as an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering" (50 CFR 17.3).

Incidental take is defined as take "that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant" (50 CFR 402.02). 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 an Incidental Take Statement.

4.8.1 Form and Amount or Extent of Take Anticipated

Based on the effects analysis above, the Service finds incidental take of bull trout is reasonably certain to occur in the form of capture of up to 10 bull trout. Of these 10 bull trout, 1 is reasonably certain to be injured or killed as a result of dewatering and salvage. Additionally, up to 10 bull trout are reasonably certain to be injured or killed annually as a result of the operation of the barrier.

4.8.2 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 bull trout across its range.

4.8.3 Reasonable and Prudent Measures

The Service finds that compliance with the proposed action outlined in the Assessment, including proposed project design features, is essential to minimizing the impacts of incidental take of the bull trout. If the proposed action, including project design features, is not implemented as described in the Assessment and this Opinion, there may be effects of the action that were not considered in this Opinion and reinitiation of consultation may be warranted.

The Service also finds that the following reasonable and prudent measures are necessary and appropriate to minimize the impacts of the take of bull trout reasonably certain to be caused by the proposed action.

1. Minimize the potential for incidental take resulting from salvage activities.

4.8.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Forest must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. To implement the reasonable and prudent measure (salvage), the project fish biologist shall ensure the following:
    a. An experienced and trained crew conducts salvage activities.
    b. Any captured bull trout shall be tallied, visually examined for condition, and immediately released into the stream at a suitable location near the collection site.

4.8.5 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 per 50 CFR 402.14 (i)(3).

1. The Forest shall provide a summary report of the number and estimated sizes of bull trout observed during salvage activities for the proposed action.
2. During project implementation, the Forest shall notify the Service within 24 hours of any emergency or unanticipated situations arising that may be detrimental to bull trout relative to the proposed activity.
3. Disposition of Individuals Taken: In the course of implementing the proposed action addressed in this Opinion, and the monitoring and reporting requirements addressed in this ITS, if dead, injured, or sick endangered or threatened species are detected and/or salvaged, the Service's Ecological Services' office in Chubbuck, Idaho, shall be notified within three working days by phone (208-237-6975) or by electronic mail (fw1idahoconsultationrequests@fws.gov). Notification should include the date, time, and precise location of the detection, a photograph, and the species involved and shall distinguish between injured and killed animals. If the listed species detected is not covered under this ITS, do not disturb the site and immediately contact the Service's Office of Law Enforcement in Idaho Falls, Idaho (208-557-5858).

4.9 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.

The Service has the following conservation recommendations:

1. Use native plants, shrubs, and trees to revegetate disturbed areas.
2. Lethally remove any brook trout captured while electrofishing and implement further brook trout removal efforts whenever feasible and biologically supported.

5. Bull Trout Critical Habitat

5.1 Status of Critical Habitat – Bull Trout

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

5.1.1 Legal Status

The Service published a final critical habitat designation for the coterminous United States population of the bull trout on October 18, 2010 (75 FR 63898); the rule became effective on November 17, 2010. Critical habitat is defined as the specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery. Designated critical habitat units (CHUs) for the bull trout are identified in Figure 4. A justification document that describes occupancy and the rationale for why these habitat areas are essential for the conservation of bull trout was developed to support the rule (USFWS 2010, entire).

The scope of the designation involved the species' coterminous range. Rangewide, the Service designated reservoirs/lakes and stream/shoreline miles as bull trout critical habitat (Table 2). Designated bull trout critical habitat is of two primary use types: (1) spawning and rearing and (2) FMO.

Table 1. 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

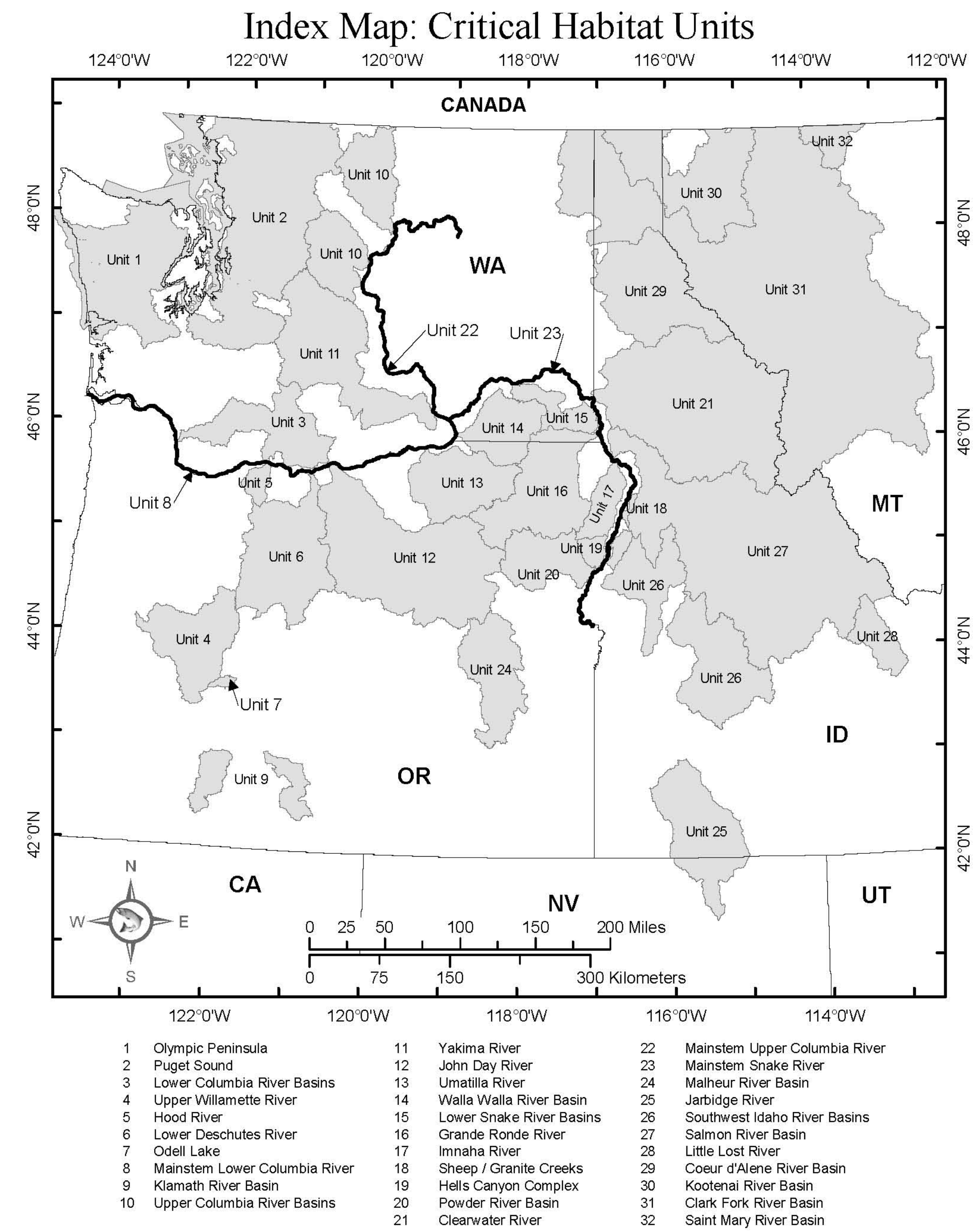

Figure 8. Index map of bull trout designated critical habitat units.

This rule also identifies and designates as critical habitat approximately 1,323.7 kilometers (822.5 miles) of streams/shorelines and 6,758.8 hectares (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. 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 critical habitat 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 issued under section 10(a)(1)(B) of the Act, 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 (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 (75 FR 63898). Fewer than 3,220 stream kilometers (2,000 miles) and 8,100 hectares (20,000 acres) of lake and reservoir surface area were excluded from the designation of critical habitat. It is important to note that the exclusion of waterbodies from designated critical habitat does not negate or diminish their importance for bull trout conservation, nor reduce authorities that protect the species under the Act. Because exclusions reflect the often complex pattern of land ownership, designated critical habitat is often fragmented and interspersed with excluded stream segments.

5.1.2 Conservation Role and Description of Critical Habitat

The conservation role of bull trout critical habitat is to support viable core area populations (75 FR 63943). The core areas reflect the metapopulation structure of bull trout and are the closest approximation of a biologically functioning unit for the purposes of recovery planning and risk analyses. Critical habitat units 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 shown in Figure 4, 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 (PBFs) 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 associated with PBFs 5 and 6 which relate to breeding habitat.

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 (Montana Bull Trout Scientific Group 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 (Hard 1995, pp. 314-315; Healey and Prince 1995, p. 182; Montana Bull Trout Scientific Group 1998, pp. 48-49; Rieman and McIntyre 1993, pp. 22-23); and (4) are distributed throughout the historical range of the species to preserve both genetic and phenotypic adaptations (Hard 1995, pp. 321-322; Montana Bull Trout Scientific Group 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 amphidromous 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, migration, and overwintering.

Physical or Biological Features for Bull Trout Critical Habitat

Within the designated critical habitat areas, the PBFs for bull trout are those components that are essential for the primary biological needs of foraging, reproducing, rearing of young, dispersal, genetic exchange, or sheltering. Based on our current knowledge of the life history, biology, and ecology of the bull trout, and the characteristics of the habitat necessary to sustain its essential life-history functions, we determined in our final designation that the following PBFs are essential for the conservation of bull trout (75 FR 63898):

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 ˚C to 15 ˚C (36 ˚F to 59 ˚F), with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shading, 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 historical 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 (*Salvelinus namaycush*), walleye (*Sander vitreus*), northern pike (*Esox lucius*), smallmouth bass (*Micropterus dolomieu*)); interbreeding (e.g., brook trout (*Salvelinus fontinalis*)); or competing (e.g., brown trout (*Salmo trutta*)) species that, if present, are adequately temporally and spatially isolated from bull trout.

PBF 9 addresses the presence of nonnative predatory or competitive fish species. Although this PBF applies to both the freshwater and marine environments, currently no nonnative fish species are of concern in the marine environment, though this could change in the future.

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

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

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

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

Activities that are likely to cause adverse effects to critical habitat are evaluated to determine if they are likely to "destroy or adversely modify" critical habitat such that the critical habitat will no longer serve the intended conservation role for the species or retain those PBFs that relate to the ability of the area to, at least periodically, support the species. Activities that may destroy or adversely modify critical habitat are those that alter the PBFs to such an extent that the conservation value of critical habitat is appreciably reduced (75 FR 63898:63943). The Service's evaluation must be conducted at the scale of the entire critical habitat area designated, unless otherwise stated in the final critical habitat rule (USFWS and NMFS 1998, pp. 4-39). Thus, adverse modification of bull trout critical habitat is evaluated at the scale of the final designation, which includes the critical habitat designated for the Klamath River, Jarbidge River, Columbia River, Coastal-Puget Sound, and Saint Mary-Belly River population segments. However, we consider all 32 CHUs to contain features or areas essential to the conservation of the bull trout (75 FR 63898:63901, 63944). Therefore, if a proposed action would alter the physical or biological features of critical habitat to an extent that appreciably reduces the conservation function of one or more CHUs for bull trout, a finding of adverse modification of the entire designated critical habitat area may be warranted (75 FR 63898:63943).

5.1.3 Current Critical Habitat Condition Rangewide

The condition of bull trout critical habitat varies across its range from poor to good. Although still relatively widely distributed across its historical range, the bull trout occurs in low numbers in many areas, and populations are considered depressed or declining across much of its range (67 FR 71240, November 29, 2002). The condition of bull trout reflects the condition of bull trout habitat. The decline of bull trout is primarily due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices, impoundments, dams, water diversions, and the introduction of nonnative species (63 FR 31647, June 10, 1998; 64 FR 17112, April 8, 1999).

There is widespread agreement in the scientific literature that many factors related to human activities have impacted bull trout and their habitat and continue to do so. Among the many factors that contribute to degraded PBFs, those which appear to be particularly significant 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; Montana Bull Trout Scientific Group 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 amphidromous 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; and
5. Degradation of overwintering habitat resulting from reduced prey base, roads, agriculture, development, and dams.

5.1.4 Effects of Climate Change on Bull Trout Critical Habitat

One objective of the final rule was 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 PBFs 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). For more discussion regarding impacts of climate change, see the *Status of the Species* section.

5.1.5 Consulted On Effects of Critical Habitat

The Service has formally consulted on the effects to bull trout critical habitat throughout its range. Section 7 consultations include actions that continue to degrade the environmental baseline in many cases. However, long-term restoration efforts are also proposed and have been implemented, which provide some stability or improvement in the existing functions within some of the CHUs. For an analysis of prior consulted-on effects in the action area, see the *Environmental Baseline* section.

5.2 Environmental Baseline of the Action Area

Refer to section 4.2 of this Opinion for a complete definition of the term "environmental baseline."

5.2.1 Status of Bull Trout Designated Critical Habitat in the Action Area

Little Lost River Critical Habitat Unit

Warm Creek occurs within the Little Lost River CHU (USFWS 2010, p. 795). This CHU occurs in southeastern Idaho within a hydrologically closed system, resulting in isolated populations. This CHU occurs in a unique ecological setting and contains many individuals. This CHU is in the southeasternmost portion of the Upper Snake RU. Located within Butte, Custer, and Lemhi Counties in east-central Idaho, designated critical habitat in the Little Lost River CHU includes 89.2 km (55.4 mi) of streams designated as critical habitat. (USFWS 2010, p. 795).

Action Area

Warm Creek is designated as critical habitat for bull trout. The action area provides spawning and rearing habitat.

5.3 Effects of the Proposed Action

Refer to section 4.3 of this Opinion for a complete definition of the term "effects of the action." In this section, the effects to critical habitat are determined by analyzing the effects on each of the PBFs below. Within the action area, Warm Creek is designated as spawning and rearing habitat for bull trout. As described above, the PBFs are those critical habitat components that are essential to bull trout for the primary biological needs of foraging, reproducing, and rearing young; dispersal; genetic exchange; or sheltering. The habitat indicators most likely impacted by the proposed action are physical barriers, sediment, pool frequency and quality, streambank condition, and riparian conservation areas (Assessment, pp. 7-10). Habitat indicators are associated with one or more PBFs, meaning impacts to habitat indicators may represent impacts to the condition of specific PBFs. PBFs 1 (groundwater and hyporeic flow), 3 (food base), 5 (water temperature), and 7 (natural hydrograph) are not expected to be affected by the proposed action because of the minimal impacts (low intensity, small scale) to the habitat indicators associated with them. PBFs 2 (migration habitats), 4 (complex habitats), 6 (spawning substrate), 8 (water quality and quantity), and 9 (predators and competitors) may be affected by the proposed action. Only the PBFs expected to be affected are discussed below.

5.3.1 Effects of the Proposed Action

PBF 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.

Migratory habitat will be impacted by the installation of the concrete barrier. The barrier will prevent bull trout, including any migratory fish, from moving into Warm Creek upstream of the barrier. Therefore, the Service expects effects to this PBF to be adverse.

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

The proposed action may impact pool frequency and quality, streambank condition, and riparian conservation areas. The installation of the barrier will convert 4 m of natural channel to a concrete structure (an area equal to approximately 0.1 percent of Warm Creek). The barrier structure could result in some scouring and the formation of a pool immediately below the structure. This may provide a resting area for bull trout Additionally, a fence will be constructed around the barrier, which will encompass approximately 15 m of Warm Creek (11 m of the natural channel). This fence will prevent livestock from accessing Warm Creek inside the fence, providing a beneficial effect on pool frequency and quality, streambank condition, and RCA. Because of the small scale of impact to pool frequency and quality, streambank condition, and the riparian conservation area and the expected improvement in habitat quality within the fenced area, the Service expects effects to this PBF to be insignificant.

PBF 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.

Spawning and rearing areas could be affected by chemical contamination and increased sediment levels. Chemical contamination can happen if a chemical spill occurs in, or outside of, the stream. Increased sediment levels from project activities can reduce egg survival and alevin development by reducing available dissolved oxygen in the gravel. Project design features, such as the use of a staging area, wetting down disturbed ground, and slowly rewatering the stream, are effective at minimizing impacts to spawning and rearing substrate. Therefore, the Service expects effects to this PBF to be insignificant.

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

Water quality could be affected by chemical contamination and increased sediment levels. Chemical contamination can happen if a chemical spill occurs in, or outside of, the stream. Water quality would also experience short-term and localized effects from increases in sediment and turbidity, particularly when installing the barrier and rewatering the channel. Project design features, such as the use of a staging area, wetting down disturbed ground, and slowly rewatering the stream, are effective at minimizing water quality impacts. Therefore, the Service expects effects to this PBF to be insignificant.

PBF 9: *Sufficiently low levels of occurrence of nonnative predatory (e.g., lake trout (Salvelinus namaycush), walleye (Sander vitreus), northern pike (Esox lucius), smallmouth bass (Micropterus dolomieu)); interbreeding (e.g., brook trout (Salvelinus fontinalis)); or competing (e.g., brown trout (Salmo trutta)) species that, if present, are adequately temporally and spatially isolated from bull trout.*

The installation of the concrete barrier will eliminate the upstream movement of fish. This would prevent brook trout from moving into Warm Creek upstream of the barrier, eliminating the potential for competition and hybridization. Additionally, as 10 meters of stream are dewatered prior to the installation of the barrier, stranded fish will be collected with dipnets and collected in buckets. Any brook trout or brook trout-bull trout hybrids will be removed, further reducing the number of fish (Assessment, p. 3).

5.3.2 Summary of Effects

Project activities would have insignificant effects to bull trout designated critical habitat PBFs 4, 6, 8, and 9. As described above, project design features are effective at minimizing impacts from increased sediment and turbidity, chemical contamination, and the installation of the barrier. Condition of these PBFs is expected to be maintained or slightly improved by the proposed action. Affects to PBF 2 would be permanent; bull trout movement upstream of the barrier would be prevented, thus having an adverse effect. However, a large portion of Warm Creek would remain accessible to bull trout.

Although adverse effects to PBF 2 are expected, the Service does not anticipate the proposed action would reduce the functionality of bull trout designated critical habitat in, or near, the action area, nor overall for the designated CHU.

5.4 Cumulative Effects

The implementing regulations for section 7 define cumulative effects to include the effects of future State or private activities that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). 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.

Future State activities that are reasonably certain to occur within the action area have been identified in this consultation. Following the installation of a fish barrier by the Forest, Warm Creek Bull Trout Protection Project partners have committed to the following future activities: removing brook trout, brook trout-bull trout hybrids, and rainbow trout from Warm Creek upstream of the barrier; using a fish trap and/or electrofishing to move bull trout upstream of the barrier; and using electrofishing and possibly eDNA techniques to monitor project effectiveness (Assessment, p. 2).

Removing brook trout, brook trout-bull trout hybrids, and rainbow trout from Warm Creek upstream of the barrier is expected to have a beneficial effect to bull trout above the barrier by reducing or removing the potential for hybridization and reducing competition with other species. This action is expected to greatly improve the condition of PBF 9 above the barrier.

Using a fish trap and/or electrofishing to capture and move bull trout below the barrier to above the barrier is expected to have lessen the adverse effects to PBF 2 by providing some connectivity for bull trout above and below the barrier. Fish trap operation and/or electrofishing would continue for at least three years. Need for continued trapping would be evaluated at that time.

Overall, the activities IDFG has committed to would improve the condition of PBF 9, lessen the adverse effect to PBF 2, and have no impact to other PBFs of bull trout designated critical habitat.

No other cumulative effects have been identified in this consultation.

5.5 Conclusion

After reviewing the current status of bull trout critical habitat, the environmental baseline in the action area, effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the proposed action is not likely to destroy or adversely modify designated critical habitat for bull trout. The Service's rationale for this conclusion is presented below.

Although some PBFs of designated critical habitat are likely to be adversely affected by the proposed action (specifically PBF 2), the Service expects these effects to be necessary for bull trout to persist in Warm Creek. Installing the fish passage barrier is expected to affect designated critical habitat because of the barrier to migration, thereby also preventing the entrance of brook trout into Warm Creek. The barrier would inhibit some bull trout movement in the stream, but the adverse effect to PBF 2 would be lessened by the future State action of moving bull trout from below the barrier to above the barrier. Overall, Warm Creek would retain functionality to provide spawning and rearing habitat for bull trout.

The magnitude and extent of effects from the proposed action would be minimal and confined to Warm Creek. Impacts to designated critical habitat would not affect the functionality or conservation value of the Little Lost River CHU. The proposed barrier will prevent brook trout from eliminating this population of bull trout. Although the barrier will restrict bull trout movement, suitable spawning and rearing habitat is available and accessible for bull trout above the barrier (the majority of the stream). For this reason, the Service concludes that the anticipated level of effects caused by the proposed action to bull trout designated critical habitat over the term of the proposed action is likely to maintain the capability of the critical habitat to support bull trout and serve its intended conservation role for the species. These adverse effects are unlikely to be discernible at the designated critical habitat rangewide scale.

6. 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.

1. Use native plants, shrubs, and trees to revegetate disturbed areas.

7. Reinitiation Notice

This concludes formal consultation on the Warm Creek Bull Trout Protection Project. 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, or
4. A new species is listed or critical habitat designated that may be affected by the action.

8. LITERATURE CITED

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