United States Department of the Interior

FISH AND WILDLIFE SERVICE
Montana Ecological Services Office
585 Shephard Way, Suite 1
Helena, Montana 59601-6287

In Reply refer to:
File: M17 FHWA
2022-0089301-S7

October 28, 2022

Brian Hasselbach
Federal Highway Administration
585 Shephard Way, Suite 2
Helena, Montana 59601

Dear Mr. Hasselbach:

The U.S. Fish and Wildlife Service (Service) has reviewed the biological assessment regarding the effects of the proposed Flathead River—3 M NW Big Fork (BR 82-1(5)5; UPN 6850000) project (project). The biological assessment analyzed the effects of the proposed action on the federally threatened bull trout (*Salvelinus confluentus*) and bull trout critical habitat, grizzly bear (*Ursus arctos horribilis*), and yellow-billed cuckoo (*Coccyzus americanus*). The Federal Highway Administration (Administration) made a determination of *may affect, likely to adversely affect* for bull trout and bull trout critical habitat, and *may affect, not likely to adversely affect* determinations for grizzly bear and yellow-billed cuckoo. Formal consultation began with receipt of your letter on June 6, 2022. Additional information was received throughout the consultation process.

The Montana Department of Transportation (Department), in cooperation with the Administration, is proposing a bridge replacement project on MT 82, approximately three miles northwest of Bigfork, Montana in Flathead County. The proposed project will replace the existing two-lane bridge over the Flathead River with a new two-lane bridge on a new alignment slightly downstream from the existing structure.

Work associated with this project includes construction of new roadway approaches to the bridge, horizontal and vertical alignment shifts, new asphalt surfacing, drainage, gravel, pavement markings, and signing. The proposed project will also include developing a multi-use path over the bridge's length and measures to enhance recreational uses in the area. A popular Montana Fish, Wildlife and Parks (MFWP) Fishing Access Site (FAS) is located immediately south of the existing bridge on the east side of the Flathead River. The FAS will be reconfigured with this project to accommodate shifting the roadway alignment and to mitigate the resulting impacts to the MFWP property.

The attached biological opinion is based on the biological assessment prepared by Respec for the Department, additional information received during the consultation process, and information in our files. The biological opinion was prepared in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). A complete project file of this consultation is on file at the Service's Montana Ecological Services Office.

We have reviewed the BA and concur with your determination that the proposed project *may affect, not likely to adversely affect* the threatened grizzly bear and yellow-billed cuckoo. We based our conclusion on the information displayed in the BA, and especially conservation measures listed on pages 6 through 8 of the BA, implementation of the contract special provisions, that the project is limited in scope, and on information in our records.

The Service appreciates your efforts toward conservation of threatened and endangered species as part of our joint responsibility under the Act. If you have questions or comments related to this consultation, please contact Mike McGrath at (406) 430-9009.

Sincerely,

Jacob M Martin

for Adam Zerrenner
Field Supervisor

Enclosure

cc: AES, R-6, MS 60120
Montana Fish, Wildlife and Parks, Missoula, MT (Attn: Lee Anderson)
Montana Department of Transportation, Helena, MT (Attn: Bill Semmens, Joe Weigand)
File: 7759 Biological Opinions – 2022

ENDANGERED SPECIES ACT SECTION 7 CONSULTATION

BIOLOGICAL OPINION
FOR THE
Flathead River—3 M NW Bigfork (BR 82-1(5)5; UPN 6850000) Project

Project Number: 2022-0089301-S7

Action Agency:	Federal Highway Administration Montana Division Helena, Montana
Consultation Conducted by:	U.S. Fish and Wildlife Service Montana Ecological Services Office Helena, Montana
Date Issued:	October 26, 2022

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I. Introduction

This biological opinion addresses project related effects to the threatened bull trout (*Salvelinus confluentus*) and bull trout critical habitat in accordance with the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). The Federal Highway Administration (Administration) and the Montana Department of Transportation (Department) are proposing to replace a bridge on MT 82 in Flathead County, Montana, across the Flathead River. The U.S. Fish and Wildlife Service (Service) based this opinion on our review of the Department's biological assessment and on additional information in our files.

Section 7(b)(3)(A) of the Act requires that the Secretary issue biological opinions on Federal agency actions that may adversely affect listed species or critical habitat. Biological opinions determine if the action proposed by the action agency is likely to jeopardize the continued existence of listed species or destroy or adversely modify critical habitat. Section 7(b)(3)(A) of the Act also requires the Secretary to suggest reasonable and prudent alternatives to any action that is found likely to jeopardize the continued existence of listed species or result in an adverse modification of critical habitat, if any has been designated. If the Secretary determines "no jeopardy," then regulations implementing the Act (50 C.F.R. § 402.14) further require the Director to specify "reasonable and prudent measures" and "terms and conditions" necessary or appropriate to minimize the impact of any "incidental take" resulting from the action(s).

This biological opinion addresses only the impacts to the federally listed bull trout and bull trout critical habitat within the action area and does not address the overall environmental acceptability of the proposed action.

Consultation History: In January 2014, the Department and Administration submitted a biological assessment (BA) for formal consultation.

On January 23, 2014, the Service responded to the submission and identified numerous places in the BA where information was either lacking or deficient, and requested additional information so that formal consultation could be initiated.

On January 4, 2017, the Department transmitted alignment information on the proposed project to the Service, and requested comments to aid in the development of the environmental document.

On January 27, 2017, the Service provided the Department and Administration with comments on the proposed project, including recommending conservation measures to reduce the impacts from the proposed action on grizzly bears, bull trout, and bull trout critical habitat.

On December 6, 2017, there was an email exchange between the Department and Service exploring specific conservation measures to reduce the effects of impact pile driving on bull trout, given the specific geotechnical conditions at the project site.

On February 9, 2022, the Department submitted a draft BA to the Service for review and comment.

On February 16, 2022, the Service provided comments to the Department on the draft BA.

On June 6, 2022, the Administration submitted a final BA and request to initiate formal consultation on the proposed action.

II. Description of the Proposed Action

The proposed project is located on Montana Highway 82 (MT 82) and begins approximately three miles northwest of Bigfork, Montana, in Flathead County. The existing bridge across the Flathead River (known as Sportsman's Bridge) is located at approximately Reference Post (RP) 5.58, and the project limits extend from RP 5.00 to RP 6.42. The proposed project will replace the existing two-lane bridge with a new two-lane bridge on an alignment that will be located slightly downstream from the existing structure.

Work associated with this project includes construction of new roadway approaches to the bridge, horizontal and vertical alignment shifts, new asphalt surfacing, drainage, gravel, pavement markings, and signing. The proposed project will also include developing a multi-use path over the bridge's length and limited measures to enhance recreational uses in the area (RESPEC 2022: 1).

A 10-foot wide multi-use path will be provided along the north side of the bridge and will taper into the roadway shoulder beyond the guardrail runs at each end of the bridge. A popular MFWP Fishing Access Site (FAS) is located immediately south of the existing bridge on the east side of the Flathead River. The FAS will be reconfigured with this project to accommodate shifting the roadway alignment and to mitigate the resulting impacts to the MFWP property (RESPEC 2022: 1).

The proposed bridge over the Flathead River will be a four-span, 706-foot long structure with end abutments supported by driven piles and by clusters of 3-foot diameter stone columns spaced at 5 feet on center. The concrete deck will be installed approximately 57 feet to the south of the existing alignment and supported by three sets of driven pile piers. Driven pile piers were selected over drilled shafts for several reasons, including: cost, constructability in deep water with unstable soils and high seismic loading, and high degree of construction risk associated with drilled shafts (RESPEC 2022: 2).

The total deck width will be approximately 54 feet and include two 12-foot wide driving lanes, two 10-foot wide shoulders, and a 10-foot wide shared use path. Cast-in-place concrete barrier rails and pedestrian rails will be used. Stormwater flows that occur on the surface of the bridge deck will be conveyed to the west abutment where these flows will be discharged onto the north and south embankment protectors. This process will allow sediment and other pollutants to filter out before the water enters the Flathead River. Approximately 0.60 miles of approach roadway work will be required on the west side of the bridge, and 0.70 miles on the east side (RESPEC 2022: 2).

Because the new bridge will be constructed downstream of the existing structure, the existing bridge will remain in service and carry traffic during construction, thereby eliminating the need for a temporary detour bridge. After construction, traffic will be routed to the new structure and the existing bridge will be removed. A temporary work bridge may be required during construction, depending on specific techniques chosen by the contractor. The temporary structure would likely be built of driven steel pile bents and would have a wood deck. Whether the temporary structure would span the entire river, or if the contractor would build one half at a time is currently unknown. To provide safe passageway for boaters on the river, the contractor may be required to leave one half of the river open at all times during the floating season (May through September; RESPEC 2022: 2).

Removal of the existing bridge will occur after the new bridge is complete and operational. Bridge deck removal typically occurs initially and is followed by removal of the super structure pieces and then the in-stream piers. The removal method is unknown at this time, but special precautions will be taken to prevent bridge materials from entering the river. Most large pieces of concrete or steel that enter the river will be lifted from the river rather than dragged out. Based on preliminary agreements between the Department and various resource agencies, the existing in-stream piers (spread footings) will be removed to a depth of 10 feet below the low-water surface elevation. A majority of the large spread footings will remain beneath the streambed after demolition to avoid major disturbance to the streambed and associated natural resources. Disturbed streambanks and the streambanks immediately adjacent to the new bridge will be stabilized and revegetated. Riprap aprons will be used to protect the end abutments of the new bridge (RESPEC 2022: 3).

Shifting the bridge alignment to the south will impact the Sportsman's Bridge FAS located on the east bank of the Flathead River. To mitigate its impacts to the FAS, the project will reconstruct the FAS immediately to the south of the existing FAS, and will include 28 truck/trailer and 8 standard vehicle parking stalls. Two handicap stalls will be located next to the relocated pit toilet. The access route and facilities associated with the FAS will be relocated with this project. Access to the FAS will be off Hanging Rock Drive. The relocated access road and new FAS will be constructed before the construction of the new bridge to maintain access to the Flathead River during bridge construction. Turn lanes will be added at the intersection of hanging rock drive and MT 82 to improve safety for left- and right-hand turns off the highway at the intersection. A new replacement boat ramp will be constructed downstream of the existing boat ramp that is associated with the FAS (RESPEC 2022: 3-4).

Conservation Measures: The following conservation measures and construction Best Management Practices (BMPs) will be implemented for this project to avoid and minimize impacts to bull trout and bull trout critical habitat. The following text is taken from the BA (RESPEC 2022: 4-7).

- To minimize the risk of barotrauma and fish mortality from driving piles for construction of the new bridge and any temporary work bridges, both on dry land and in water:
    - limit the periods of impact pile driving to no more than 12 hours per day, except in rare circumstances when safety issues require the work to be completed that

day. The project manager must be notified and approve pile driving that exceeds 12 hours per day.

- Conduct hydroacoustic monitoring. Through hydroacoustic monitoring, it is possible that the physical harm thresholds of the peak sound pressure level (SPL) of 206 decibels (dB; re: 1 micropascal [µPa]) or the cumulative sound exposure level (SEL) of 187 decibel (re: 1 µPa) may be attained or exceeded during the calibration exercise. The calibration period will be limited in duration with the purpose of obtaining a representative sample of piles (e.g., size and materials) and locations to ensure that the appropriate sound information is collected for use in the National Marine Fisheries Service Calculator Tool. In combination with hydroacoustic monitoring, use one of the following measures:
  - Use a vibratory hammer to drive piles to a point where an impact hammer will be required to drive the pile to the point of completion OR;
  - For production piledriving, use a "soft start" or "ramp up" pile driving method (e.g., driving does not begin at 100% energy) to encourage fish to vacate the surrounding area. Use the information collected during the hydroacoustic monitoring calibration and the National Marine Fisheries Service Calculator Tool to determine how many pile strikes can occur during a day, based on pile type and size, before reaching the cumulative SEL threshold of 187 dB. Once the number of strikes has been attained, impact pile driving must be stopped for the day. If pile driving outside the stated work time frames with an impact hammer over consecutive days, either do not drive piling between the hours of 9:00 PM and 6:00 AM OR;
  - Use department approved noise reduction methods, such as those offered in Leslie and Schwertner (2013; e.g., bubble curtains).

- To the maximum extent possible, disassemble the existing bridge and remove without pieces being allowed to fall into the stream. If portions of the old bridge do fall into the stream during demolition, they will be removed from the stream without dragging the material along the streambed.
- Any blasting required during bridge pier removal will be contained to the maximum extent practicable by using a containment shielding device to attenuate the blast's pressure wave within the water and prevent debris from entering the river. Meet all applicable requirements contained within the current Department *Standard Specifications for Road and Bridge Construction*, Section 204—Blasting.
- Instream work conducted within the channel shall be kept to the minimum amount necessary, preferably during periods of low flow. This includes, but is not limited to, construction and removal of pilings for any temporary support structures that may be necessary. Instream construction work shall be completed in the shortest amount of time possible.
- Visually monitor all dewatering activities, if any, to ensure bull trout are not trapped. In the unlikely event a live bull trout is found within a dewatering area, immediately return it to the river.
- The proposed project will be constructed in accordance with the applicable environmental standard specifications found in the current Department *Standard Specifications for Road and Bridge Construction*. Standard specifications will include:
  - Section 208.03.1—*Water Pollution Control*

        - The contractor will implement a spill prevention and waste disposal plan.
        - The contractor will implement appropriate erosion and sediment control measures. This includes installation of barriers (e.g., silt fencing, straw wattles) adjacent to waterways prior to any soil disturbance to prevent sediment from leaving the site.
        - The contractor will be responsible for conducting routine site monitoring to ensure all pollution control measures are installed, maintained, and functioning correctly.
    - Section 208.03.2—*Aquatic Resource Protection*. The contractor will implement the general provisions of this standard specification that include:
        - Do not spill or dump material from equipment into regulated aquatic resources.
        - Do not discharge wastewater from washout of concrete related equipment, concrete finishing, saw cutting, wet concrete, hydraulic demolition, etc, into any regulated aquatic resource.
        - Locate staging or storage areas at least 50 feet (15.2 meters) horizontally from any aquatic resource, top of streambank, or the highest anticipated water level during the construction., whichever is furthest from the resource.
        - Store and handle petroleum products, chemicals, cement, and other deleterious materials to prevent their entering regulated aquatic resources.
        - Provide sediment and erosion controls for topsoil stockpiles, staging areas, access roads, channel changes, and instream excavations.
        - Clean, maintain, and operate equipment so that petroleum based products do not leak or spill into any regulated aquatic resource.
- The special provision entitled *Protection of Aquatic Resources and Threatened and Endangered Species* will be included in the final construction bid documents to avoid and minimize potential impacts to bull trout and bull trout critical habitat.
    - The special provision identifies aquatic resource locations and requires the construction contractor to prepare and submit an aquatic resource protection plan (ARPP) to the Department before construction that outlines procedures for implementing and maintaining BMPs. The ARPP will be reviewed by the Department and approved, with modifications as necessary, before construction.
- The special provision entitled *Conservation and Coordination Measures for Bull Trout* will be included in the final construction bid documents as an additional conservation measure to protect bull trout and bull trout critical habitat.
- Additional standard BMPs will be implemented with the project to include the following:
    - Minimizing the site disturbance to only the area absolutely necessary to complete the project.
        - Clearing and grubbing should not be allowed within the ROW beyond the construction limits or required clear zone. Any temporary clearing outside the construction limits (e.g., for culvert installation, etc.) but within the ROW should be kept to the smallest area possible and reclaimed immediately following construction.
    - Minimize impact on riparian vegetation fringing the project area and the Flathead River to the greatest extent practicable.

    - All excavated material that cannot be reused as backfill will be contained and hauled off site.
    - Stabilize exposed soils with a desirable native vegetation community as soon as feasible.

The following standard specifications are intended to avoid project impacts on migratory bird species:

- Section 208.03.4A, *Migratory Bird Treaty Act Compliance*, will be included in the final construction bid documents to avoid and minimize potential impacts on migratory birds resulting from any unforeseen requirement for vegetation removal. The standard specification includes the following construction requirements for vegetation removal and structures:
    - **Vegetation Removal:** Perform required cutting of trees or shrubs between August 16 and April 15, and when no active nests are present. Remove only those trees and shrubs in direct conflict with the permanent construction limits. Where possible, do not remove, but trim trees and shrubs as necessary for equipment access and construction activities.
    - **Structures:** Use one or a combination of the following measures for structure removal or work that may directly impact active nests:
        - It is permissible to remove non-active nests (without birds or eggs), partially completed nests, or new nests as they are built (prior to occupation).
        - Conduct work that may impact active nests outside of the nesting season, typically between the dates of August 16 and April 15, and when no active nests are present, or
        - Install nesting deterrents meeting the requirements below prior to the nesting season as follows:
            - Cover or enclose all potential nesting surfaces on the structure tightly with mesh netting or other material with no opening or mesh size greater than 1/2 inch. Maintain the material/enclosure until the structure is removed or work is completed, or
            - Thoroughly apply a non-toxic, non-lethal bird roosting or landing repellent gel or liquid (do not use smell or taste deterrents) on all potential nesting surfaces on the structure in accordance with the manufacturer's instructions. Reapply the repellent as needed to maintain adequate coverage to prevent new nests from being established, or
            - Prepare a description of alternate methods of effectively keeping birds from establishing nests during the nesting season and submit them along with proposed installation dates and methods to the project manager for review.

The following conservation measures are proposed to avoid project impacts on bears in general:

- Standard Specification 208.03.4(E)—*Work in Bear Habitat* applies to this project and

additional language specific to conservation measures for grizzly bears will be included in the contract documents. The following requirements are included:
    - Promptly clean up any project related spills or debris.
    - Camping is allowed in designated camping areas only.
    - Store all food, food related items, petroleum products, antifreeze, garbage, and personal hygiene items inside a closed, hard-sided vehicle or commercially manufactured bear resistant container.
    - Remove garbage from the project site daily and dispose of it in accordance with all applicable regulations.

The following Special Provision will be included in the contract documents to make clear the requirements above:

- Grizzly Bear—Endangered Species Act (revised 12-09-21m).
    - Description. This project is located within grizzly bear habitat. Comply with this provision to minimize impacts to the grizzly bear, which is a federally listed species under the Endangered Species Act.
    - Requirements
        - Follow the requirements of Subsection 208.03.4(E) for all project activities.
        - Notify the Project Manager of any animal carcasses found in the area. The Project Manager will contact MDT Maintenance to promptly remove and dispose of carcasses.
        - Notify the Project Manager of any bears observed in the vicinity of the project. The Project Manager will promptly inform the MDT District Biologist at 406-444-9205 of bear observations.
        - Conduct project-related activities outside of construction limits in accordance with the measures above and Subsection 208.03.4(E).
- Method of Measurement and Basis of Payment. Requirements in this provision are not measured for payment.

III. Analytical Framework for the Jeopardy and Adverse Modification Analysis

A. Jeopardy Determination

In accordance with policy and regulation, the jeopardy analysis in this BO relies on four components:

1. The *Status of the Species*, which evaluates the bull trout's rangewide condition, the factors responsible for that condition, and its survival and recovery needs.
2. The *Environmental Baseline*, which evaluates the condition of the bull trout in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the bull trout.
3. The *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the bull trout.

4. *Cumulative Effects*, which evaluates the effects of future, non-Federal activities reasonably certain to occur in the action area on the bull trout.

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

Recovery Units (RUs) for the bull trout were defined in the final *Recovery Plan for the Coterminous United States Population of [the] Bull Trout* (Service 2015a, entire). Pursuant to Service policy, 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 BO 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.

The jeopardy analysis for the bull trout in this BO considers the relationship of the action area and affected core areas (discussed below under the *Status of the Species* section) to the RU and the relationship of the RU to both the survival and recovery of the bull trout as a whole as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.
Within the above context, the Service also considers how the effects of the proposed Federal action and any cumulative effects impact bull trout local and core area populations in determining the aggregate effect to the RU(s). Generally, if the effects of a proposed Federal action, taken together with cumulative effects, are likely to impair the viability of a core area population(s), such an effect is likely to impair the survival and recovery function assigned to a RU(s) and may represent jeopardy to the species (Service 2005b, 70 FR 56258).

B. **Adverse Modification Determination**

The adverse modification analysis in this BO relies on four components: (1) the Status of Critical Habitat, which evaluates the range-wide condition of designated critical habitat for the bull trout in terms of primary constituent elements (PCEs); the factors responsible for that condition and the intended recovery function of the critical habitat overall; (2) the Environmental Baseline, which evaluates the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area; (3) the Effects of the Action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the PCEs and how those effects are likely to influence the recovery role of affected critical habitat units or subunits; and (4) Cumulative Effects, which evaluates the effects of future, non-Federal activities in the action area on the PCEs and how those effects are likely to influence the recovery role of affected critical habitat units.

For purposes of the adverse modification determination, the effects of the proposed Federal action on bull trout critical habitat are evaluated in the context of the range-wide condition of the critical habitat, together with any cumulative effects, to determine if the critical habitat range-wide would remain functional (or would retain the current ability for the PCEs to be functionally established in areas of currently unsuitable but capable habitat) and continue to serve its intended recovery role for bull trout. The analysis in this BO places an emphasis on using the intended range-wide recovery function of bull trout critical habitat, especially in terms of maintaining and/or restoring habitat conditions that are necessary to support viable core area populations, and the role of the action area relative to that intended function as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the adverse modification determination.

C. Scales of Analysis Summary

The scale of analysis for a bull trout jeopardy determination from largest to smallest is as follows: Recovery Unit, Major Geographic Region, Core Area, Local Population. The scale of analysis for a bull trout critical habitat adverse modification determination from largest to smallest is as follows: Range of Bull Trout, Critical Habitat Unit (CHU), Critical Habitat Sub-Unit (CHSU), Stream Segment/Waterbody. The project-specific scales of analysis for jeopardy and adverse modification used in this BO are presented in the *Status of the Species and Critical Habitat* sections.

IV. Status of the Species and Critical Habitat

This section provides information about the bull trout's life history, habitat preferences, geographic distribution, population trends, threats, and conservation needs. This includes 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.

A. Status of the Species

A.1 Listing Status

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

The final listing rule for the United States coterminous population of the bull trout discusses the consolidation of five distinct population segments (DPSs) into one listed taxon, the application of the jeopardy standard under section 7 of the ESA relative to this species, and established five interim recovery units (RUs) for purposes of consultation and recovery (Service 1999, 64 FR 58930). However, in 2010 six RUs were identified based on the best available information. The

Service determined that these six RUs were needed to ensure a resilient, redundant, and representative distribution of bull trout populations throughout the range of the listed entity (Service 2010, 75 FR 93898). In 2015, the six RUs were formalized in the final *Recovery Plan for the Coterminous United States Population of Bull Trout (Salvelinus confluentus)* (Recovery Plan; Service 2015a). The final RUs replace the previous five interim RUs and are used in the application of the jeopardy standard for ESA section 7 consultation procedures.

A.2 Reasons for Listing

Throughout its range, the bull trout is threatened by a wide variety of factors. These include: habitat degradation and fragmentation, instream flow alterations associated with water diversions, road construction and maintenance, mining, grazing, the blockage of migratory corridors by dams or other diversion structures, poor water quality; incidental angler harvest, entrainment (a process by which aquatic organisms are pulled through a diversion or other device) into diversion channels; and introduced non-native species (Service 1999, 64 FR 58910). Poaching and incidental mortality of bull trout during other targeted fisheries are additional threats. Since the time of coterminous listing of the species (Service 1999, 64 FR 58910) and designation of its critical habitat (Service 2005a, 70 FR 56212; Service 2010, 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), the bull trout core areas templates (Service 2005b), Conservation Status Assessment (Service 2005c), and 5-year Reviews (Service 2008, 2015g) have provided additional information about threats and status. The final Recovery Plan lists many other documents and meetings that compiled information about the status of bull trout (Service 2015a). The most recent 5-year status review (Service 2015g) maintains the listing status as threatened based on the information compiled in the final bull trout recovery plan (Service 2015a) and the Recovery Unit Implementation Plans (RUIPs) (Service 2015a-f)

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 (Service 2002, 2004a, 2004b) included detailed information on threats at the recovery unit scale (i.e., similar to subbasin or regional watersheds), thus incorporating the metapopulation concept with core areas and local populations. In the 5-year 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) (Service 2008, 2015g). In the final Recovery Plan, threats are described at RU scale that typically incorporates multiple watersheds. The plan also describes threats for 109 core areas, local populations, forage/migration/overwintering areas, and includes research needs areas (Service 2015a).

A.3 Emerging Threats

Climate change was not addressed as a known threat when bull trout were originally listed in 1999. The 2015 Recovery Plan and RUIPs summarize the threat of climate change and acknowledge that some extant bull trout core area habitats will likely change (and may be lost) over time due to anthropogenic climate change effects. It was determined that use of best available information to identify and ensure future conservation efforts will offer the greatest long-term benefit to sustain bull trout and their required cold water habitats (Service 2015a, Service 2015a-f).

Mote et al. (2014) summarized climate change effects to include rising air temperature, changes in the timing of streamflow related to changing snowmelt, increases in extreme precipitation events, lower summer stream flows, and other changes. A warming trend in the mountains of western North America is expected to decrease snowpack, hasten spring runoff, reduce summer stream flows, and increase summer water temperatures (Poff et al. 2002, Koopman et al. 2009). 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 non-native 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) 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 (Service 2015c). Although all salmonids are likely to be affected by climate change, bull trout are particularly vulnerable given that spawning and rearing are constrained by their location in upper watersheds and the requirement for cold water temperatures (Battin et al. 2007, Rieman et al. 2007). Climate change is expected to reduce the extent of cold water habitat (Isaak et al. 2015), and increase competition with other fish species (e.g., lake trout, brown trout, brook trout, and northern pike) for resources in remaining suitable habitat. Several authors project that brook trout, a fish species that competes for resources with and predates on the bull trout, will continue increasing their range in several areas (an upward shift in elevation) due to the effects from climate change (Isaak et al. 2010, 2014, Peterson et al. 2013).

A.4 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 (Cavender 1978; Bond 1992). To the west, the bull trout's range includes Puget Sound, various coastal rivers of British Columbia, Canada, and southeast Alaska (Bond 1992). Bull trout occur in portions of the Columbia River and tributaries within the basin, including its headwaters in Montana and Canada. Bull trout also occur in the Klamath River basin of south-central Oregon. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta and Montana, and in the MacKenzie River system in Alberta and British Columbia, Canada (Cavender 1978; Brewin and Brewin 1997).

Reproductive Biology

Bull trout typically reach sexual maturity in 4 to 7 years and may live longer than 12 years. They are iteroparous (i.e., 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; Leathe and Graham 1982; Pratt 1992; Rieman and McIntyre 1996). The iteroparous reproductive strategy (i.e., fish 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 (i.e., fishes that spawn once and then die, and require only one-way passage upstream). Therefore, even dams or other barriers with fish passage facilities may be a factor in isolating bull trout populations if they do not provide a safe 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.

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). Redds are often constructed in stream reaches fed by springs or near other sources of cold groundwater (Goetz 1989; Pratt 1992; Rieman and McIntyre 1996). Depending on water temperature, incubation is typically 100 to 145 days (Pratt 1992). Post hatching, fry remain in the substrate, with time from egg deposition to emergence potentially surpassing 220 days. Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows (Pratt 1992; Ratliff and Howell 1992).

Early life stages of fish (specifically the developing embryo) require the highest inter-gravel dissolved oxygen (IGDO) levels and are the most sensitive life stage to reduced oxygen levels. The oxygen demand of embryos depends on temperature and on stage of development, with the greatest IGDO required just prior to hatching. A literature review conducted by the Washington Department of Ecology (WDOE 2002) indicates that adverse effects of lower oxygen concentrations on embryo survival are magnified as temperatures increase above optimal (for incubation). Normal oxygen levels seen in rivers used by bull trout during spawning ranged from 8 to 12 mg/L (in the gravel), with corresponding instream levels of 10 to 11.5 mg/L (Stewart et al. 2007). In addition, IGDO concentrations, water velocities in the water column, and especially the intergravel flow rate, are interrelated variables that affect the survival of incubating embryos (ODEQ 1995). Due to their long incubation period (220+ days), bull trout are particularly sensitive to inadequate IGDO levels. An IGDO level below 8 mg/L is likely to result in mortality of eggs, embryos, and fry.

Growth varies depending upon life-history strategy. Resident adults range from 6 to 12 inches total length, and migratory adults commonly reach 24 inches or more (Goetz 1989; Pratt 1985). The largest verified bull trout is a 32-pound specimen caught in Lake Pend Oreille, Idaho in 1949 (Simpson and Wallace 1982).

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). 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). Migratory bull trout spawn in tributary streams where juvenile fish rear for 1 to 4 years before migrating to either a lake (adfluvial form), river (fluvial form) (Fraley and Shepard 1989; Goetz 1989), or saltwater (anadromous form) to rear as sub-adults and to live as adults (Brenkman and Corbett 2005; McPhail and Baxter 1996; WDFW et al. 1997).

Bull trout are believed to be naturally migratory, which allows them to capitalize on temporally abundant food resources and larger downstream habitats. However, resident forms likely develop where barriers (either natural or manmade) occur or where foraging, migrating, or overwintering habitats for migratory fish are minimized (Brenkman and Corbett 2005; Goetz et al. 2004). For example, multiple life history forms (e.g., resident and fluvial) and multiple migration patterns have been noted in the Grande Ronde River (Baxter 2002). Parts of this river system have retained habitat conditions that allow free movement between spawning and rearing areas and the mainstem Snake River. Such multiple life history strategies help to maintain the stability of bull trout populations and allow persistence following environmental changes. Benefits to migratory bull trout include greater growth in the more productive waters of larger streams, lakes, and marine waters; greater fecundity resulting in increased reproductive potential; and dispersing the population across space and time so that spawning streams may be recolonized if local populations suffer a catastrophic loss (Frissell 1999; MBTSG 1998; Rieman and McIntyre 1993). In the absence of the migratory bull trout life form, isolated populations cannot be replenished when disturbances make local habitats temporarily unsuitable. Therefore, the range of the species is diminished, and the potential for a greater reproductive contribution from larger size fish with higher fecundity is lost (Rieman and McIntyre 1993).

Whitesel et al. (2004) noted that although there are multiple resources that contribute to the subject, Spruell et al. (2003) best summarized genetic information on bull trout population structure. Spruell et al. (2003) 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). These three groups are characterized below:

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) of the Saskatchewan River drainage populations (east of the continental divide), grouping them with the upper Columbia River group.

Spruell et al. (2003) noted that within the major assemblages, populations were further subdivided, primarily at the level of major river basins. Taylor et al. (1999) surveyed bull trout populations, primarily from Canada, and found a major divergence between inland and coastal populations. Costello et al. (2003) suggested the patterns reflected the existence of two glacial refugia, consistent with the conclusions of Spruell et al. (2003) and the biogeographic analysis of Haas and McPhail (2001). Both Taylor et al. (1999) and Spruell et al. (2003) 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). Based on a recommendation in the 5-year review of the species’ status (Service 2008), the Service reanalyzed the 27 recovery units identified in the 2002 draft bull trout recovery plan (Service 2002) by utilizing, in part, information from previous genetic studies and new information from additional analysis (Ardren et al. 2011). In this examination, the Service applied relevant factors from the joint U.S. Fish and Wildlife Service and National Marine Fisheries Service Distinct Population Segment (DPS) policy (Service 1996) and subsequently identified six draft recovery units that contain assemblages of core areas that retain genetic and ecological integrity across the range of bull trout in the coterminous United States. These six draft recovery units were used to inform designation of critical habitat for bull trout by providing a context for deciding what habitats are essential for recovery (Service 2010). The six draft recovery units identified for bull trout in the coterminous United States include: Coastal, Klamath, Mid-Columbia, Columbia Headwaters, Saint Mary, and Upper Snake. These six draft recovery units were adopted, described, and identified in the final bull trout recovery plan (Service 2015a) and RUIPs (Service 2015a-f).

Population Dynamics

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

The metapopulation concepts of conservation biology have been suggested relative to the distribution and characteristics of bull trout, although empirical evidence is relatively scant (Rieman and McIntyre 1993; Dunham and Rieman 1999; Rieman and Dunham 2000). A metapopulation is an interacting network of local populations with varying frequencies of migration and gene flow among them (Meffe and Carroll 1994). For inland bull trout, metapopulation theory is likely most applicable at the watershed scale where habitat consists of discrete patches or collections of habitat capable of supporting local populations; local populations are for the most part independent and represent discrete reproductive units; and long-term, low-rate dispersal patterns among component populations influences the persistence of at least some of the local populations. Ideally, multiple local populations distributed throughout a watershed provide a mechanism for spreading risk because the simultaneous loss of all local populations is unlikely (Rieman and Dunham 2000). However, habitat alteration, primarily through the construction of impoundments, dams, and water diversions has fragmented habitats, eliminated migratory corridors, and in many cases isolated bull trout in the headwaters of tributaries (Rieman and Clayton 1997; Dunham and Rieman 1999; Spruell et al. 1999; Rieman and Dunham 2000).

Human-induced factors as well as natural factors affecting bull trout distribution have likely limited the expression of the metapopulation concept for bull trout to patches of habitat within the overall distribution of the species (Dunham and Rieman 1999). However, despite the theoretical fit, the relatively recent and brief time period during which bull trout investigations have taken place does not provide certainty as to whether a metapopulation dynamic is occurring (e.g., a balance between local extirpations and recolonizations) across the range of the bull trout or whether the persistence of bull trout in large or closely interconnected habitat patches (Dunham and Rieman 1999) is simply reflective of a general deterministic trend towards extinction of the species where the larger or interconnected patches are relics of historically wider distribution (Rieman and Dunham 2000). 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), while Whitesel et al. (2004) identified that bull trout fit the metapopulation theory in several ways.

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). 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; Goetz 1989; Hoelscher and Bjornn 1989; Howell and Buchanan 1992; Pratt 1992; Rich 1996; Rieman and McIntyre 1993; Rieman and McIntyre 1995; Sedell and Everest 1991; Watson and Hillman 1997). Watson and Hillman (1997) concluded that watersheds must have specific physical characteristics to provide the habitat requirements necessary for bull trout to successfully spawn and rear and that these specific characteristics are not necessarily present throughout all watersheds. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993), 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 since migrations facilitate gene flow among local populations when individuals from different local populations interbreed or stray to non-natal streams (Rieman and McIntyre 1993). 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; Spruell et al. 1999). Migration also facilitates access to more abundant or larger prey, leading to increases in 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; Pratt 1992; Rieman and McIntyre 1993).

Thermal requirements for bull trout appear to differ among life stages. Spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Pratt 1992; Rieman and McIntyre 1993). 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; Goetz 1989). In Granite Creek, Idaho, Bonneau and Scarnecchia (1996) observed that juvenile bull trout selected the coldest water available in a plunge pool, 8 °C to 9 °C, 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) 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; Fraley and Shepard 1989; Rieman and McIntyre 1993; Rieman and McIntyre 1995). Availability and proximity of cold water patches and food productivity can influence bull trout ability to survive in warmer rivers (Myrick et al. 2002).

All life history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Pratt 1992; Rich 1996; Sedell and Everest 1991; Watson and Hillman 1997). Maintaining bull trout habitat requires natural stability of stream channels and maintenance of natural flow patterns (Rieman and McIntyre 1993). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997). These areas are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns. For example, altered stream flow in the fall may disrupt bull trout during the spawning period, and channel instability may decrease survival of eggs and young juveniles in the gravel from winter through spring (Fraley and Shepard 1989; Pratt 1992; Pratt and Huston 1993). Pratt (1992) 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 (Quinn 2005). Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, and small fish (Boag 1987; Donald and Alger 1993; Goetz 1989). Subadult and adult migratory bull trout generally feed on various fish species (Donald and Alger 1993; Fraley and Shepard 1989; Leathe and Graham 1982). Bull trout of all sizes other than fry have been found to eat fish half their length (Beauchamp and VanTassell 2001). In near-shore 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; WDFW et al. 1997).

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 which facilitates exploitation of a wider variety of prey resources. For example, in the Skagit River system, anadromous bull trout make migrations as long as 121 miles between marine foraging areas in Puget Sound and headwater spawning grounds, foraging on salmon eggs and juvenile salmon along their migration route (WDFW et al. 1997). Anadromous bull trout also use marine waters as migration corridors to reach seasonal habitats in non-natal watersheds to forage and possibly overwinter (Brenkman and Corbett 2005; Goetz et al. 2004).

A.5 Conservation Status and Needs

Bull Trout Recovery Planning

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

Information presented in prior draft Recovery Plans published in 2002 and 2004 (Service 2002, 2004a, 2004b) have served to identify recovery actions across the range of the species and to provide a framework for implementing numerous recovery actions by our partner agencies, local working groups, and others with an interest in bull trout conservation. The 2015 Recovery Plan 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 single distinct population segment (DPS) listed under the Act.

The Service has developed a recovery strategy 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 (Service 2015a).

To implement the recovery strategy, the 2015 recovery plan establishes four categories of recovery actions for each of the six Recovery Units (Service 2015a):

1. Protect, restore, and maintain suitable habitat conditions for bull trout.

2. Minimize demographic threats to bull trout by restoring connectivity or populations where appropriate to promote diverse life history strategies and conserve genetic diversity.

3. Prevent and reduce negative effects of nonnative fishes and other nonnative taxa on bull trout.

4. Work with partners to conduct research and monitoring to implement and evaluate bull trout recovery activities, consistent with an adaptive management approach using feedback from implemented, site-specific recovery tasks, and considering the effects of climate change

Bull trout recovery is based on a geographical hierarchical approach. Bull trout are listed as a single DPS within the five-state area of the coterminous United States. The single DPS is subdivided into six biologically-based recovery units: (1) Coastal Recovery Unit; (2) Klamath Recovery Unit; (3) Mid-Columbia Recovery Unit; (4) Upper Snake Recovery Unit; (5) Columbia Headwaters Recovery Unit; and (6) Saint Mary Recovery Unit (Figure 4, Service 2015a). A viable recovery unit should demonstrate that the three primary principles of biodiversity have been met: representation (conserving the genetic makeup of the species); resiliency (ensuring that each population is sufficiently large to withstand stochastic events); and redundancy (ensuring a sufficient number of populations to withstand catastrophic events) (ibid.).

Each of the six recovery units contains multiple bull trout core areas, 116 total, which are non-overlapping watershed-based polygons. Each core area includes one or more local populations. Currently there are 109 occupied core areas, which comprise 611 local populations (Service 2015a). 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. Core areas are further described as either complex or simple core areas (ibid.). Complex core areas contain multiple bull trout local populations, are found in large watersheds, have multiple life history forms (i.e., fluvial, adfluvial, resident), and have migratory connectivity between spawning and rearing habitat (SR) and foraging, migration, and overwintering habitats (FMO). Simple core areas are those that contain one bull trout local population. These core areas are relatively small in scope, isolated from other core areas by natural barriers, and may contain unique genetic or life history adaptations.

A local population is a group of bull trout that spawn within a particular stream or portion of a stream system (Service 2015a). A local population is considered to be the smallest group of bull trout that is known to represent an interacting reproductive unit. For water bodies 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.

Population Units

The final Recovery Plan (Service 2015a) designates six bull trout recovery units as described above. These units replace the 5 interim recovery units previously identified (Service 1999). The Service will address the conservation of these final recovery units in our section 7(a)(2) analysis for proposed Federal actions. The Recovery Plan identified threats and factors affecting the bull trout within these units. A detailed description of recovery implementation for each recovery unit is provided in separate Recovery Unit Implementation Plans (Service 2015a-f), which identify conservation actions and recommendations needed for each core area, forage/ migration/ overwinter (FMO) areas, historical core areas, and research needs areas. Each of the following recovery units (below) is necessary to maintain the bull trout's distribution, as well as its genetic and phenotypic diversity, all of which are important to ensure the species' resilience to changing environmental conditions.

Coastal Recovery Unit

The Coastal Recovery Unit Implementation Plan describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (Service 2015a). The Coastal Recovery Unit is located within western Oregon and Washington, and is divided into three regions: Puget Sound, Olympic Peninsula, and the Lower Columbia River Regions. This recovery unit contains 20 core areas comprising 84 local populations and a single potential local population in the historic Clackamas River core area where bull trout had been extirpated and were reintroduced in 2011. Further, the recovery unit has four historically occupied core areas that could be re-established (Service 2015a, 2015a). Core areas within Puget Sound and the Olympic Peninsula currently support the only anadromous local populations of bull trout. This recovery unit also contains ten shared FMO habitats which are outside core areas and allows for the continued natural population dynamics in which the core areas have evolved (Service 2015a). There are four core areas within the Coastal Recovery Unit that have been identified as current population strongholds: Lower Skagit, Upper Skagit, Quinault River, and Lower Deschutes River (Service 2015a). These are the most stable and abundant bull trout populations in the recovery unit. The current condition of the bull trout in this recovery unit is attributed to the adverse effects of climate change, loss of functioning estuarine and near-shore 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, the removal of riparian vegetation, and livestock grazing), fish passage (e.g., dams, culverts, instream flows) residential development, urbanization, forest management practices (e.g., timber harvest and associated road building activities), connectivity impairment, mining, and the introduction of non-native species. Conservation measures or recovery actions implemented include relicensing of major hydropower facilities that have provided upstream and downstream fish passage or complete removal of dams, land acquisition to conserve bull trout habitat, floodplain restoration, culvert removal, riparian revegetation, levee setbacks, road removal, and projects to protect and restore important near-shore marine habitats.

Klamath Recovery Unit

The Klamath Recovery Unit Implementation Plan describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (Service 2015c). The Klamath Recovery Unit is located in southern Oregon and northwestern California. The Klamath Recovery Unit is the most significantly imperiled recovery unit, having experienced considerable extirpation and geographic contraction of local populations and declining demographic condition, and natural re-colonization is constrained by dispersal barriers and presence of nonnative brook trout (Service 2015a). This recovery unit currently contains three core areas and eight local populations (Service 2015a, 2015c). Nine historic local populations of bull trout have become extirpated (Service 2015c). All three core areas have been isolated from other bull trout populations for the past 10,000 years (Service 2015c). The current condition of the bull trout in this recovery unit is attributed to the adverse effects of climate change, habitat degradation and fragmentation, past and present land use practices, agricultural water diversions, nonnative species, and past fisheries management practices. Conservation measures or recovery actions implemented include removal of nonnative fish (e.g., brook trout, brown trout, and hybrids), acquiring water rights for instream flows, replacing diversion structures, installing fish screens, constructing bypass channels, installing riparian fencing, culvert replacement, and habitat restoration.

Mid-Columbia Recovery Unit

The Mid-Columbia Recovery Unit Implementation Plan describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (Service 2015d). The Mid-Columbia Recovery Unit is located within eastern Washington, eastern Oregon, and portions of central Idaho. The Mid-Columbia Recovery Unit is divided into four geographic regions: Lower Mid-Columbia, Upper Mid-Columbia, Lower Snake, and Mid-Snake Geographic Regions. This recovery unit contains 24 occupied core areas comprising 142 local populations, 2 historically occupied core areas, 1 research needs area, and 7 FMO habitats (Service 2015a, 2015d). The current condition of the bull trout in this recovery unit is attributed to the adverse effects of climate change, agricultural practices (e.g. irrigation, water withdrawals, livestock grazing), fish passage (e.g. dams, culverts), nonnative species, forest management practices, and mining. Conservation measures or recovery actions implemented include road removal, channel restoration, mine reclamation, improved grazing management, removal of fish barriers, and instream flow requirements.

Upper Snake Recovery Unit

The Upper Snake Recovery Unit Implementation Plan describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (Service 2015f). The Upper Snake Recovery Unit is located in central Idaho, northern Nevada, and eastern Oregon. The Upper Snake Recovery Unit is divided into seven geographic regions: Salmon River, Boise River, Payette River, Little Lost River, Malheur River, Jarbidge River, and Weiser River. This recovery unit contains 22 core areas and 207 local populations (Service 2015a), with almost 60 percent being present in the Salmon River Region. The current condition of the bull trout in this recovery unit is attributed to the adverse effects of climate change, dams, mining, forest management practices, nonnative species, and agriculture (e.g., water diversions, grazing). Conservation measures or recovery actions implemented include instream habitat restoration, instream flow requirements, screening of irrigation diversions, and riparian restoration.

Columbia Headwaters Recovery Unit

The Columbia Headwaters Recovery Unit Implementation Plan describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (Service 2015b). The Columbia Headwaters Recovery Unit is located in western Montana, northern Idaho, and the northeastern corner of Washington. The Columbia Headwaters Recovery Unit is divided into five geographic regions: Upper Clark Fork, Lower Clark Fork, Flathead, Kootenai, and Coeur d'Alene Geographic Regions (Service 2015b). This recovery unit 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 (Service 2015b). Fish passage improvements within the recovery unit have reconnected some previously fragmented habitats (Service 2015b), while others remain fragmented. Unlike the other recovery units in Washington, Idaho, and Oregon, the Columbia Headwaters Recovery Unit does not have any anadromous fish overlap. Therefore, bull trout within the Columbia Headwaters Recovery Unit do not benefit from the recovery actions for salmon (Service 2015b). The current condition of the bull trout in this recovery unit is attributed to the adverse effects of climate change, historic mining and legacy 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. Conservation measures or recovery actions implemented include habitat improvement, fish passage, and removal of nonnative species.

Saint Mary Recovery Unit

The Saint Mary Recovery Unit Implementation Plan describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (Service 2015e). The Saint Mary Recovery Unit is located in Montana but is heavily linked to downstream resources in southern Alberta, Canada. Most of the Saskatchewan River watershed, which the St. Mary flows into, is located in Canada. The United States portion includes headwater spawning and rearing habitat and the upper reaches of FMO habitat. This recovery unit contains four core areas, and seven local populations (Service 2015e) in the U.S. Headwaters. The current condition of the bull trout in this recovery unit 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.

Recovery Status of Bull Trout in the Action Area

The action area is located in the Flathead Lake geographic region of the Columbia Headwaters Recovery Unit. Geographic regions are comprised of neighboring core areas that share similar bull trout genetic, geographic (hydrographic), and/or habitat characteristics. Conserving bull trout in Geographic Regions allows for the maintenance of broad representation of genetic diversity; neighboring core areas to benefit from potential source populations in the event of local extirpations and provides a broad array of options among neighboring core areas to contribute recovery under uncertain environmental change.

The 2015 bull trout recovery plan outlines a hierarchical order of demographic units ranging from local populations to the range of bull trout within the coterminous United States. In ascending hierarchical order of bull trout demographic units, bull trout in the action area are assigned to the Flathead Lake core area, Flathead Lake Geographic Region, of the Columbia Headwaters Recovery Unit (Table 1).

Table 1. Hierarchy of bull trout demographic units

Bull Trout Analysis Scale	Hierarchical Relationship
Coterminous United States (DPS)	Range of bull trout
Columbia Headwaters Recovery Unit	One of 6 Recovery Units in the range of the species within the coterminous United States
Flathead Geographic Region	One of 5 Geographic Regions in the Columbia Headwaters Recovery Unit
Flathead Lake Core Area	One of 22 complex core areas in the Flathead Geographic Region

Flathead Geographic Region

The *Flathead Geographic Region* includes a major portion of northwestern Montana upstream of Seli'š Ksanka Qlispe' (Kerr) Dam on the outlet of Flathead Lake. The complex core area of Flathead Lake is the hub of this area, but other complex core areas isolated by dams are Hungry Horse Reservoir (formerly South Fork Flathead River) and Swan Lake. Within the glaciated basins of the Flathead River headwaters are 19 simple core areas, many of which lie in Glacier National Park or the Bob Marshall and Great Bear Wilderness areas and some of which are isolated by natural barriers or other features.

Flathead Lake Core Area

The Flathead Lake watershed is one of the largest, most complex, and best-documented bull trout core areas in the upper Columbia River watershed, encompassing 125,000-acre Flathead Lake (the largest freshwater lake in the U.S. west of the Mississippi River) and a large portion of northwest Montana extending into British Columbia, Canada. An extensive redd count monitoring program was devised by Montana Fish, Wildlife, and Parks and has been in place since 1980 (MFWP 2004a). These redd counts accurately reflect the population trend. Based on data collected from eight index tributary streams in the North Fork and Middle Fork Flathead River (collectively representing about half the known spawning in the basin), bull trout index redd counts ranged from about 300-600 in the 1980's (averaging 392), then dropped drastically in the early 1990's, to a range of 83-243 in the seven years prior to listing (averaging 137 between 1991 and 1997). In the 5 years post-listing (1998-2002), a brief rebound was experienced (range 187-251; average 215), but the 2003 redd count was only 130 and in 2004 only 136 redds were found (MFWP 2004a). Since 2004, the annual redd count has gradually increased to where the average count from 2005 to 2021 was 422 (range 180-699), with 346 redds counted in 2021 (MFWP 2022).

Based on extrapolations, each redd is estimated to represent roughly six adult fish in the population (3 fish per redd, with spawning occurring in alternate years). Thus, recent redd counts may indicate an adult bull trout population base near, but probably lower than 1,000 adult fish. Adult bull trout numbers in the 1980's may have been 2,000-3,000 fish. There is abundant evidence that, even in the 1980's, this population was being fished hard and may have been reduced below carrying capacity. However, natural carrying capacity prior to the early 1900's, when nonnative fish introductions first began to alter the food web, is undocumented.

For the entire period of record, interpretation of population trend is strongly dependent upon the portion of that time frame that is considered. There's no doubt that current bull trout numbers remain significantly below 1980's levels, but whether bull trout have substantially rebounded from the prelisting lows of the early 1990's may not yet be clear. Trouble signals remain for some formerly strong local populations (e.g. Coal Creek) where redd counts remain at an especially low ebb, occasionally reaching zero.

B. **Critical Habitat**

B.1 Legal Status

The Service published a final critical habitat designation for the coterminous United States population of bull trout on October 18, 2010 (75 FR 63898), and the rule became effective on November 17, 2010. A justification document was also developed to support the rule and is available on the Service's website (http://www.fws.gov/pacific/bulltrout). The scope of the designation involved the species' coterminous range, which includes the Jarbidge River, Klamath River, Columbia River, Coastal-Puget Sound, and Saint Mary River population segments (also considered as interim recovery units at the time of final designation).

Again, designated bull trout critical habitat is of two primary use types: 1) spawning and rearing (SR), and 2) foraging, migration, and overwintering (FMO). Bull trout critical habitat includes both reservoirs/lakes and stream/shoreline miles, and was broken up into 32 Critical Habitat Units (CHU) as bull trout critical habitat. The 2010 revision increased the amount of designated bull trout critical habitat by approximately 76 percent for miles of stream/shoreline and by approximately 71 percent for acres of lakes and reservoirs compared to the 2005 designation. For the Columbia River Basin 16,915.9 miles of stream and 427,044 acres of reservoirs/lakes were designated as critical habitat. The final rule also identified and designated approximately 822.5 miles of streams/shorelines and 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. In contrast, no unoccupied habitat was included in the 2005 designation. These unoccupied areas were determined by the Service to be essential for restoring functioning migratory bull trout populations based on currently available scientific information. These unoccupied areas often include lower main stem 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. A break-down of designated bull trout critical habitat by state is presented below in Table 2.

Table 2. 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	8,772	14,117	170,218	68,885
Montana	3,057	4,919	221,471	89,626
Nevada	72	116	-	-
Oregon	2,836	4,564	30,256	12,244
Oregon/Idaho	108	173	-	-
Washington	3,793	6,105	66,308	26,834
Washington (marine)	754	1,213	-	-
Washington/Idaho	37	60	-	-
Washington/Oregon	301	485	-	-
Total	**19,730**	**31,752**	**488,253**	**197,589**

The final rule continues to exclude some critical habitat segments based on a careful balancing of the benefits of inclusion versus the benefits of exclusion. Critical habitat does not include: (1) waters adjacent to non-Federal lands covered by legally operative incidental take permits for habitat conservation plans (HCPs) issued under section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended (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. It is important to note that the exclusion of water bodies from designated critical habitat does not negate or diminish their importance for bull trout conservation. Because exclusions reflect the often complex pattern of land ownership, designated critical habitat is often fragmented and interspersed with excluded stream segments.

B.2 Conservation Role and Description of Critical Habitat

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

As previously noted, 32 CHUs within the geographical area occupied by the species at the time of listing are designated under the final rule. Twenty-nine of the CHUs contain all of the physical or biological features identified in this final rule and support multiple life-history requirements. Three of the mainstem river units in the Columbia and Snake River basins contain most of the physical or biological features necessary to support the bull trout's particular use of that habitat, other than those physical and biological features associated with Primary Constituent Elements (PCEs) 5 and 6, which relate to breeding habitat (see list below).

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

The Olympic Peninsula and Puget Sound CHUs are essential to the conservation of 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 PCEs that are critical to adult and subadult foraging, migrating, and overwintering.

In determining which areas to propose as critical habitat, the Service considered the physical and biological features that are essential to the conservation of bull trout and that may require special management considerations or protection. These features are the PCEs laid out in the appropriate quantity and spatial arrangement for conservation of the species. The PCEs for bull trout are those habitats components that are essential for the primary biological needs of foraging, reproducing, rearing of young, dispersal, genetic exchange, or sheltering (75 FR 63898, p. 2306). The PCEs of designated critical habitat are:

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

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

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

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

5. Water temperatures ranging from 2 to 15 °C (36 to 59 °F), with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shading, such as that provided by riparian habitat; streamflow; and local groundwater influence.

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

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

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

9. Sufficiently low levels of occurrence of nonnative predatory (e.g., lake trout, walleye, northern pike, smallmouth bass); interbreeding (e.g., brook trout); or competing (e.g., brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout.

B.3 Current Range-wide Condition of Bull Trout Critical Habitat

The condition of proposed bull trout critical habitat varies across its range from poor to good. Although still relatively widely distributed across its historic range, the bull trout occurs in low numbers in many areas, and populations are considered depressed or declining across much of its range (67 FR 71240). This condition reflects the condition of bull trout habitat. The primary land and water management activities impacting the physical and biological features essential to the conservation of bull trout include timber harvest and road building, agriculture and agricultural diversions, livestock grazing, dams, mining, urbanization and residential development, and non-native species presence or introduction (75 FR 2282). There is widespread agreement in the scientific literature that many factors related to human activities have impacted bull trout and their habitat, and continue to do so. Among the many factors that contribute to degraded PCEs, those which appear to be particularly significant and have resulted in a legacy of degraded habitat conditions are as follows:

1. Fragmentation and isolation of local populations due to the proliferation of dams and water diversions that have eliminated habitat, altered water flow and temperature regimes, and impeded migratory movements (Dunham and Rieman 1999, p. 652; Rieman and McIntyre 1993, p. 7).

2. Degradation of spawning and rearing habitat and upper watershed areas, particularly alterations in sedimentation rates and water temperature, resulting from forest and rangeland practices and intensive development of roads (Fraley and Shepard 1989, p. 141; MBTSG 1998, pp. ii - v, 20-45).

3. The introduction and spread of nonnative fish species, particularly brook trout and lake trout, as a result of fish stocking and degraded habitat conditions, which compete with bull trout for limited resources and, in the case of brook trout, hybridize with bull trout (Leary et al. 1993, p. 857; Rieman et al. 2006, pp. 73-76).

4. In the Coastal-Puget Sound region where 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.

5. Degradation of FMO habitat resulting from reduced prey base, roads, agriculture, development, and dams.

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 physical or biological features described in PCEs 1, 2, 3, 5, 7, 8, and 9. Protecting bull trout strongholds and cold water refugia from disturbance and ensuring connectivity among populations were important considerations in addressing this potential impact. Additionally, climate change may exacerbate habitat degradation impacts both physically (e.g., decreased base flows, increased water temperatures) and biologically (e.g., increased competition with non-native fishes).

B.4 Status of the Clark Fork River Critical Habitat Unit (CHU) 31

The Clark Fork River Basin CHU includes 5,356.0 km (3,328.1 mi) of streams and 119,620.1 ha (295,586.6 ac) of lakes and reservoirs designated as critical habitat. The sub-units within this unit provide spawning, rearing, foraging, migratory, connecting, and overwintering habitat. For a detailed description of this unit and sub-units, for justification of why this CHU, included CHSUs, or in some cases individual water bodies are designated as critical habitat, and for documentation of occupancy by bull trout, see Service (2010), or *http://www.fws.gov/pacific/bulltrout*.

The Clark Fork River Basin CHU is essential to maintaining bull trout distribution within this unique geographic region of the Columbia Headwaters Recovery Unit in large part because it represents the evolutionary heart of the migratory adfluvial bull trout life history form (USDI 2009a, p. 32). Flathead Lake and Lake Pend Oreille are the two largest lakes in the range of the species, and bull trout from those core areas historically grew to be large and migrated upstream up to 322 km (200 miles) to spawning and rearing habitats. These habitats were partially fragmented by hydroelectric dams and other manmade barriers but are increasingly being reconnected with dam removal (Milltown Dam) and improved fish passage (Cabinet Gorge, Noxon Rapids, Thompson Falls). The resident life history form of bull trout is minimally present in this CHU and fluvial bull trout play a reduced role relative to adfluvials. The two major lakes (Flathead and Pend Oreille), as well as over 20 additional core areas established in smaller headwater lakes that are isolated from Flathead and Pend Oreille to varying degrees, are the primary refugia for the naturally occurring adfluvial form of bull trout across their range.

The action area for this biological opinion includes a portion of the Flathead Lake core area that encompasses a portion of the Flathead River in proximity to the bridge. Based on the proposed action, the project is expected to generate sound, sediment, and affect hydraulics beyond the immediate project area. Sound is expected to be generated by heavy equipment that is working on the site, and by impact pile driving. Of the two, impact pile driving is expected to travel farther and have an aquatic component. The size and type of pile affects the amount of sound generated by pile driving activities. However, underwater noise propagation in rivers is limited by the sinuosity of a system and generally dissipates at river bends that are beyond the line of sight (Washington Department of Transportation 2015). The Flathead River bends to the west both up- and downstream of the bridge. These river bends would disrupt the propagation of the underwater noise where the river curves out of the line of sight at approximately 0.6 miles downstream and 0.9 miles upstream from the proposed project. Temporary sediment and turbidity induced from instream work during construction of the piers for the new bridge and pier removal for the existing bridge is anticipated to dissipate within the downstream extent of the noise impacts as the river bends to the west downstream of the existing bridge site.

The presence of the proposed bridge piers within the river channel could alter hydraulics downstream. The size of the piers is small in relation to the river at the bridge crossing location; therefore, any hydraulic effects would be expected to dissipate over relatively short distances. Thus, the aquatic portion of the action area is expected to extend approximately 0.9 miles upstream of the proposed bridge site, and approximately 0.6 miles downstream, and will be determined by noise impacts.

B.5 Status of the Flathead Lake Core Area

The Flathead Lake watershed is one of the largest, most complex, and best-documented bull trout core areas in the upper Columbia River watershed, encompassing 125,000-acre Flathead Lake (the largest freshwater lake in the U.S. west of the Mississippi River) and a large portion of northwest Montana extending into British Columbia, Canada. The Flathead Lake core area includes all of Flathead Lake and the North Fork Flathead River, Middle Fork Flathead River, and South Fork Flathead River (up to Hungry Horse Dam) and all tributaries within these described areas. The South Fork above Hungry Horse Dam forms the separate Hungry Horse core area. The Whitefish and Stillwater River systems are separate core areas and are currently insignificant contributors of bull trout to the Flathead Lake core area, due in part to low current population densities of fish that are restricted primarily to their headwaters, although they may have been more important historically. The Swan River is a separate core area from the outlet of Swan Lake upstream (Swan Lake core area) and also was historically isolated due to the warm thermal regime of the lower Swan River.

The South Fork Flathead (upstream of Hungry Horse Dam) was a naturally important contributor to Flathead Lake. Zubik and Fraley (1987) estimated that potential habitat for about 2,100 spawning adult bull trout (and 65,287 migratory juvenile cutthroat trout) was lost annually to Flathead Lake in the South Fork Flathead (38% of the drainage basin) with the closure of Hungry Horse Dam in 1953. Based on comparative population levels of spawning bull trout in the North Fork and Middle Fork, the loss statement (Zubik and Fraley 1987) estimated that between 4,844 and 6,966 adult bull trout would have spawned in the Flathead River forks in the early 1980's without the dam.

Biologists believe current bull trout densities in the Flathead Lake core area are approximately ten percent to as much as fifty percent of what they were historically (USFS 2013: 381). The distribution of populations throughout the core area is likely similar to historic patterns. Local populations are still relatively widespread in about 22 tributaries and occur in all historically occupied systems (occurrence is based largely on presence of cold water). Life history expression is probably also similar to historic, as most populations are currently and were historically primarily adfluvial.

Bull trout populations in the Flathead Lake core area were likely first exposed to significant human-caused impacts in the late 1800's. Prior to this time, bull trout were fished for by native Salish and Pend Orielle peoples and maintained relatively robust and widespread populations throughout the Flathead Lake core area. Beginning in the late 1800's, however, European settlement in the area increased, which brought more fishing pressure and intensive land uses that directly affected bull trout and their habitats. Bull trout were commonly viewed as "trash fish" for decades and indiscriminately killed (until the 1950's, when tributaries were closed to fishing for bull trout – we are unsure whether these closures were due to observed population declines or a proactive measure to protect vulnerable spawners). Logging by the Kalispell and Flathead Company and other private landowners soon to be followed by the US Forest Service in the early 1900's was directly and indirectly responsible for extensive changes in habitat. These practices resulted in both direct mortality to bull trout inhabiting the river and also long-term simplification of habitat that negatively affected the productivity and carrying capacity of the system for decades. Construction of the transcontinental railroad caused significant impacts along the Middle Fork Flathead River and road construction practices of the time paid little concern to important riparian habitat and access to spawning grounds. The mainstem Flathead River upstream of Flathead Lake was subjected to intensive snag removal and channel clearing to clear the way for steamboat traffic upstream from Flathead Lake.

Beginning around 1905, another long-term impact to the system arrived with the stocking of Lake Trout in Flathead Lake (Lake Whitefish were also planted around this time, but their impact on bull trout has been minimal, so far as is known). In 1910, other non-native fish were planted in the lake and throughout many tributaries. Yellow perch, brook trout, Yellowstone cutthroat trout, rainbow trout, and kokanee were all stocked in the system between 1910 and 1916. The effects of these species have not all been the same. As mentioned, Lake Trout have likely had the biggest long-term negative effect on bull trout, through direct predation and competition for similar food resources in Flathead Lake. Brook trout have colonized much of the valley habitat (though less common in the Middle fork and North Fork tributaries) and in so doing may have had effects on formerly productive bull trout populations. Kokanee, on the other hand, likely had a neutral or positive effect on bull trout populations by providing an abundant high-calorie food source in the lake and rivers, where the larger fish migrated and spawned when they matured. While it is thought that kokanee, an obligate planktivore, largely replaced formerly abundant native westslope cutthroat trout, they may have bolstered bull trout populations by creating an unnaturally elevated prey base.

In the 1950's-1960's another era of extensive logging in the three forks of the Flathead River headwaters of the core area began. This time, extensive road networks were constructed to access timber, which resulted in increased erosion and a proliferation of small-scale fish barriers at road/stream crossings throughout the watershed. These roads not only affected habitat, but also facilitated increased fishing and harvest or poaching of spawning bull trout in many tributaries. These impacts occurred on both Flathead National Forest and State Forest as well as Plum Creek Timber Company and other private lands throughout most of the Flathead Lake core area.

The 1964 Flood was a record event that took out large portions of Highway 2 and the railroad along the Middle Fork Flathead River. Many streams were scoured to bedrock and large wood was flushed from the system which simplified habitat. Streams may still be recovering from the effects of the flood.

On the fisheries front, the mid-1960's saw the introduction of *Mysis* shrimp into several Flathead Valley lakes (1967), which ultimately spread to Flathead Lake (1981) and disrupted the food web interactions in the system. The establishment of *Mysis* was determined to be responsible for the collapse of a formerly strong population of kokanee salmon and fueled major increases in lake trout and lake whitefish populations that followed (Spencer et al. 1991). Predation, competition, or other forms of negative interaction with lake trout is widely believed to be the single factor most responsible for the currently depressed condition of bull trout in this core area (MFWP and CSKT 2000, Service 2002). However, these complex interactions and the specific role of each in the Flathead Lake core area remain unsettled and are a source of major disagreement and ongoing concern.

Ongoing summary and discussion of recent (MFWP and CSKT) fish management program direction indicates that Flathead Lake anglers have harvested between 45,000 and 70,000 lake trout annually from 2008 through 2011 (roughly equal to the management goal of 60,000). Catch per unit effort and species composition of lake-wide gill net catch were similar in recent years, and indicators suggest the lake trout population remains stable (Hansen and Evarts 2008) and bull trout and cutthroat trout populations remain stable but lower than pre-*Mysis* levels. Pike numbers, inhabiting primarily the mainstem Flathead River also appear relatively stable. Recent bioenergetics modeling (Muhlfeld et al. 2008) indicated that northern pike consume nearly 3,500 bull trout annually in the core area and are likely contributing to the declining bull trout population. Monitoring programs indicate that bull trout redd numbers were at or below secure levels prescribed by managers in the mid-1990's but exceeded secure levels since the late 1990's (Deleray and Hansen 2002). Numbers still remain far below recovery targets prescribed by the Service (Service 2002).

In the mid-1990's, with the threat of listing under the Endangered Species Act, greater angling restrictions were instituted on bull trout harvest. There is currently no harvest of bull trout allowed in the Flathead Lake core area, but some incidental mortality is associated with the heavy angling pressure for lake trout in Flathead Lake and heavy angler use on the Flathead River system, and there is also some limited mortality associated with gillnetting in the lake.

At the current time, many of the past direct habitat impacts associated with logging and road construction have been reduced or eliminated, and therefore some potential stressors on the population no longer play as large a role as they did historically. In addition, much of the habitat where bull trout spawn and rear is protected by Wilderness, National Park, or National Wild and Scenic River corridors. Private land ownership in the three forks of the Flathead is limited.

Considerable new information has been developed in recent years that indicate a generally improving recent trend in overall bull trout habitat in this core area (see e.g., Weaver 2005, Muhlfeld et al. 2005, 2007, Steed et al. 2008, and Sylvester et al. 2008). On National Forest lands where bull trout exist, there has been minimal development of new roads or timber sales and a strong emphasis on road decommissioning and application of BMPs, in large part due to grizzly bear security concerns. Potential for significant negative impacts due to sediment production and other wide-scale effects of recent large fires has been largely mediated by favorable precipitation and runoff patterns in the vulnerable post-fire periods. The full implementation of the selective withdrawal system at Hungry Horse Dam has restored more normative flow and temperature regimes to the mainstem Flathead River (Sylvester et al. 2008).

Though Hungry Horse Dam on the South Fork Flathead River removed a substantial portion (estimated 38%) of the spawning and rearing habitat, the integrity and connectivity of the remaining habitat in the North and Middle Fork drainages of this core area is high. The Flathead Lake core area is a large core area with some natural barriers in headwaters and occasional temporary barriers resulting from beaver dams or other natural activities. However, there are no known man-caused barriers on bull trout spawning and rearing streams and bull trout from Flathead Lake have been documented to travel as far as 150 miles upstream to spawn in headwaters of the North Fork and Middle Fork.

Despite the recent improving trend in bull trout habitat, some concerns remain due to potential for long term increases in water temperatures, future effects of rain-on-snow precipitation patterns, and potential future land management in the headwaters. Recently, additional emphasis has been placed on identifying and evaluating important bull trout habitat in the British Columbia headwaters of the Flathead, given threats of expanded coal, oil, and gas exploration and development and timber extraction.

Currently, the main threats to bull trout in the Flathead Lake core area are: 1) Introduced species/fisheries management, 2) Forest management practices and forest roads, and 3) angling or harvest (legal or illegal). The FWS convened a Bull Trout Scientific Review Team in 2008 that agreed with 100% consensus that these three threats, in this order, currently represent the greatest threats to bull trout in the Flathead Lake core area. Given that the second threat is currently mitigated by BMPs and other actions and active forest management activities are much reduced in scope; and also that the overall habitat trend is improving, they concluded that the nonnative species threat (especially lake trout and *Mysis*, but also northern pike and other warm-water fish) poses the greatest ongoing risk to bull trout in the Flathead Lake core area.

While none of these impacts is easy to address, it is important that we begin to address them while there are still enough bull trout to populate all local populations in the Flathead Lake core area. Persistent improvements in forest management and angling/harvest issues have not been easy to come by, but they can contribute synergistically to a stronger population over the long-term. It is unlikely, however, that improvements in these two areas can fully compensate for past impacts and it does not appear that the population will recover to 1980's levels until these threats from introduced species are significantly reduced. Currently, there is no consensus on whether bull trout populations will decline further without more aggressive and effective efforts to significantly reduce lake trout populations in Flathead Lake, despite habitat restoration and other efforts that may buy time for the population.

C. **Analysis of Species/Critical Habitat Likely to be Affected**

The proposed action will occur in the Flathead Lake core area and Flathead Lake, Flathead River, and Headwater Lakes CHSU. The Flathead Lake core area is one of 35 primary core areas in the Columbia Headwaters Recovery Unit. In this Recovery Unit, a distinction has been made between two types of core areas (primary and secondary core areas) based mostly on the size, connectedness, and complexity of the associated watershed and the degree of natural population isolation. In 2010, the Service identified the Flathead Lake, Flathead River, and Headwater Lakes CHSU as essential to bull trout conservation because it is comprised almost entirely of adfluvial fish that reside in Flathead Lake and spawn in the headwater tributaries of the Flathead River. This CHSU contains approximately 231 miles of SR habitat and 198 miles of riverine FMO habitat, and 125,933 acres of FMO habitat in lakes that are designated as critical habitat. These designated segments provide the necessary habitat (SR and FMO) that support the local populations in the Flathead Lake core area needed for recovery.

C.1 Previous Consultations and Conservation Efforts

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

A total of 158 biological opinions or other forms of issued take (i.e., Section 10 permits) were issued for the Columbia Headwaters Recovery Unit since listing to September 12, 2022 (39 from listing to August 2003 and 119 from August 2003 to now). Of these, 16 biological opinions have been issued for the Flathead Lake core area. All of the opinions have included mandatory terms and conditions, which are binding on the action agency, in order to reduce the potential impacts of anticipated incidental, take to bull trout.

C.2 Conservation Needs

The 2015 Recovery Plan (RP) for bull trout established the primary strategy for recovery of bull trout in the coterminous United States: (1) conserve bull trout so that they are geographically widespread across representative habitats and demographically stable in six RUs; (2) effectively manage and ameliorate the primary threats in each of six RUs at the core area scale such that bull trout are not likely to become endangered in the foreseeable future; (3) build upon the numerous and ongoing conservation actions implemented on behalf of bull trout since their listing in 1999, and improve our understanding of how various threat factors potentially affect the species; (4) use that information to work cooperatively with our partners to design, fund, prioritize, and implement effective conservation actions in those areas that offer the greatest long-term benefit to sustain bull trout and where recovery can be achieved; and (5) apply adaptive management principles to implementing the bull trout recovery program to account for new information (Service 2015a, p. 24).

Information presented in prior draft recovery plans published in 2002 and 2004 (Service 2002a, entire; 2004b, entire; 2004c, entire) provided information that identified recovery actions across the range of the species and to provide a framework for implementing numerous recovery actions by our partner agencies, local working groups, and others with an interest in bull trout conservation. Many recovery actions were completed prior to finalizing the RP in 2015.

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

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

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

1. Protect, restore, and maintain suitable habitat conditions for bull trout.

2. Minimize demographic threats to bull trout by restoring connectivity or populations where appropriate to promote diverse life history strategies and conserve genetic diversity.

3. Prevent and reduce negative effects of nonnative fishes and other nonnative taxa on bull trout.

4. Work with partners to conduct research and monitoring to implement and evaluate bull trout recovery activities, consistent with an adaptive management approach using feedback from implemented, site-specific recovery tasks, and considering the effects of climate change.

Complementary to the Bull Trout Recovery Plan, the Service completed Recovery Unit Implementation Plans (RUIP) for each of the six recovery units. Each RUIP describes the threats to bull trout and the site-specific management actions necessary for the recovery of the species within each RU. These documents identify primary threats by core area and include additional threats that may be present but are not considered primary to the core area. Primary threats are those known or likely (i.e., non-speculative) to negatively impact bull trout populations at the core area level, and accordingly require management actions to assure bull trout persistence to a degree necessary that bull trout will not be at risk of extirpation within that core area in the foreseeable future (Service 2015a, p. D9). Current primary threats are categorized into Habitat Threats, Demographic Threats, and Nonnative Species Threats.

Habitat threats include upland and riparian management, water quality, instream impacts, and climate change. Demographic threats include connectivity impairment, small population size, fisheries management, and forage fish availability. Nonnative threats include competition and hybridization from brook trout, as well as competition and predation from lake trout, smallmouth and largemouth bass, northern pike, walleye, and other nonnative species. These threats are discussed in greater detail in each recovery unit RUIP document (Service 2015b pp. A9-A29, Service 2015c, pp. D26-D32, Service 2015d, pp. B7-B10, Service 2015e, pp. C7-C345, Service 2015f, pp. F7-F8, Service 2015g, pp. E15-E18). Competition from brook trout and their hybrids occurs in the SR habitat in this adfluvial complex core area. Additionally, suppression of competing or predating nonnatives, like bass, brown trout, and northern pikehas been identified as being necessary to enhance survival of the adfluvial life history form of bull trout (Service 2015a). Such suppression is needed in FMO habitat (primarily lakes).

The final Recovery Plan for the Coterminous Bull Trout Population (Service 2015: 17) describes new or emerging threats, climate change, and other threats. Climate change was not addressed as a known threat when bull trout was listed. The 2015 bull trout recovery plan and RUIPs (Service 2015a-f) 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 (Service 2015: 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 (Service 2015: vii, 17-20). Mote et al. (2014) summarized climate change effects to include rising air temperature, changes in the timing of streamflow related to changing snowmelt, increases in extreme precipitation events, lower summer stream flows, and other changes. A warming trend in the mountains of western North America is expected to decrease snowpack, hasten spring runoff, reduce summer stream flows, and increase summer water temperatures (Poff et al. 2002; Koopman et al. 2009, PRBO Conservation Science 2011). 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) 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 (Service 2015b: B-10). Although all salmonids are likely to be affected by climate change, bull trout are especially vulnerable given that spawning and rearing are constrained by their location in upper watersheds and the requirement for cold water temperatures (Batten et al. 2007: 6672-6673; Rieman et al. 2007: 1552). Climate change is expected to reduce the extent of cold water habitat (Isaak et al. 2015), and increase competition with other fish species (lake trout, brown trout, brook trout, and northern pike) for resources in remaining suitable habitat. Several authors project that brook trout, a fish species that competes for resources with and predates on the bull trout, will continue increasing their range in several areas (an elevation shift in distribution) due to the effects from climate change (Wenger et al. 2011, Isaak et al. 2010, 2014; Peterson et al. 2013; Dunham 2015).

V. Environmental Baseline

Regulations implementing the Act, as amended (16 U.S.C. 1531 et seq.; 50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, state, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area that have already undergone section 7 consultation, and the impacts of state and private actions in the action area that are contemporaneous with the consultation in progress. The environmental baseline should characterize the effects of past and ongoing human factors leading to the current status of the species, their habitats, and ecosystem within the action area. The action area for this biological opinion is included within the portion of the Flathead Lake core area and CHSU that encompasses the Flathead River-Rose Creek 6th code watershed #170102080108 (sub-watershed). As previously discussed on p. 33, the aquatic portion of the action area is expected to extend approximately 0.9 miles upstream of the proposed bridge site, and approximately 0.6 miles downstream, and will be determined by noise impacts.

Baseline conditions for bull trout were assessed using information in the Bull Trout Core Area Templates (UDSI 2005a), Section 7 Consultation Watershed Baseline: Upper Clark Fork (USDA 2000a; NRCS 2010), Columbia Headwaters Recovery Unit Implementation Plan (Service 2015a), Final Rule for Bull Trout Critical Habitat, and other sources of information.

A. **Status of the Species and Critical Habitat within the Action Area**

Flathead Lake Core Area: The Flathead Lake core area is considered one of the largest, most complex, and best-documented bull trout core areas in the upper Columbia River watershed. The Flathead Lake core area includes all of Flathead Lake, the North Fork Flathead River, Middle Fork Flathead River, and South Fork Flathead River (up to Hungry Horse Dam). In addition to the mainstem rivers, the Flathead Lake core area also includes all tributaries within these described areas. The South Fork Flathead River above Hungry Horse Dam forms the separate Hungry Horse core area and will not be affected, and thus will not be further described within this biological opinion. The Whitefish and Stillwater River systems make up separate core areas. These core areas are insignificant contributors of bull trout to the Flathead Lake core area, largely due to low population densities and decreased distribution within the core area.

The bull trout population in the Flathead Lake core area is greatly reduced relative to historic levels. Estimates range from 10 percent to 50 percent of the historical population. It is estimated that approximately 1,600 spawning adult bull trout inhabit Flathead Lake (USFS 2013). This value was derived from redd counts, and only represents bull trout that are mature enough to spawn. The absolute number of bull trout in the Flathead Lake core area is likely twice that number given that many non-spawning individuals are not accounted for in redd-based population estimates.

The distribution of populations throughout the core area is likely similar to historic patterns as local populations are still relatively widespread in about 22 tributaries and occur in all historically occupied systems (occurrence is based largely on the presence of cold water). Life history expression is probably also similar to historic conditions, as most populations are dominated by the adfluvial life history form (USFS 2013).

In the Flathead River system, the majority of the outmigrating juvenile bull trout typically move downstream through the river system during the summer. Data suggest that juvenile bull trout move downriver into the mainstem Flathead River and inhabit the partially regulated portion of the river throughout the year before moving into Flathead Lake (Shepard et al. 1984: 40). The action area occurs in this partially regulated portion of the river. Shepard et al. (1984) also found that the migration of adult bull trout into the mainstem Flathead River from Flathead Lake began in April and peaked during May and June when river flows were high. These movements upstream through the action area were typically slow moving, with spawners arriving at the North and Middle Forks in late June through July. As previously mentioned, bull trout juveniles appear to use this lower segment of the river as a staging area before entering the lake, while adults use the river to seasonally migrate through the area. However, bull trout will also use this lower segment for food during the fall, when pygmy whitefish concentrate in the lower Flathead River (Shepard et al. 1984: 56)

Currently, non-native fish species represent the primary threat to bull trout in the Flathead Lake core area (Service 2015e). The early 1900's saw a series of introductions in Flathead Lake that had impacts to bull trout (USFS 2013). Yellow perch, brook trout, lake trout, Yellowstone cutthroat trout, rainbow trout, and kokanee were all stocked in the Flathead Lake system between 1910 and 1916. Brook trout are often cited as contributing to the decline of native fish (MBTSG 1998). The nature of negative interactions between bull trout and brook trout is thought to include competition, predation, and hybridization. The result of species interaction is suspected to be detrimental to bull trout given the apparent overlapping niches of these two species (Leary et al. 1993). Kanda et al. (2002) found that hybridization tends to occur between male brook trout and female bull trout indicating a greater reproductive wasted effort for bull trout than brook trout. Rich et al. (2003) suggested that bull trout may resist brook trout invasion in streams with high habitat complexity and "strong" neighboring bull trout populations.

Perhaps the single greatest threat to bull trout in the Flathead Lake core area is the invasion and proliferation of lake trout (Service 2015e). From the time of their introduction, lake trout likely had negative effects on bull trout through direct predation and competition for similar food resources in Flathead Lake. However, it was not until the introduction of *Mysis* shrimp into Flathead Valley lakes in 1967 that the negative interaction between lake trout and bull trout was fully realized (Service 2015e). The establishment of *Mysis* shrimp in Flathead Lake provided juvenile lake trout with a consistent prey base in their deep water habitats. This deep water prey base was not available prior to *Mysis* introduction and allowed the lake trout population in Flathead Lake to surge. Spencer et al. (1991) concluded that the benefit Mysis shrimp introduction has on lake trout was responsible for the collapse of a formerly strong population of kokanee salmon through direct predation by lake trout. Further, it has been determined that predation, competition, or other forms of negative interaction with lake trout is the factor most responsible for the currently depressed condition of bull trout in this core area (MFWP-CSKT 2000, Fredenberg 2008).

An extensive redd count monitoring program was developed and implemented by MFWP beginning in 1980. Based on data collected from eight index tributary streams in the North Fork and Middle Fork of the Flathead River (collectively representing about 45 percent of the known spawning in the basin), bull trout index redd counts ranged from about 300-600 in the 1980s (averaging 392), then dropped drastically in the early 1990s to a range of 83-243 in the seven years prior to listing (averaging 137 between 1991 and 1997). From 1998 through 2017, index redd counts ranged from 130 to 251 redds, averaging 195 (MFWP pers comm.). Some counts were considered minimum counts due to poor conditions during portions of the survey. Based on these counts, the recent trend appears relatively stable at a level roughly half of that in the 1980s.

Flathead River Basin-wide counts were made sporadically in 11 of the survey years, representing "all 31 stream sections known to be used by Flathead Lake spawners" (MFWP, pers. comm.). The Basin-wide total has ranged from lows of 236 (1997) and 291 (1992) to highs of 1,156 (1982) and 850 (1986). The Basin-wide count in 2012 was 500, approaching the average count of 578 for the 11 Basin-wide counts conducted since 1980.

Currently, the primary threats to bull trout in the Flathead Lake core area are non-native species and fisheries management (Service 2015e). In the 1980's, non-native lake trout expanded in the Flathead Lake and mainstem Flathead River FMO habitat. We discussed this expansion in detail above.

VI. Effects of the Action

Effects of the action are "…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]. These effects are considered along with the predicted cumulative effects to determine the overall effects to the species for purposes of preparing a BO on the proposed action.

A. Analyses for Effects of the Action

This biological opinion evaluates the impacts of replacing the MT 82 bridge across the Flathead River, construction of new roadway approaches to the bridge, development of a multi-use path over the bridge's length, and the reconfiguration of a popular MFWP FAS immediately south of the bridge on bull trout and bull trout critical habitat. The primary factors by which bull trout and bull trout critical habitat have the potential to be adversely affected by the proposed action are through sediment delivery associated with construction activities, loss of habitat due to encroachment by construction of the boat launch, temporary barriers to movement through the action area, possible barotraumas due to impact pile driving, and possible chemical contaminants associated with construction activities.

To define the habitat conditions for the species and its critical habitat and assess impacts from proposed actions, the Service uses "A Framework to Assist in Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Bull Trout Subpopulation Watershed Scale" (framework/matrix; USDI, 1998b). The framework/matrix defines the biological requirements for bull trout and facilitates the evaluation and relevance of the environmental baseline to the current status of the species to determine the effect of the proposed action and whether the species can be expected to survive with an adequate potential for recovery. The evaluation of the population and habitat indicators were conducted at the 5th or 6th field Hydrologic Unit Code (HUC or sub-watersheds) scales to establish the environmental baseline. Definitions for the baseline determinations Functioning Appropriately (FA), Functioning at Risk (FAR), and Functioning at Unacceptable Risk (FUR) for each of the habitat indicators are discussed in USDI 1998a, Table 1 at page 20. Analysis of the habitat indicators can provide a thorough evaluation of the existing baseline condition and potential project impacts to the PCEs. Appendix A in USDI (1998a) explains the relationship between the PCEs for bull trout critical habitat and the framework habitat indicators.

Habitat indicators in a sub-watershed that are FA provide habitats that maintain strong and significant populations, are interconnected and promote recovery of a proposed or listed species or its critical habitat to a status that will provide self-sustaining and self-regulating populations. When a habitat indicator is FAR, they provide habitats for persistence of the species but in more isolated populations and may not promote recovery of a proposed or listed species or its habitat without active or passive restoration efforts. FUR suggests the proposed or listed species continues to be absent from historical habitat, or is rare or being maintained at a low population level; although the habitat may maintain the species at this low persistence level (i.e., PCEs are not providing their intended recovery function) active restoration is needed to begin recovery of the species.

Table 3 includes the functional level of habitat indicators for the sub-watershed in the action area as assessed in the 2010 NRCS baseline analysis (NRCS 2010). Major effects to a habitat indicator result in a change in one level of baseline condition e.g. FA to FAR. Minor effects indicate the action may result in an incremental or cumulative effect, but does not result in a functional change to the system. For the purposes of this checklist, restore (R) means to change the function of an indicator in a positive direction by one condition class (i.e. FUR to FAR). Maintain (M) means that the function of an indicator does not change, and degrade (D) means to change the function of an indicator for the worse. In some cases, a FUR indicator may be further degraded, and this should be noted.

Characteristics Subpopulation: This pathway is made up of subpopulation size, growth and survival, life history diversity and isolation, and persistence and genetic integrity indicators. The proposed action will not affect the life history diversity and isolation, and persistence and genetic integrity indicators. Direct mortality of bull trout could occur during construction project activities by crushing an adult or juvenile bull trout when riprap is placed for streambank stabilization, and mortality could result from barotraumas caused by impact pile driving.

Water Quality: Water temperature, sedimentation, and chemical contamination/nutrients make up the indicators for water quality. The proposed action will not affect water temperature or spawning and rearing habitat. Increases in sedimentation from the proposed action could temporarily reduce the availability, quality, and abundance of substrate needed for macroinvertebrate production. Increases in sedimentation from the action could temporarily clog fish gills, or cause bull trout to avoid the project area when the boat launch is built, the existing piers are removed, and when bank armoring is installed, releasing sediment downstream.

The proposed action may result in short term increases in sediment due to general construction activities. High levels of suspended sediment and turbidity can result in direct mortality of fish by damaging and clogging gills (Curry and MacNeill 2004, p. 140). Fish gills are delicate and easily damaged by abrasive silt particles (Bash et al. 2001i, p. 15). Fish are more susceptible to increased suspended sediment concentrations at different times of the year or in watersheds with naturally high sediment such as glaciated streams. Fish secrete protective mucous to clean the gills (Erman and Ligon 1985, p. 18). In glaciated systems or during winter and spring high flow conditions when sediment concentrations are naturally high, the secretion of mucous can keep gills clean of sediment. Protective mucous secretions are inadequate during the summer months, when natural sediment levels are low in a stream system. Consequently, sediment introduction at this time may increase the vulnerability of fish to stress and disease (Bash et al. 2001g, p. 12).

Newcombe and Jensen (1996) have shown that construction effects upon fish are based on suspended sediment mg/L over time expressed as duration in hours or days. Past monitoring efforts indicate that total suspended sediment levels, elevated during the construction activity can quickly (within 1 to 3 hours post construction) return to pre activity levels. The duration and magnitude of sediment load increases during instream construction reflect watercourse size, volume of flow, construction activity, the effectiveness of Best Management Practices and sediment particle sizes. The dispersion of suspended sediment concentrations within the plume will reflect the flow conditions of the receiving waterbody (Julien, 1995). Very low flow conditions can result in minimal dilution and high suspended solid concentrations. However, the distance of downstream transport may be minimized. At the other extreme, high flows associated with storm events can increase background levels and entrain exposed sediment at the crossing location. Additionally, the downstream extent and concentrations of the sediment plume will reflect the particle sizes of the material excavated. In this case, gravel and coarse sand will settle out downstream close to the project site. Physical structures (BMP's) such as silt curtains or debris dams and boulders that trap particles promote the settling of suspended sediment.

Table 3. Checklist for documenting the environmental baseline (NRCS 2010) and effects of the proposed action. The numbers following the habitat indicators correspond to the PCEs.

Pathways: **Indicators**	**Flathead River-Rose Creek, Sub –watershed (170102080108)**	**Major Effects of the Action(s)**	**Minor Effects of the Action(s)**
	FA/FAR/FUR	M/D/R*	M/D/R*
Characteristics Subpopulation:			
Subpopulation Size	FAR	M	M
Growth & Survival	FAR	M	M
Life History Diversity & Isolation	FAR	M	M
Persistence and Genetic Integrity	FAR	M	M
Water Quality:			
Temperature 2, 3, 5, 8	FUR	M	M
Sediment 2, 3, 6, 8	FUR	M	D
Chemical Contam. / Nutrients 1, 2, 3, 8	FUR	M	M
Habitat Access:			
Physical Barriers 1, 2, 3, 9	FA	M	D
Habitat Elements:			
Substrate Embeddedness 1, 3, 6	FUR	M	M
Large Woody Debris 4, 6	FUR	M	M
Pool Frequency & Quality 3, 4, 6	FUR	M	M
Large Pools 4, 5	FUR	M	M

Off-Channel Habitat 4	FUR	M	M
Refugia 2, 5, 9	FUR	M	M
Channel Condition & Dynamics:			
Wetted Width/Max Depth Ratio 2, 4, 5	FUR	M	M
Streambank Condition 1, 4, 5, 6	FUR	M	D
Floodplain Connectivity 1, 3, 4, 5, 7, 8	FUR	M	M
Flow & Hydrology:			
Change in Peak/Base Flows 1, 2, 5, 7 ,8	FUR	M	M
Drainage network Increase 1, 7, 8	FAR	M	M
Watershed Conditions:			
Road Density & Location 1, 5, 7	FUR	M	M
Disturbance History 4, 7, 8, 9	FAR	M	M
Riparian Conservation Area 1, 3, 4, 5, 7	FAR	M	D
Disturbance Regime 4, 7, 8	FAR	M	M
Integration of Species & Habitat Condition	FUR	M	M

Based upon the presence of bull trout in the Flathead River year round, the potential for localized short-term sediment effects to adult and juvenile bull trout will occur. These impacts will be minimized through implementation of the project's conservation measures. In addition, bull trout may avoid the proposed project area and utilize adjacent suitable habitat in the river.

The proposed action has some potential for additions of toxic substances to the lake that could have long-term effects on macroinvertebrate production, and could decrease available foraging habitat for bull trout. All construction equipment will be inspected daily (during work days) to ensure hydraulic, fuel, and lubrication systems are in good condition and free of leaks to prevent these materials from entering any stream. Vehicle servicing and refueling areas, fuel storage areas, and construction staging and materials storage areas will be located a minimum of 50 feet from ordinary high water, and contained properly to ensure that spilled fluids or stored materials do not enter any aquatic resource. These minimization measures to reduce potential delivery of toxic substances will likely be effective.

Habitat Access: Scientific research by the Washington State Fish and Wildlife Office in conjunction with the Washington Department of Transportation in April 2010, indicated that impact pile-driving for the installation of piers, pilings, etc., may result in elevated underwater sound pressure waves that are physically detrimental to fish and other animal species. The primary concern is that the sound pressure waves generated by impact pile driving and other sources, such as explosives, can have negative physiological and neurological effects on fish (Yelverton et al. 1973, Yelverton and Richmond 1981, Steevens et al. 1999, Fothergill et al. 2001, U.S. Department of Defense 2002). Injury and mortality to fish species has been directly attributed to impact pile-driving (Stotz and Colby 2001, Stadler 2002, Fordjour 2003, Abbott et al. 2005, Hastings and Popper 2005). In some instances, these high sound pressure waves resulted in physical damage to the gas-filled internal organs of fish, such as kidneys, eyes, and swim bladders (Turnpenny and Nedwell 1994, Turnpenny et al. 1994, Popper 2003, Hastings and Popper 2005). These injuries can occur as the result of barotraumas, pathologies associated with high sound levels, including hemorrhage and rupture of internal organs (Turnpenny and Nedwell 1994, Turnpenny et al. 1994, Popper 2003, Hastings and Popper 2005).

Essentially, the sound waves enter the fish tissue as the tissues nearly match the surrounding water's acoustical behavior (Hastings 2002). When the sound waves pass through the fish, they cause the swim bladder to rapidly contract and expand repeatedly with the high sound pressure waves of the impact pile driving. This rapid expansion and contraction of the swim bladder causes it to repeatedly batter the surrounding internal tissues and organs, such as the kidneys, heart, liver, etc. (Gaspin 1975). Yelverton and others have found that body mass factors into the effect of sound pressure waves on fish, whereby fish greater in mass and size would require a greater impulse level of sound to cause an injury, while fish with a smaller mass and size would sustain injuries from smaller impulses. For the purpose of endangered species consultations, and until new information becomes available to refine the criteria, NOAA Fisheries expects the onset of physical injury would occur if either the peak sound pressure level (SPL) exceeds 206 dB (re: 1µPa) or the SEL, accumulated of all pile strikes generally occurring within a single day, exceeds 187 dB (re: 1 $\mu Pa^2 \cdot sec$) for fishes 2 grams or larger, or 183 dB for smaller fishes (Stadler and Woodbury 2009). Additionally, the threshold for adverse behavioral effects has been documented at 150 dB_{RMS} (root mean square; Teachout 2010).

The most noticeable and documented effects resulting from impact pile-driving is fish kills, but it is reported that not all fish killed by pile driving float to the surface, and thus remain undetected (Telecki and Chamberlain 1978, WSDOT 2003). Death resulting from barotraumas did not necessarily result in immediate death, as it occurred within minutes to days after exposure to these sound pressure waves (Abbott et al. 2002). Dependent on the source of such underwater sound pressure levels, they can also result in temporary stunning of fish, and alterations in behavior that could potentially affect fish feeding and predator evasion within the vicinity of the pile driving activity (Turnpenny and Nedwell 1994, Turnpenny et al. 1994, Popper 2003, Hastings and Popper 2005).

The proposed project will be using impact pile driving on dry land and in the active river channel to drive 14-inch-diameter steel H-type piles for temporary work platforms, and 48-inch steel pipe piles for abutment foundations and pier piles. In order to determine the area affected by sound pressure waves, the NOAA Fisheries calculation spreadsheet was used, and 1,000 strikes per day was assumed. Reference data to populate the spreadsheet was obtained from Reyff (2007:I.4-7). Because reference data for heavy 14-inch-diameter steel H-type piles driven in dry land could not be located, data for 15-inch diameter thick-walled steel H piles driven in a dewatered cofferdam adjacent to a river channel was used as a surrogate (Reyff 2007:I.4-7). Data presented in Reyff (2007) indicate that a single strike impact hammer strike on a 15-inch diameter thick-walled steel H pile yields a sound exposure level (SEL) of 147 dB, a peak of 177 dB, and a RMS of 160 dB when measured at a distance of 25 meters. Stadler and Woodbury (2009) indicate that the distance from the pile driver at which a single strike SEL drops to 150 dB is the maximum distance from a pile that fishes can be injured, regardless of how many times the pile is struck. Additionally, the threshold for adverse behavioral effects has been documented at 150 dB RMS (Teachout 2010), which would require approximately 127 yd (101 m) using the above data. Similar calculations were conducted using reference material for 48-inch cast-in-steel-shell (CISS) steel pipe piles on land and in the active channel (Reyff 2007:I.3-25 and I.3-26, respectively). Data for CISS steel pipe piles was used because information could not be located for 48-inch steel pipe piles in the literature. The equations from Stadler and Woodbury (2009) and data from Reyff (2007: I.3-25) indicate a single strike impact hammer strike on a 48-inch

CISS steel pipe pile on dry land yields a sound exposure level (SEL) of 165 dB, a peak of 192 dB, and a RMS of 180 dB when measured at a distance of 20 meters. Using these data, and a total of approximately 1,000 strikes per day, the 48-inch steel pipe piles are expected to ensonify an area approximately 2000 meters (2,187 yards) upstream and downstream of the work site (i.e., 150 dB_{RMS}). The onset of physical injury for fish ≥ 2 grams is expected to occur within 68 meters (74 yards) of the pile being driven on land (i.e., 187 dB Cumulative SEL), and within 126 meters (138 yards) for fish < 2 grams (i.e., 183 dB Cumulative SEL). Following the previous example, using data from Reyff (2007: I.3-26), a single strike impact hammer strike on a 48-inch CISS steel pipe pile in the wetted channel yields a sound exposure level (SEL) of 172 dB, a peak of 197 dB, and a RMS of 184 dB when measured at a distance of 19 meters. Using these data, and a total of approximately 1,000 strikes per day, the 48-inch steel pipe piles are expected to ensonify an area approximately 3511 meters (3,840 yards) upstream and downstream of the work site (i.e., 150 dB_{RMS}). The onset of physical injury for fish ≥ 2 grams is expected to occur within 190 meters (208 yards) of the pile being driven on land (i.e., 187 dB Cumulative SEL), and within 351meters (384 yards) for fish < 2 grams (i.e., 183 dB Cumulative SEL).

Due to the project's proximity to Flathead Lake, that the Flathead Lake core area is comprised predominantly of adfluvial bull trout that migrate from Flathead Lake through the project area to the higher tributaries of the Flathead River to spawn, and that juvenile bull trout are present in the mainstem of the Flathead River throughout the year (Shepard et al. 1984, Fraley and Shepard 1989), there is no period of time when impact pile driving can occur that would minimize the effects to bull trout. As a result, the Department and Administration have proposed hydroacoustic monitoring of impact pile driving as one of their conservation measures (Respec 2022: 4). Hydroacoustic monitoring will be used during a calibration period, during which a representative sample of pile types (i.e., temporary work platform piles and 48-inch steel pipe piles) and locations (i.e., dry land and active channel) will be monitored using hydroacoustic equipment. Data collected during the calibration exercise will be input into the National Marine Fisheries Service Calculator Tool to determine the number of hammer strikes that can be done per day, prior to reaching the cumulative sound exposure level (SEL) threshold of 187 dB. Through the hydroacoustic monitoring calibration exercise, it is possible that the physical harm thresholds of the peak sound pressure level (SPL) of 206 dB (re: 1 µPa) or the cumulative sound exposure level (SEL) of 187 dB (re: 1 µPa) may be attained or exceeded. This would be during a period when juvenile and adult bull trout may be moving through the project area. Hence, the proposed project may cause a temporary physical and behavioral barrier to adult or juvenile bull trout in the project area due to construction activities. These temporary barrier effects would occur intermittently during construction, primarily during installation of the temporary work platform's piles and the 48-inch steel pipe piles.

Habitat Elements and Channel Condition and Dynamics: The habitat elements pathway consists of the following six indicators: substrate embeddedness, large woody debris, pool frequency and quality, large pools, off-channel habitat, and refugia. Habitat indicators wetted width/max depth ratio, streambank condition, and floodplain connectivity are the three indicators that make up the channel condition and dynamics pathway. For substrate embeddedness see sediment discussion above. The proposed action will result in minor long term degrades to several habitat indicators.

The proposed action will affect bank condition through vegetation removal and installation of riprap. Such actions would likely result in reductions of bank and habitat complexity, as well as reductions in macroinvertebrates. Such actions would likely result in a minor long-term reduction in bank condition.

B. **Species Response to the Proposed Action**

The project has potential to directly affect adult and juvenile bull trout from increased turbidity due to intermittent instream activities, through behavioral effects, abandonment of cover, short-term reductions in feeding rates and success, and minor physiological stress (U.S. Fish and Wildlife Service 2010). Intermittent pulses of sediment are expected and would be associated with removal of the existing piers. Increased turbidity associated with these activities may cause adult and juvenile bull trout to abandon cover, and may cause short-term reductions in feeding, and minor physiological stress.

Impact pile driving associated with installation of the temporary work platform, abutment foundations and pier piles will require a calibration exercise for hydroacoustic monitoring that will be used to determine the specifications by which impact pile driving can occur while staying below the physical injury thresholds of a peak SPL exceeding 206 dB (re: 1µPa) or the SEL, accumulated of all pile strikes generally occurring within a single day, exceeding 187 dB (re: 1 $\mu Pa^2 \cdot sec$) for fishes 2 grams or larger. During the calibration exercise, it is possible that these thresholds may be exceeded, and physical injury may occur to juvenile and adult bull trout. However, once the calibration exercise has been completed, impact pile driving would occur under conditions where the physical injury thresholds will not be attained, and there will be at least a nine hour period at night when bull trout can move through the project area when impact pile driving will not occur. This will help reduce behavioral responses, maintain a migratory corridor, and limit the risk of physical injury to juvenile and adult bull trout in the project area.

For indirect effects, the new bridge is designed to prevent or minimize stormwater runoff, including de-icing chemicals, road debris, and sanding materials, from directly entering the Flathead River. Stormwater flows that occur on the surface of the bridge deck will be conveyed to the west abutment where these flows will be discharged onto the north and south embankment protectors. This process will allow sediment and other pollutants to filter out before the water enters the Flathead River (Respec 2022:3).

Reconstruction of the Sportsman's Bridge FAS in the existing location will include an expansion to provide increased access and parking. A new boat ramp will be constructed in the Flathead River and additional parking will be provided for a FAS that currently receives heavy use. These improvements to the FAS will increase accessibility to the Flathead River for recreational fishing, and could result in illegal or accidental harvest of bull trout. Several telemetry studies in the upper Clark Fork basin indicate that intentional and unintentional harvest is responsible for at least 10% - 15% of annual fluvial bull trout mortality (Knotek et al. 2004, Pierce et al. 2004, Schmetterling 2003, Swanberg 1997a, Swanberg 1997b). Patterns of angler use, combined with bull trout behavior and life history make this species particularly susceptible to illegal harvest and potentially high rates of delayed (i.e., catch and release) mortality (Knotek 2005). This is further complicated by the ability of recreational anglers to correctly identify bull trout. In a 2004 survey of anglers in the Middle Clark Fork River Core Area, 59% of all anglers could correctly identify bull trout, while only 47% of those anglers indicating that they were intending to keep fish that they caught could correctly identify bull trout (Knotek 2005:59).

C. **Effects of the Action to Designated Critical Habitat**

The specific effects of the proposed action on critical habitat are virtually the same as those described in the preceding section, because the PCEs considered under critical habitat involve the same habitat parameters analyzed in the matrix (Table 3). Consequently, those discussions and analysis of effects apply here; and therefore, will not be repeated. The primary factor by which bull trout and bull trout critical habitat have the potential to be adversely affected by the proposed action is through changes to habitat indicators sediment (turbidity PCE 8) and physical barriers (PCE 2 physical barriers).

VII. Cumulative Effects

The implementing regulations for section 7 define cumulative effects as "…those effects of future State or private activities, not involving Federal 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. It is important to note that the section 7 definition (related to the Act) is not the same as the definition of "cumulative effects" under the National Environmental Policy Act.

The Sportsman's Bridge FAS, whose reconstruction is included as part of the proposed project, provides fishing access to the Flathead River. The reconstructed FAS will provide for greater fishing access due to the provision of additional parking. As a result, the proposed project will likely provide for increased angling, and potentially increased bull trout harvest. Angler harvest and poaching has been identified as one reason for bull trout decline (U.S. Fish and Wildlife Service 2002b). In addition, misidentification of bull trout has been a concern because of the similarity of appearance with brook trout. Although harvest of bull trout is illegal, incidental catch does occur and the fate of the released bull trout is unknown, but some level of hooking mortality is likely due to the associated stress and handling of the release (Long 1997).

The harvest of bull trout, either unintentionally or illegally, could have a direct effect on the local resident bull trout population and possibly the migratory fluvial component of bull trout populations in Montana. The extent of the effect would be dependent on the amount of increased recreational fishing pressure, which is a function of the increased number of fishermen utilizing the fish resources each season. Illegal poaching is difficult to quantify, but generally increases in likelihood as the human population in the vicinity grows (Ross 1997).

VIII. Conclusion

A. **Jeopardy Analysis**

After reviewing the current status of bull trout, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the action as proposed, is ***not likely to jeopardize the continued existence*** of bull trout. This conclusion is based on the magnitude of the project effects (to reproduction, distribution, and abundance) in relation to the listed population. Implementing regulations for section 7 (50 CFR 402) defines "jeopardize the continued existence of" as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species."

Jeopardy determinations for bull trout are made at the scale of the listed entity, which is the coterminous United States population (64 FR 58910). This follows the April 20, 2006, analytical framework guidance described in the Service's memorandum to Ecological Services Project Leaders in Idaho, Oregon and Washington from the Assistant Regional Director – Ecological Services, Region 1 (USDI 2006). The guidance indicates that a biological opinion should concisely discuss all the effects and take into account how those effects are likely to influence the survival and recovery functions of the affected interim recovery unit(s), which should be the basis for determining if the proposed action is "likely to appreciably reduce both survival and recovery of the coterminous United States population of bull trout in the wild."

As discussed earlier in this BO (see Part III.), the approach to the jeopardy analysis in relation to the proposed action follows a hierarchal relationship between units of analysis (i.e., geographical subdivisions) that characterize effects at the lowest unit or scale of analysis (the local population) toward the highest unit or scale of analysis (the Columbia Headwaters Recovery Unit). The hierarchal relationship between units of analysis (local population, core areas) is used to determine whether the proposed action is likely to jeopardize the survival and recovery of bull trout. As mentioned previously, should the adverse effects of the proposed action not rise to the level where it appreciably reduces both survival and recovery of the species at a lower scale, such as the local or core population, the proposed action could not jeopardize bull trout in the coterminous United States (i.e., rangewide). Therefore, the determination will result in a no-jeopardy finding. However, should a proposed action cause adverse effects that are determined to appreciably reduce both survival and recovery of the species at a lower scale of analysis (i.e., local population), then further analysis is warranted at the next higher scale (i.e., core area).

Our conclusion is based on the magnitude of the project effects in relation to the Flathead Lake core area bull trout population. Our rationale for this no jeopardy conclusion is based on the following:

- Minimization measures employed by the Administration and Department during implementation of the proposed action are likely to be effective in reducing sediment generated during instream activities.

- Sediment increases as a result of the proposed action are limited in scale and are not anticipated to persist for more than one year after construction.

- The implementation of the proposed action is not anticipated to reduce the reproduction, numbers, or distribution of bull trout within the Flathead River core area or action area to the degree that survival or recovery is reduced because:
    - The action area does not provide spawning and rearing habitat, and thus, the proposed action would not affect bull trout spawning.
    - The action area provides foraging, migration, and overwintering habitat for bull trout, and bull trout are more likely to migrate at night. The proposed action will not pile drive at night (9:00 pm to 6:00 am), allowing for adult and juvenile bull trout to migrate through the project area, when they are more likely to do so.
    - The proposed action will intermittently ensonify a small portion of the Flathead River, while allowing for nighttime (9:00 PM – 6:00 AM) movement through the corridor.

As a result, the Service concludes that implementation of this project is ***not likely to appreciably reduce survival, recovery, or the continued existence*** of bull trout at the scale of the Columbia Headwaters Recovery Unit, and by extension, the coterminous United States Population of bull trout.

B. **Adverse modification of bull trout critical habitat analysis**

Pursuant to current national policy and the statutory provisions of the Act, destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features (50 CFR 402.02).

The approach to the adverse modification analysis in relation to the proposed action follows a hierarchical relationship between units of analysis (discussed in detail above). The hierarchical relationship between units of analysis (e.g., stream segment, critical habitat subunit) is used to determine whether the proposed action is likely to adversely modify designated bull trout critical habitat. If the adverse effects of the proposed action do not rise to the level where it appreciably diminishes the value of critical habitat at a lower scale (such as the individual stream segment or subunit), then by extension, the proposed action could not adversely modify bull trout critical habitat at larger scales (such as the critical habitat unit, or the coterminous United States). Therefore, the determination is appropriately a "no adverse modification" finding. However, if a proposed action causes adverse effects that are determined to appreciably reduce both survival and recovery of the species at a lower scale of analysis (i.e., local population or core area), then further analysis is warranted at the next higher scale.

The range-wide status of designated critical habitat for the bull trout is variable among and within CHSUs, which were designated in five states in a combination of reservoirs/lakes and streams/shoreline. Designated bull trout critical habitat is of two primary use types: (1) spawning and rearing; and (2) foraging, migration, and overwintering. The conservation role of bull trout critical habitat is to support viable core area populations. 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. Thirty-two CHUs and 78 associated subunits are designated as critical habitat under the 2010 final rule for designation of bull trout critical habitat (75 FR 63898).

After reviewing the current status of the Flathead Lake core area of bull trout and its relationship to the Columbia Headwaters Recovery Unit, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service's opinion that the action, as proposed, is ***not likely to destroy or adversely modify bull trout critical habitat***. The proposed action will result in minor temporary degrades to PCEs 2, 3, and 4. These impacts are small relative to the amount of FMO in the Flathead Lake, Flathead River, and Headwater Lakes CHSU (191 miles). The Service anticipates that effects to critical habitat within the action area will be minor and that the Flathead Lake, Flathead River, and Headwater Lakes CHSU will retain its current ability for the PCEs to be functionally established. By extension, the project, as proposed, is not likely to adversely modify the Clark Fork River Basin Critical Habitat Unit, which as a whole will remain functional. By further extension, because the relevant critical habitat unit is not likely to be adversely modified, designated critical habitat for the bull trout, as a whole, is not likely to be adversely modified.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. *Take* is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct (Act, section 3). *Harm* is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 17.3). *Harass* is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering (50 CFR 17.3). *Incidental take* is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity (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 this Incidental Take Statement.

The measures described below are not discretionary and must be undertaken by the Administration and the Department so that they become binding conditions of any contract issued, as appropriate, for the exemption in section 7(o)(2) to apply. The Administration has a continuing duty to regulate and oversee the activity covered by this Incidental Take Statement. If the Administration and Department fail to assume and implement the terms and conditions of the Incidental Take Statement, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the Administration and Department must report the progress of the action and its impact on the species to the Service as specified in the Incidental Take Statement [50 CFR 402.14(i)(3)].

The BA (Respec 2022) describes actions anticipated to occur during implementation of the Flathead River—3 M NW Big Fork project. Some of the actions described in the BA, when implemented, are *likely to adversely affect* bull trout. Thus, the Service anticipates that implementation of the Flathead River—3 M NW Big Fork project will likely impart a level of adverse effects to individual bull trout to the extent that incidental take will occur.

Amount or Extent of Take Anticipated

The Service anticipates that project activities will result in incidental take of bull trout in the form of harm, harassment or mortality related to the short-term degradation of aquatic habitat parameters related to increased levels of activity-created sediment, physical barriers, and the related risk to bull trout life history stages, and long-term recreational fishing. Activity-created sediment will have short-term adverse effects (sub-lethal) by impairing feeding and sheltering patterns of juvenile and adult bull trout to the extent of injury (harm and/or harassment).

Sound pressure waves resulting from impact pile driving would be expected to create a temporary physical barrier preventing the movement of bull trout through the project area for the duration of the impact pile driving. Furthermore, impact pile driving activities may harass individual bull trout from the project area, disrupting normal behavior patterns which include, but are not limited to feeding and sheltering. Finally, depending upon bull trout proximity to the impact pile driving, the sound pressure waves may induce barotraumas to individuals, possibly resulting in physical harm or mortality. Because the Department and Administration will conduct hydroacoustic monitoring of the pile driving calibration exercise(s) to determine the number of strikes per day to stay below harm thresholds, the Service anticipates a low level of take from the proposed action over the long-term. Additionally, during the demolition of the existing structure, portions of the structure may fall into the active channel and present partial or complete barriers to fish passage for up to 2 days. The temporary obstructions may harass individual bull trout from the project area, disrupting normal behavior patterns which include, but are not limited to feeding and sheltering.

Due to the proximity of the project to the Sportsman's Bridge FAS and the impacts the project will have on it, the Administration and Department will be reconstructing the FAS with a higher capacity than the existing FAS. The reconstructed FAS will enable greater fishing access to this reach of the Flathead River. Such fishing access may result in harassment, harm, and mortality for bull trout under existing Montana Fish, Wildlife and Parks issued fishing regulations. Take related to fishing is attributable to the public access from the FAS and existing fishing regulations. Such take is currently not prohibited take and does not require exemption from prohibitions of section 9 of the Act because it is exempted under the final 4(d) rule (Federal Register 1999 64: 58929 – 58930), and is not associated with this proposed action. Thus, fishing-related take does not need to be covered under this incidental take statement.

The Service anticipates a low level of take from the proposed action during project implementation due to proposed conservation measures. The amount of take that may result from implementation of the action is difficult to quantify for the following reasons:

- The amount of sediment produced or delivered is determined by a number of factors that are not only influenced by local site parameters such as topography and soil type, but are influenced by weather, time of implementation and effectiveness of the mitigation measures.

- The amount and location of sediment deposition depends on numerous factors (e.g. flow regime, size of stream, channel roughness).

- Losses may be masked by seasonal fluctuations in numbers, and aquatic habitat modifications are difficult to ascribe to particular sources, especially in already degraded watersheds.

- Because of the wide ranging distribution of bull trout, difficulties in the identification and detection of dead or impaired individuals, and the likelihood that not all barotrauma-induced mortalities float to the surface, detection of injured or dead individuals may be difficult.

For these reasons, the Service has determined that the actual amount or extent of the anticipated incidental take is difficult to determine. In these cases, the Service uses surrogate measures to measure the amount or extent of incidental take, and determine when the amount of take anticipated has been exceeded. In this biological opinion we use length of stream affected (approximately 2,200 yards upstream (impact pile driving; projected distance of 3,840 yards was reduced due to river sinuosity) and one mile downstream (sediment), and the duration of the project (2 years). It is possible that take may be exceeded if:

- Steel pipe piles driven with an impact hammer exceed 48 inches in diameter or steel H-type piles exceed 14 inches in diameter, because the area that is expected to be ensonified from the pile driving would exceed the calculations presented in the biological opinion.

- The rest period between consecutive days of impact pile driving is less than 9 hours.

- The number of impact hammer strikes per day exceeds those that are calculated using the National Marine Fisheries Service calculation spreadsheet. Such calculations are used to determine the number of strikes per day that can be done and still remain below cumulative SEL levels.

- Additional sediment generating activities are conducted that differ from pier foundation removal and streambank riprapping.

- The sediment plume travels more than one mile downstream.

- The project duration exceeds 2 years.

The Service anticipates that incidental take of bull trout will occur intermittently in the Flathead River approximately 2,200 yards upstream and one mile downstream from the affected bridge.

Take would be expected to occur when impact pile driving, pier foundation removal, and streambank riprapping activities occur. This portion of the Flathead River is used as foraging, migration, and overwintering habitat by bull trout throughout the year (Shepard et al. 1984). Thus, the take would apply to juvenile and adult bull trout within the action area. If at any time during implementation of the project, the Administration and Department conducts impact pile driving activities in addition to those described in the proposed action, or conducts proposed activities in a manner that differs from that described in the proposed action, then the amount of take we anticipate could be exceeded. Should the Administration and Department anticipate that permitted take will be exceeded, the Service should be consulted prior to those activities' occurrence.

Effect of the Take

In the accompanying biological opinion, the Service concludes that implementation of this project is not likely to appreciably reduce both the survival and recovery of bull trout in the Flathead River core area, and by extension, the Clark Fork River Management Unit. Therefore the Service concludes the action will not jeopardize the continued existence of bull trout within the coterminous United States population of the bull trout.

Reasonable and Prudent Measures

Incidental take statements typically provide reasonable and prudent measures which are expected to reduce the amount of incidental take. Reasonable and prudent measures are those measures necessary and appropriate to minimize the incidental take resulting from the proposed action. These reasonable and prudent measures are non-discretionary and must be implemented by the Administration and Department in order for the exemption in section 7(0)(2) to apply. The Service believes the following reasonable and prudent measure(s) are necessary and appropriate to minimize impacts of incidental take of bull trout.

A. The Administration and the Department shall implement means to reduce the potential for incidental take of bull trout resulting from impact pile driving, pier foundation removal, and streambank protection of the Flathead River.

B. The Administration and Department shall implement the reporting requirement as described in the terms and conditions below.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Administration and Department must comply with the following terms and conditions that implement the reasonable and prudent measure described above and outline reporting and monitoring requirements. These terms and conditions are non-discretionary:

To implement RPM A:

1. To minimize the risk of barotrauma and fish mortality from driving piles for construction of the new bridge and any temporary work bridges, both on dry land and in water:
    a. Limit the periods of impact pile driving to no more than 12 hours per day, except in rare circumstances when safety issues require the work to be completed that day. The project manager must be notified and approve pile driving that exceeds 12 hours per day. The project manager will notify the Department's District Biologist, who will then notify the Service.
    b. Conduct hydroacoustic monitoring. Through hydroacoustic monitoring, it is possible that the physical harm thresholds of the peak sound pressure level (SPL) of 206 decibels (dB; re: 1 micropascal [μPa]) or the cumulative sound exposure level (SEL) of 187 decibel (re: 1 μPa) may be attained or exceeded during the calibration exercise. The calibration period will be limited in duration with the purpose of obtaining a representative sample of piles (e.g., size and materials) and locations to ensure that the appropriate sound information is collected for use in the National Marine Fisheries Service Calculator Tool. In combination with hydroacoustic monitoring, use one of the following measures:
        i. Use a vibratory hammer to drive piles to a point where an impact hammer will be required to drive the pile to the point of completion OR;
        ii. Four production piledriving, use a "soft start" or "ramp up" pile driving method (e.g., driving does not begin at 100% energy) to encourage fish to vacate the surrounding area. Use the information collected during the hydroacoustic monitoring calibration and the National Marine Fisheries Service Calculator Tool to determine how many pile strikes can occur during a day, based on pile type and size, before reaching the cumulative SEL threshold of 187 dB. Once the number of strikes has been attained, impact pile driving must be stopped for the day. If pile driving outside the stated work time frames with an impact hammer over consecutive days, either do not drive piling between the hours of 9:00 PM and 6:00 AM OR;
        iii. Use department approved noise reduction methods, such as those offered in Leslie and Schwertner (2013; e.g., bubble curtains).

2. The Department and Administration will coordinate with the Service so that a representative of the Service may be present during the calibration exercise(s).

3. To the maximum extent possible, disassemble the existing bridge and remove without pieces being allowed to fall into the stream. If portions of the old bridge do fall into the stream during demolition, they will be removed from the stream without dragging the material along the streambed.

4. Any blasting required during bridge pier removal will be contained to the maximum extent practicable by using a containment shielding device to attenuate the blast's pressure wave within the water and prevent debris from entering the river. Meet all applicable requirements contained within the current Department *Standard Specifications for Road and Bridge Construction*, Section 204—Blasting.

5. Instream work conducted within the channel shall be kept to the minimum amount necessary, preferably during periods of low flow. This includes, but is not limited to, construction and removal of pilings for any temporary support structures that may be necessary. Instream construction work shall be completed in the shortest amount of time possible.

6. Visually monitor all dewatering activities, if any, to ensure bull trout are not trapped. In the unlikely event a live bull trout is found within a dewatering area, immediately return it to the river.

7. The proposed project will be constructed in accordance with the applicable environmental standard specifications found in the current Department *Standard Specifications for Road and Bridge Construction*. Standard specifications will include:
    a. Section 208.03.1—*Water Pollution Control*
        i. The contractor will implement a spill prevention and waste disposal plan.
        ii. The contractor will implement appropriate erosion and sediment control measures. Includes installation of barriers (e.g., silt fencing, straw wattles) adjacent to waterways prior to any soil disturbance to prevent sediment from leaving the site.
        iii. The contractor will be responsible for conducting routine site monitoring to ensure all pollution control measures are installed, maintained, and functioning correctly.
    b. Section 208.03.2—*Aquatic Resource Protection*. The contractor will implement the general provisions of this standard specification that include:
        i. Do not spill or dump material from equipment into regulated aquatic resources.
        ii. Do not discharge wastewater from washout of concrete related equipment, concrete finishing, saw cutting, wet concrete, hydraulic demolition, etc, into any regulated aquatic resource.
        iii. Locate staging or storage areas at least 50 feet (15.2 meters) horizontally from any aquatic resource, top of streambank, or the highest anticipated water level during the construction., whichever is furthest from the resource.
        iv. Store and handle petroleum products, chemicals, cement, and other deleterious materials to prevent their entering regulated aquatic resources.
        v. Provide sediment and erosion controls for topsoil stockpiles, staging areas, access roads, channel changes, and instream excavations.
        vi. Clean, maintain, and operate equipment so that petroleum based products do not leak or spill into any regulated aquatic resource.

8. The special provision entitled *Protection of Aquatic Resources and Threatened and Endangered Species* will be included in the final construction bid documents to avoid and minimize potential impacts to bull trout and bull trout critical habitat.
    a. The special provision identifies aquatic resource locations and requires the construction contractor to prepare and submit an aquatic resource protection plan (ARPP) to the Department before construction that outlines procedures for

implementing and maintaining BMPs. The ARPP will be reviewed by the Department and approved, with modifications as necessary, before construction.

9. The special provision entitled *Conservation and Coordination Measures for Bull Trout* will be included in the final construction bid documents as an additional conservation measure to protect bull trout and bull trout critical habitat.

10. Additional standard BMPs will be implemented with the project to include the following:
    a. Minimizing the site disturbance to only the area absolutely necessary to complete the project.
        i. Clearing and grubbing should not be allowed within the ROW beyond the construction limits or required clear zone. Any temporary clearing outside the construction limits (e.g., for culvert installation, etc.) but within the ROW should be kept to the smallest area possible and reclaimed immediately following construction.
    b. Minimize impact on riparian vegetation fringing the project area and the Flathead River to the greatest extent practicable.
    c. All excavated material that cannot be reused as backfill will be contained and hauled off site.
    d. Stabilize exposed soils with a desirable native vegetation community as soon as feasible.

11. Upon locating dead or injured bull trout, notify the Department's Project Manager and contact the Service Field Office at (406) 449-5225 within 24 hours. Record information relative to the date, time, and location of dead or injured bull trout when/if found. Include any activities that were occurring at the location and time of injury and/or death of each fish and provide this information to the Service.

12. Conduct project-related activities outside of construction limits in a manner which will not adversely affect species and/or designated critical habitat listed under the Endangered Species Act.

To implement RPM B:

In order to monitor the impacts of incidental take, the Federal agency or any applicant must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [(50 CFR 402.14 (i)(3)]. To demonstrate that the Flathead River—3 M NW Big Fork project is adequately reducing the potential for and minimizing the effect of any incidental take that may result, and that the assumptions made in this consultation are valid, the Administration and Department shall:

13. Provide a report from the hydroacoustic monitoring calibration exercise for impact pile driving ***prior to*** the beginning of production pile driving that would occur. The report shall include:
    a. Impact hammer energy rating, model and size
    b. A description of the sound monitoring equipment

c. Pile type and size
d. Depth of the hydrophone(s) and water depth at hydrophone locations
e. Total number of strikes to drive each pile that is monitored
f. Distance from the pile where the data were collected
g. Depth into the substrate that the pile was driven
h. The total number of strikes to drive each pile and for all piles driven during a 24-hour period.
i. The results of the hydroacoustic monitoring. An example is listed in Appendix A.
j. The distance at which peak, cumulative SEL, and RMS values exceed the respective threshold values.
k. A description of any observable fish behavior in the immediate area, and if possible, correlation to underwater sound levels occurring at that time.
l. Recommended number of strikes per day, based on the National Marine Fisheries Service calculator tool to stay below the physical harm thresholds of the peak sound pressure level (SPL) of 206 dB (re: 1 μPa) or the cumulative sound exposure level (SEL) of 187 dB (re: 1 μPa) for production pile driving.

14. The Administration and Department shall provide summaries by March 1 each year detailing project progress and compliance monitoring of the terms and conditions in this BO.

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 information.

1. To assist in meeting the Department's responsibilities under Section 7(a)(1) of the Act, and to utilize authorities granted within the Bipartisan Infrastructure Law (BIL), which provide opportunities to increase partnerships between transportation and environmental sectors, the Service strongly recommends that the Administration and Department work proactively with the Service, MFWP, and others to identify and remedy any impacts to salmonids, including bull trout, within the Flathead Lake core area that are the result of transportation systems. Within this area, many streams are impacted by bridges and culverts that were not designed to accommodate the aquatic systems that they cross, and are impacted by road sanding materials during winter. These impacts increase water velocities and negatively impact fish habitat.

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

Reinitiation Notice

This concludes consultation on the action outlined in your June 6, 2022, request for consultation on the effects of the Flathead River—3 M NW Big Fork project on bull trout and bull trout critical habitat. As provided in 50 C.F.R. § 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental 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. The Service retains the discretion to determine whether the conditions listed in (1) through (4) have been met and reinitiation of formal consultation is required.

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Appendix A

Table 1. Example table for required information for reporting the results of hydroacoustic monitoring of pile driving.

Date and Time	Pile ID	Hammer Impact or Vibratory	# Strikes or Vibratory Seconds	Distance to Pile from Hydrophone (m)	Water Depth (m)		Peak (dB)			$SEL_{90\%}$ (dB)				$RMS_{90\%}$ (dB)			Notes
					At Pile	At H-phone	Max	Min	Mean	Max	Min	Mean	$cSEL_{90\%}$	Max	Min	Mean	