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:
M.06 File: COE (F)
06E11000-2020-F-0181

February 19, 2020

Duane Mitchell
U.S. Army Corps of Engineers
Walla Walla Regulatory Office
201 North Third Avenue
Walla Walla, WA 99362

Sage Joyce
U.S. Army Corps of Engineers
Helen Regulatory Office
10 West 15th Street, Suite 2200
Helena, MT 59626

Dear Mr. Mitchell and Ms. Joyce:

On behalf of the U. S. Fish and Wildlife Service's (Service) Montana Ecological Services Office and Idaho Fish and Wildlife Office, this document transmits the biological opinion on the U.S. Army Corps of Engineers (Corps) Standard Local Operating Procedures for Endangered Species for Nationwide Permits Affecting Bull Trout and Kootenai River White Sturgeon in Northern Idaho, Western Montana, and Northeast Washington (SLOPES).

The biological opinion was prepared in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.). Your request for formal consultation and biological assessment was received by the Service on June 19, 2019.

The biological opinion analyzes the effects of SLOPES to the threatened bull trout (*Salvelinus confluentus*), designated bull trout critical habitat throughout the Columbia Headwaters and Saint Mary Recovery Units, as well as the endangered Kootenai River white sturgeon (*Acipencer transmontanus*) and designated Kootenai River white sturgeon critical habitat throughout the species' range in the United States. The biological opinion in based on the information provided by the Corps in the final biological assessment, correspondences between the Corps and Service throughout the consultation process, and information in our files.

The Service appreciates your efforts to ensure the conservation of threatened and endangered species as part of our joint responsibilities under the Act. If you have further questions related to

this consultation or your responsibilities under the Act, please contact:
Kevin Aceituno at (406) 758-6871 or kevin_aceituno@fws.gov (for Montana), or
Katherine Sarensen at (509) 893-8021 or katherine_sarensen@fws.gov (for Idaho.

Sincerely,

for Jodi L. Bush
Office Supervisor,
Montana Ecological Services Office

for Christopher Swanson,
Acting State Supervisor,
Idaho Fish and Wildlife Office

ENDANGERED SPECIES ACT SECTION 7 CONSULTATION

BIOLOGICAL OPINION

for

U. S. Army Corps of Engineers
Standard Local Operating Procedures for Endangered Species (SLOPES) for Selected Nationwide Permit Activities Affecting Bull Trout and Kootenai River White Sturgeon in Western Montana and Northern Idaho

TAILS Number: 06E11000-2020-F-0181

Action Agency:

U.S. Army Corps of Engineers
Walla Walla District
Walla Walla, Washington

Consultation Conducted by:

U.S. Fish and Wildlife Service
Montana Ecological Services Office
Kalispell, Montana

And

U.S. Fish and Wildlife Service
Northern Idaho Field Office
Spokane, Washington

February 18, 2020

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A. INTRODUCTION

This biological opinion (BO) was prepared by the U.S. Fish and Wildlife Service (Service) in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.). Section 7 of the Act requires Federal agencies to use their authorities to carry out conservation programs to benefit endangered and threatened species. There is also an explicit requirement for Federal agencies to ensure, in consultation with the Fish and Wildlife Service or the National Marine Fisheries Service, that any action they authorize, fund, or carry out will not be likely to jeopardize the continued existence of a listed species, or destroy or adversely modify designated critical habitat. As a result, Federal agencies have a unique opportunity and obligation to assist recovery implementation by addressing threats that result from their programs and actions.

Section 7(b)(3)(A) of the Endangered Species Act (Act) requires that the Secretary of the Interior issue BOs on federal agency actions that may adversely affect listed species or designated critical habitat. BOs determine if the action proposed by the action agency is likely to jeopardize the continued existence of a 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 result in jeopardy to a listed species or adverse modification of critical habitat, if any has been designated. 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 BO addresses impacts to the federally threatened bull trout, designated bull trout critical habitat, as well as the federally endangered Kootenai River white sturgeon (Kootenai sturgeon) and designated Kootenai River white sturgeon critical habitat. This BO does not address the overall environmental acceptability of the proposed action.

1. Purpose of this Consultation

Section 10 of the Rivers and Harbors Act of 1899 requires authorization from the Secretary of the Army, acting through the Corps of Engineers, for activities that alter or modify the course, condition, location, or capacity of or the construction of any structure in, over, or under any navigable water of the United States [33 CFR 322.3(b)]. This law applies to activities in navigable waters including, but not limited to, dredging, excavation, disposal of dredged/excavated material, installation and removal of piling, docks, and piers, and the discharge of fill material such as rock and soil.

Section 404 of the Clean Water Act requires authorization from the Secretary of the Army, acting through the Corps of Engineers (Corps), for the discharge of dredged or fill material into waters of the United States, including jurisdictional wetlands. Discharges of fill material include, but are not limited to, the placement of material such as soil, rock, and large woody debris necessary for the construction of structures, roadways, dams/dikes, and stabilization of eroding stream banks.

The Corps is proposing the renewal of Standard Local Operating Procedures for Endangered Species (SLOPES), which would be applicable to activities that require review and verification under commonly utilized Nationwide Permits (NWPs) pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act (see Federal Register Vol. 82, No. 4, dated January 6, 2017). The concept of this SLOPES is modeled after existing SLOPES agreements between the Corps and National Marine Fisheries Service (NMFS) in Oregon, which resulted in a programmatic biological opinion for a limited group of activities that are commonly authorized by the Corps.

The Agencies' intent of establishing SLOPES is to provide more efficient use of government resources required to conduct numerous ESA consultations for minor activities and to document compliance with the ESA for implementing NWPs affecting endangered species. NWPs are typically considered "minor actions" by the Corps due to limitations in size and scope of the projects. Proposed projects exceeding the size and scope limitations of the NWPs would be considered Individual Permits (IPs) and would not be covered under this SLOPES. The implementation of SLOPES also encourages the use of low-impact methods and materials which permit applicants can incorporate into the planning and design of their projects, thus receiving expedited regulatory approval. Ultimately the establishment of SLOPES is expected to further minimize impacts to important aquatic and riparian areas that some listed species depend upon for their continued survival, while making the most efficient use of limited government resources, and streamlining the permit verification process for applicants. The intent of the SLOPES is to cover non-federal land where the Corps is the lead consulting agency. Other federal agencies may follow the conservation measures, and in so doing may benefit from streamlined consultation, but must initiate consultation and obtain their own authorization for incidental take, as appropriate.

2. Consultation History

On May 28, 2013, the Service issued an initial BO for the effects of SLOPES on bull trout and bull trout critical habitat in Norther Idaho Montana and Northeast Washington.

On September 17, 2013, an amended BO which included an analysis of effects for Kootenai River white sturgeon, which was not included in the original BO. It was agreed that the consultation would be valid for 5 years, terminating in 2018, at which time it would be revisited.

In 2017, representatives from the 3 Corps districts and the 2 Service regions began discussions of renewing the SLOPES. It was decided that SLOPES had proven to be very beneficial for both agencies and the public and renewal was in order. With the renewal, a few revisions would be made to address a significant number of variance requests related to a few conditions and excluded actions.

In early 2018, it was obvious that workload issues in both agencies would prohibit the completion of a revised BA and consultation in 2018. On May 21, 2018, the Corps submitted a request for an extension of the existing SLOPES BO including a blanket variance approval for three particular items that have been the subject of numerous variance requests. The Service issued a letter of approval for the extension and the variance approval on May 31, 2018, extending the effective date of the SLOPES BO until May 31, 2019.

On March 6, 2019, the Corps provided a draft BA to the Service for review. The Service provided comments back to the Corps on May 20, 2019. The Service also issued a letter to the Corps on May 24, 2019 extending the existing effective date of the BO to December 31, 2019.

The Corps submitted the final BA to the Service on June 19, 2019.

On January 28, 2020, the Service provided a draft of the BO to the Corps for inter-agency review. The Corps provided minor comments to the Service on January 31, 2020, all comments were incorporated into the final BO.

B. DECRIPTION OF THE PROPOSED ACTION

1. Action Area

The geographic area covered by the SLOPES consultation includes portions the Columbia Headwaters Recovery Unit, and the St. Mary Recovery Unit. The area includes bull trout core areas found within the 8-digit Hydrologic Unit Codes (HUC) of northern Idaho, western Montana, and northeastern Washington listed below. The entire range of Kootenai River white sturgeon is a subset of the geographic region within the Kootenai River. This geographic area is intended to include areas where bull trout and white sturgeon and their critical habitat are present (see Figure 1 and maps in Appendix G).

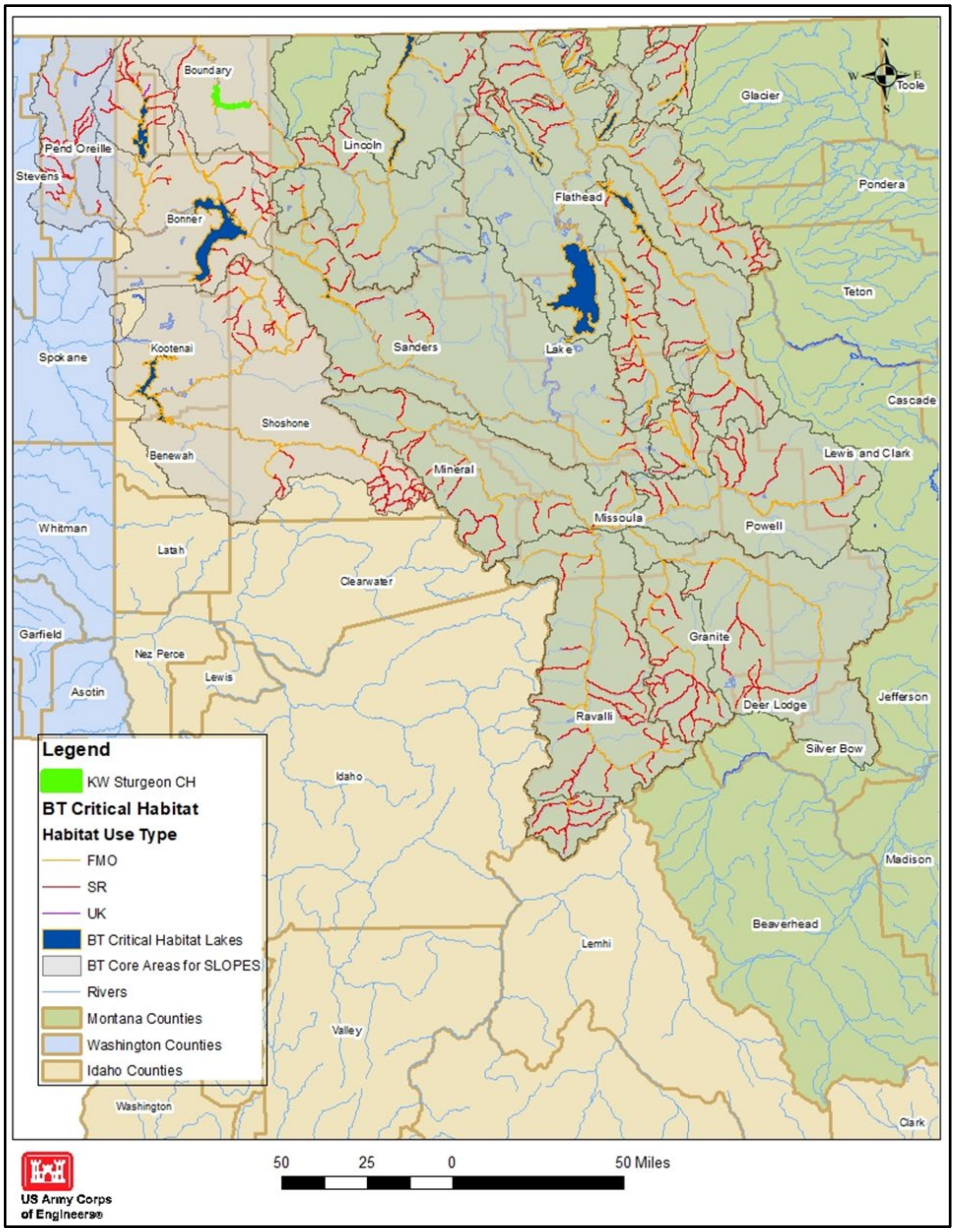

Figure 1.

Geographic coverage of this consultation. Adopted from 2019 BA (USACE 2019).

Idaho

COLUMBIA RIVER BASIN

KOOTENAI SUBBASIN

- 17010104 Lower Kootenai River

LOWER CLARK FORK SUBBASIN

- 17010213 Clark Fork below Flathead River

PEND OREILLE RIVER SUBBASIN

- 17010214 Pend Oreille Lake (some exclusions, including Pend Oreille River)
- 17010215 Priest River (including Priest Lakes)

COEUR D'ALENE RIVER SUBBASIN

- 17010301 Upper Coeur d'Alene
- 17010303 Coeur d'Alene Lake
- 17010304 St. Joe

Montana

COLUMBIA RIVER BASIN

KOOTENAI SUBBASIN

- 17010101 Upper Kootenai River
- 17010102 Fisher River
- 17010104 Lower Kootenai River

FLATHEAD SUBBASIN

- 17010206 North Fork Flathead River
- 17010207 Middle Fork Flathead River
- 17010208 Flathead River to and including Flathead Lake
- 17010209 South Fork Flathead River
- 17010210 Stillwater River
- 17010211 Swan River

LOWER CLARK FORK SUBBASIN

- 17010204 Clark Fork between Blackfoot River and Flathead River
- 17010212 Flathead River below Flathead Lake
- 17010213 Clark Fork below Flathead River

UPPER CLARK FORK SUBBASIN

- 17010201 Clark Fork above Blackfoot River
- 17010202 Flint Creek - Rock Creek
- 17010203 Blackfoot River
- 17010205 Bitterroot River

SASKATCHEWAN RIVER BASIN

SAINT MARY SUBBASIN

- 10010001 Belly River
- 10010002 St. Mary River

Washington

COLUMBIA RIVER BASIN

COLUMBIA RIVER SUBBASIN

- 17010216 Pend Oreille
- 17010214 Pend Oreille Lake (partial)
- 17010303 Coeur d'Alene Lake (partial)

2. Activities Covered by this Consultation

This section describes the categories of actions covered by these SLOPES. These actions correspond to the NWPs in Table 1.

Table 1. *Nationwide Permits covered under this consultation.*

NWP Number – Description	Authority	Walla Walla District	Omaha District	Seattle District
3 – Maintenance	10, 404	RC, 401C	RC, 401C	RC, 401C
12 – Utility Work	10, 404	RC, 401C	RC, 401C	RC, 401C
13 - Bank Stabilization	10, 404	RC, 401C	RC, 401C	RC, 401C
14 – Transportation Work	10, 404	RC, 401C	401C	RC, 401C
18 – Minor Discharges	10, 404	RC, 401C	401C	RC, 401C
19 – Minor Excavation	10, 404	RC, 401C	401C	RC, 401C
27 – Restoration	10, 404	RC, 401C	401C	RC, 401C
33 – Temporary Access/Dewatering	10, 404	RC, 401C	401C	RC, 401C

The NWPs covered by these SLOPES have been grouped into the following three "impact categories":

Impact Category 1 – Disturbance (short-term). This category contains NWPs that consist primarily of short-term disturbance as is typical for maintenance, utility crossings, minor discharges and dredging, and impacts related to temporary construction, access and dewatering.

Impact Category 2 – Disturbance / Habitat Modification (long-term, detrimental). This category includes streambank stabilization and linear transportation projects.

Impact Category 3 – Disturbance / Habitat Modification (long-term, beneficial). This category includes impacts of aquatic habitat restoration, establishment, and enhancement.

Impact Category 1: Disturbance (Short-Term)

NWP 3 (Maintenance)
Maintenance activities under this NWP involve the repair, rehabilitation, or replacement of any previously authorized, currently serviceable, structure or fill provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized modification. Examples of maintenance activities covered by this SLOPES include clearing accumulated organic debris from inlets, outlets, abutments, and piers, removal of sediment or debris inside a culvert or under a bridge, replacement and maintenance of culverts or bridges, or re-burying exposed utility lines. These actions typically involve excavation, grading, and placement of fill material. Small organic debris consists of twigs, leaves, and bushes. Large organic debris includes tree trunks, rootwads, and branches.

NWP 3 does allow minor deviations in the structure's configuration or filled area, including those due to changes in materials, construction techniques, or current construction codes. NWP 3 also allows minor deviations for safety standards that are necessary to make the repair, rehabilitation, or replacement.

NWP 12 (Utility Lines)
Utility line construction or repair could involve excavation, temporary side casting of excavated material, placement of pipeline or cable in a trench, backfilling of the trench, and restoration of the work site to pre-construction contours and vegetation. A utility line is any pipe or pipeline for the transportation of any gaseous, liquid, liquefiable, or slurry substance, for any purpose, and any cable, line, or wire for the transmission for any purpose of electrical energy, telephone and telegraph messages, and radio and television communication. The term “utility line” does not include activities which drain a water of the United States, such as drainage tile; however, it does apply to pipes conveying drainage from one area to another. Infiltration galleries are considered utility lines.

NWPs 18 & 19 (Minor Discharges and Excavation)
This category includes minor discharges and excavations such as small structural fills, minor excavations or dredging necessary for installation of outfall structures and minor repairs of previously authorized structures or fills. The quantity of fill or excavation is limited to 25 cubic yards below the ordinary high water mark.

NWP 33 (Temporary Construction, Access and Dewatering)
This category of activities includes temporary structures, fills, and work that may be associated with other activities that may not necessarily be covered by this SLOPES. For example, a state’s Dept. of Transportation (DOT) may be consulting with USFWS on a large federally funded project. The DOT’s contractor, who will provide the details of the temporary work associated with the highway project, will be given the opportunity to review and incorporate

this SLOPES into their proposal for temporary facilities, with the understanding that if they comply with the approved conservation measures, the DOT will not have to consult with the USFWS on the activities associated with the temporary facilities. The outcome may be that the contractor's proposal is approved faster and work may begin sooner than if the DOT had to consult separately for the temporary work, the details of which are usually not known at the time of consultation on the larger parent project.

Impact Category 2: Disturbance/Habitat Modification (Long-Term Detrimental)

NWP 13 (Streambank and Shoreline Stabilization)
Stabilization activities include the placement of material along or adjacent to streambanks or shorelines for the purpose of increasing resistance to erosion by moving water. Methods may include hardening the bank with vegetation, soil, large wood, rock, or by creating structures to divert stream flow away from the bank or reduce the effects of wave action by utilizing in-water structures such as dikes, groins, buried groins, drop structures, porous weirs, weirs, riprap, rock toes, and similar structures. Streambank stabilization usually includes the placement of fill material below the ordinary high water mark of streams in order to prevent damage to existing adjacent structures caused by the erosive force of flowing water and to protect lake and reservoir shorelines from erosion caused by wind and wave action. It is important to note the difference between stream restoration and bank stabilization projects. Proposed projects should be looked at closely to determine if the intent is to arrest lateral movement of a bank or shoreline to preserve property (stabilization), or to re-establish vegetative and geomorphologic stability in a disturbed environment, such as an overgrazed or burned riparian area (restoration).

This SLOPES encourages the use of bioengineering principles and practices. Bioengineering is defined as the integration of living woody and herbaceous materials along with organic and inorganic materials to increase the strength and structure of soil. Streambank soil bioengineering is defined as the use of living and nonliving plant materials in combination with natural and synthetic support materials for slope stabilization, erosion reduction, and vegetative establishment. The following streambank and shoreline stabilization methods, individually or in combination, are included in this SLOPES: woody plantings; herbaceous cover; deformable soil reinforcement; coir logs, straw bales and straw logs to trap sediment; engineered log jams (use of concrete logs is not proposed); and stream barbs made of wood. The use of quarried stone riprap or barbs would be limited as follows: The elevation of the rock would be limited to the top of the bank. The portion of bank above the rock should be vegetated with native trees, shrubs, grasses and forbs according to an approved revegetation plan submitted concurrently with the application. As described in Conservation Measure 2(e), the design for streambank stabilization must incorporate woody vegetation unless the stream experiences altered hydrology from an impoundment. In lacustrine or lacustrine-like settings, rock may be needed to address issues of wave action, boat wake action and/or erosion effects of ice.

NWP 14 (Linear Transportation Projects)
Linear transportation projects include new highway construction or improvement of an existing highway, road, street or bridge, including widening, repairing, realigning, reconstructing or removing existing roads and bridges, or replacing culverts under roads including temporary fills and access fills. Linear transportation projects may involve excavation, grading, filling, placement of culverts, construction of bridges, and construction of drainage features. Linear transportation projects may also include construction and maintenance of railroad tracks and

supporting fill, bridges, trestles, and culverts.

Impact Category 3: Disturbance/Habitat Modification (Long-Term Beneficial)

NWP 27 (Aquatic Habitat Restoration, Establishment and Enhancement Activities)
This category may include road decommissioning; actions to set-back or remove water control structures (e.g., small dams (<10' head difference), levees, dikes, berms, weirs); remove trash and other artificial debris dams that block fish passage; provide stormwater management that restores natural or normative hydrology; remove sediment bars or terraces that block fish passage within 50 feet of a tributary mouth; place large wood within the channel or riparian area; installation of stream flow and current deflectors; enhancement, restoration or creation of riffle and pool stream structure; placement of in-stream habitat structures; modifications of the stream bed and/or banks to restore or create stream meanders; reshaping of streambanks to reconnect with adjacent floodplain; installation of streambank vegetation; backfilling of artificial channels and drainage ditches; removal of existing drainage structures; construction of small nesting islands; construction of open water areas; activities needed to reestablish vegetation; and other activities described in Nationwide Permit 27.

3. Proposed Conservation Measures

The SLOPES being considered in this consultation include a variety of conservation measures meant to reduce the impacts of individual projects on aquatic resources (USACE 2019). These conservation measures must be incorporated into individual projects involving specified activities to be covered under this programmatic consultation. Consultation for projects that incorporate the specified conservation measures and meet all other requirements for the NWPs will be covered by this programmatic consultation. The proposed conservation measures are:

1. Nationwide Permit Conditions

a. Permit Specific Conditions - All actions covered under this SLOPES shall comply with all applicable Nationwide Permit specific conditions and limitations.

b. General Conditions – All actions covered under this SLOPES shall comply with all applicable Nationwide Permit General Conditions.

c. Regional Conditions – All actions covered under this SLOPES shall comply with all Regional Conditions applicable to the state where the action will occur and the NWP being used to authorize the project.

2. Project Design

a. All stream crossings (new and replacement of existing structures) will be designed to allow unimpeded natural stream flow and movement of existing streambed material.

b. Utility stream crossings shall be perpendicular to the watercourse, or nearly so, and designed in the following priority: (1) directional drilling, boring and jacking; and (2) dry trenching or plowing.

c. If trenching or plowing are used, all work shall be completed in the dry and backfilled with native material and any large wood displaced by trenching or plowing will be returned to its original position wherever feasible.

d. All construction impacts must be confined to the minimum area necessary to complete the project and boundaries of clearing limits associated with site access and construction will be clearly marked to avoid or minimize disturbance of riparian vegetation, wetlands and other sensitive sites.

e. The design of any proposed stream bank stabilization must incorporate woody vegetation unless the stream experiences altered hydrology from an impoundment.

f. Maximum barb length will not exceed 1/4 of the bankfull channel width.

g. Riprap/rock material must be keyed into the toe of the bank.

h. Existing channel form and dimension must be maintained to the maximum extent possible.

i. Rock riprap shall be individually placed without end dumping.

j. If the bank stabilization structure has been destroyed or damaged beyond repair, replacement of the structure shall utilize bioengineering principals and methods, and will incorporate native vegetation.

k. Bank stabilization activities shall not exceed the limits of Nationwide Permit 13 unless a variance is approved.

l. Placement of riprap/rock for any structure shall not exceed top of bank elevation.

m. Any proposals to add spawning gravel must first be reviewed and approved by the local state fisheries biologist. Spawning gravel must be inspected by either a state fisheries biologist or a qualified fisheries biologist familiar with the site's characteristics and requirements.

n. Any intake structure (pump or raw water intake), shall meet the most recent NOAA screening criteria. https://www.westcoast.fisheries.noaa.gov/publications/hydropower/southwest_region_1997_fish_screen_design_criteria.pdf

o. Clean natural angular rock or stone may be used to anchor or stabilize large wood, fill scour holes, prevent scouring or undercutting of an existing structure, or to construct a barb, weir or other properly designed and approved in-water structure.

3. In-water Work Timing

a. The Corps will check with appropriate sources to determine whether or not listed fish are present or likely to be present during any proposed in-water work. The following work timeframes will be adhered to minimize adverse impacts to listed fish:

i. Bull trout: In rivers and streams, foraging, migrating, and overwintering habitat in-channel disturbance is limited to the period between July 1 and September 30, except for projects incorporating dormant woody vegetation where species presence has been adequately evaluated; Spawning and rearing habitat in-channel disturbance is limited to the period between May 1 and August 31.

ii. In lake or lake influenced settings, such as Lake Pend Oreille or Flathead Lake, work may be conducted in the dry during the lake draw down period.

4. Work Area Isolation

a. All work should be performed in the dry when possible. Any work in rivers (excluding the Pend Oreille River) and streams must be completed by working from the top of the bank or the work areas must be isolated from flowing or open water using cofferdams, silt curtains, sandbags or other approved means to keep suspended sediment from entering flowing or open water, unless not isolating the area and working in the channel would result in less habitat disturbance.

5. Erosion Control Measures

a. Minimize Site Preparation Impacts

i. Site clearing, staging areas, access routes, and stockpile areas shall be in a manner that minimizes overall disturbance, minimizes disturbance to riparian vegetation, and that precludes erosion into stream channels.

ii. Sediment barriers will be placed around potentially disturbed sites to prevent sediment from entering a stream directly or indirectly, including by way of roads and ditches.

iii. A supply of erosion control materials (e.g. silt fence and straw bales) will be kept on hand to respond to sediment emergencies. Sterile straw or certified "weed free" straw will be used to prevent introduction of noxious weeds.

b. Minimize Earthmoving-Related Erosion

i. Work will be confined to the minimum area necessary to complete the project.

ii. Project operations must cease under high flow conditions that may result in inundation of the project area, except for efforts to avoid or minimize resource damage.

6. Pollution and Invasive Species Control Measures

   a. Equipment Use

      i. All equipment fueling, maintenance, and staging areas will be located in non-wetland areas landward of the ordinary high water mark of the waterbody unless no other option is available. When no option is available, these activities shall occur at the greatest distance possible perpendicular from any water body to adequately avoid and minimize potential impacts.

      ii. All equipment used for in-channel work will be cleaned of external oil, grease, dirt, mud, plant material or other debris, which may harbor invasive plants or animals; and leaks repaired; prior to arriving at the project site. All equipment will be inspected before unloading at site. Any leaks or accumulations of grease will be corrected before entering streams or areas that drain directly into streams or wetlands.

   b. General

      i. All projects must comply with the conditions of the applicable state, EPA, or tribal 401 Water Quality Certification for the appropriate NWP.

      ii. Structural fills with materials such as concrete shall be placed into tightly sealed forms or cells that do not contact the waterway until fully cured.

      iii. Road crossing and bridge structures shall be designed to direct surface drainage into areas or features to prevent erosion of soil and entry of other pollutants directly into waterways or wetlands (such as biofiltration swales or other treatment facilities).

7. Site Restoration

   a. For projects in Washington and Idaho, site revegetation must comply with the applicable Regional Conditions.

   b. For projects in Montana, site revegetation must comply with the following conditions.

      i. All areas of vegetation disturbance or removal will be revegetated with native species appropriate for the project location. A revegetation plan must be submitted with the application specifying species, planting or seeding rates and maintenance measures to ensure 80% cover (ground or canopy) after three years.

      ii. Within the first planting season post-construction, the stabilized bank shall be revegetated with native species.

4. Excluded Activities

Below is a list of activities that are excluded from these SLOPES. These types of activities are not covered in this programmatic consultation, and would undergo project-specific review.

- Oil and gas exploration or production, construction or upgrading of a gas, sewer or water line to support a new or expanded service area, and foundations for transmission towers.
- Outfalls and intakes where none previously existed.
- Unscreened intakes.
- Any in-stream structure that could become a barrier to fish movement during low flows.
- Temporary bypass channels in excess of 300 linear feet
- Dewatering that places a stream into a pipe more than 300 feet long or for more than 30 days.
- New sea walls, retaining walls or bulkheads, where none previously existed.
- Any streambank stabilization project utilizing concrete.
- Stream or wetland impacts for new road construction within 300 feet of occupied bull trout or Kootenai River white sturgeon streams.
- Bridge abutments below ordinary high water of occupied streams where none previously existed.
- A replacement bridge constructed adjacent to an existing bridge without full removal of the existing bridge, support structures and approach fill.
- Pond construction or expansion in streams or jurisdictional wetlands.
- Large dam removal projects (>10' head difference).
- Projects that involve relocating more than 300 feet of channel (cumulative total for the entire project).
- Use of concrete logs, cable (wire rope) or chains to permanently anchor any structure.

5. Timeframe

The consultation is intended to cover the specified Corps activities during the five year period following the effective date in 2020 through 2025. The SLOPES may be revisited during this period, if new information becomes available that warrants re-initiation of consultation. Annual meetings will occur to discuss the permits authorized under this SLOPES consultation, the quantity and type of resources that were impacted, and the effectiveness of conservation measures incorporated to minimize impacts.

C. STATUS OF THE SPECIES

1. Bull Trout

The bull trout was listed as a threatened species in the coterminous United States in 1999 (64 FR 58910-58933; USFWS 1999). Throughout its range, bull trout are threatened by the combined effects of habitat degradation, fragmentation, and alterations associated with dewatering, road construction and maintenance, mining, grazing, the blockage of migratory corridors by dams or other diversion structures, poor water quality, incidental angler harvest, entrainment, and introduced non-native species. Since the listing of bull trout, there has been very little change in the general distribution of bull trout in the coterminous United States, and we are not aware that any known, occupied bull trout core areas have been extirpated (USFWS 2015).

The 2015 recovery plan for bull trout identifies six proposed recovery units within the listed range of the species (USFWS 2015). Each of the recovery units are further organized into multiple bull trout core areas, which are mapped as non-overlapping watershed-based polygons, and each core area includes one or more local populations. Within the coterminous United States, we currently recognize 109 occupied core areas, which comprise 600 or more local populations of bull trout (USFWS 2015). Core areas are functionally similar to bull trout metapopulations, in that bull trout within a core area are much more likely to interact, both spatially and temporally, than are bull trout from separate core areas.

The Service has also identified a number of marine or mainstem riverine habitat areas outside of bull trout core areas that provide foraging, migration, and overwintering (FMO) habitat that may be shared by bull trout originating from multiple core areas. These shared FMO areas support the viability of bull trout populations by contributing to successful overwintering survival and dispersal among core areas (USFWS 2015).

For a detailed account of bull trout biology, life history, threats, demography, and conservation needs, refer to Appendix A: Status of the Species - Bull Trout.

2. Kootenai River White Sturgeon

In the United States, Kootenai sturgeon were listed as endangered on September 6, 1994 (59 FR 45989). At the time of ESA listing, threats to the species were decline in the adult population and the almost complete lack of natural recruitment; loss of suitable spawning and rearing habitat as a result of Libby Dam operations; reduced biological productivity in the basin; and contaminants leading to poor water quality. In 1999, the Service finalized the Recovery Plan for the Kootenai River Distinct Population Statement of the White Sturgeon (USFWS 1999). The 1999 recovery plan was recently revised and finalized in September, 2019 (USFWS 2019).

For a detailed account of Kootenai sturgeon biology, life history, threats, demography, and conservation needs, refer to Appendix C: Status of the Species and Critical Habitat – Kootenai River white sturgeon.

D. STATUS OF CRITICAL HABITAT

1. Bull Trout Critical Habitat

On October 18, 2010, the Service issued a final revised critical habitat designation for the bull trout (75 FR 63898; USFWS 2010). The critical habitat designation includes 32 critical habitat units in six recovery units located throughout the coterminous range of the bull trout in Washington, Oregon, Idaho, Montana, and Nevada. Designated bull trout critical habitat is of two primary use types: 1) spawning and rearing, and 2) FMO habitat. The conservation role of bull trout critical habitat is to support viable core area populations (75 FR 63943; USFWS 2010). Critical habitat units generally encompass one or more core areas and may include FMO areas, outside of core areas, that are important to the survival and recovery of bull trout.

The final rule excludes some critical habitat segments. 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 the Act, in which bull trout is a covered species on or before the publication of this final rule; 2) waters within or adjacent to Tribal lands subject to certain commitments to conserve bull trout or a conservation program that provides aquatic resource protection and restoration through collaborative efforts, and where the Tribes indicated that inclusion would impair their relationship with the Service; or, 3) waters where impacts to national security have been identified (75 FR 63898; USFWS 2010).

Bull trout have more specific habitat requirements than most other salmonids (USFWS 2010). The predominant habitat components influencing their distribution and abundance include water temperature, cover, channel form and stability, spawning and rearing substrate conditions, and migratory corridors. The PCEs of bull trout critical habitat, as revised in 2010, are (USFWS 2010):

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 departure from a natural hydrograph.

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

9. Sufficiently low levels of occurrence of non-native predatory (e.g., lake trout, 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.

For a detailed account of the status of designated bull trout critical habitat, refer to Appendix B: Status of Critical Habitat - Bull Trout.

2. Kootenai River White Sturgeon Critical Habitat

Critical habitat for Kootenai sturgeon was designated on September 6, 2001 (USFWS 2001; 66 FR 46548). An interim rule designating additional critical habitat was published on February 8, 2006 (USFWS 2006b; 71 FR 6383), and a final rule published on July 9, 2008 (USFWS 2008a; 73 FR 39505).

Four PCEs are defined for Kootenai sturgeon critical habitat (73 FR 39506). These PCEs are specifically focused on adult migration, spawning site selection, and survival of embryos and free-embryos, the latter two of which are the life stages now identified as limiting the reproduction and numbers of the Kootenai sturgeon. The PCEs are defined as follows:

1. A flow regime, during the spawning season of May through June, that approximates natural variable conditions and is capable of producing depths of 23 feet (ft) (7 meters (m)) or greater when natural conditions (for example, weather patterns, water year) allow. The depths must occur at multiple sites throughout, but not uniformly within, the Kootenai River designated critical habitat.

2. A flow regime, during the spawning season of May through June, that approximates natural variable conditions and is capable of producing mean water column velocities of 3.3 feet/second (ft/s) (1.0 meters/second) or greater when natural conditions (for example, weather patterns, water year) allow. The velocities must occur at multiple sites throughout, but not uniformly within, the Kootenai River

designated critical habitat.

3. During the spawning season of May through June, water temperatures between 47.3 and 53.6 °F (8.5 and 12 °C), with no more than a 3.6 °F (2.1 °C) fluctuation in temperature within a 24-hour period, as measured at Bonners Ferry.

4. Submerged rocky substrates in approximately 5 continuous river miles (8 river kilometers) to provide for natural free embryo redistribution behavior and downstream movement.

5. A flow regime that limits sediment deposition and maintains appropriate rocky substrate and inter-gravel spaces for sturgeon egg adhesion, incubation, escape cover, and free embryo development. Note: the flow regime described above under PCEs 1 and 2 should be sufficient to achieve these conditions.

For a detailed account of the status of designated bull trout critical habitat, refer to Appendix C: Status of the Species and Critical Habitat – Kootenai River White Sturgeon.

E. ANALYTICAL FRAMEWORK FOR JEOPARDY AND ADVERSE MODIFICATION ANALYSES

1. Jeopardy Analysis – Bull Trout

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 range-wide 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; and (4) Cumulative Effects, which evaluates the effects on bull trout of future non-federal activities reasonably certain to occur in the action area. 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 (RU) for the bull trout were defined in the final Recovery Plan for the Coterminous United States Population of [the] Bull Trout (USFWS 2015). 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 (70 C.F.R. 56258).

The action area for this BO is non-federally owned lands within core areas in the Clark Fork, Flathead, Kootenai and Coeur d'Alene major geographic regions of the Columbia Headwaters Recovery Unit, and the St. Mary Recovery Unit (see Figure 1 and Appendix G). The analysis of effects at the level of local population is not considered in detail because projects are initiated at the sole discretion of non-federal applicants, rather than being directed by the Corps, and site-specific locations and types of projects are not predictable. Such effects can only be generally predicted, based on federal vs. non-federal ownership of the watersheds that support local populations. This biological opinion addresses only the impacts to the federally listed bull trout and their designated critical habitat within the action area. It does not address the overall environmental acceptability of the proposed action.

The bull trout recovery plan considers a hierarchical order of demographic units ranging from local populations to the range of bull trout within the coterminous United States. This stepdown organization is important for implementing recovery, tracking consultation under section 7 of the Endangered Species Act, identifying and protecting critical habitat, and other aspects of planning and coordination. Core areas represent the closest approximation of a biologically functioning unit for bull trout, containing habitat that could supply all elements for the long-term security of bull trout and one or more local bull trout populations (USFWS 2015). Local populations are considered the smallest group of fish that are known to represent an interacting reproductive unit.

The proposed project will affect bull trout in local populations within the Columbia Headwaters and Saint Mary Recovery Units (USFWS 2015b, 2015c). Table 2 shows the hierarchical units for bull trout in the action area.

Table 2. *Hierarchy of analysis for bull trout.*

Name	**Hierarchical Relationship**
Coterminous United States	Range of the species within the coterminous United States (i.e., the listed ESA entity)
Columbia Headwaters Recovery Unit	One of 6 recovery units in the coterminous United States
Lower Clark Fork, Upper Clark Fork, Flathead, Kootenai, and Coeur d'Alene Geographic Regions	5 geographic regions within the Columbia Headwaters Recovery Unit
Core Areas: Akokala Lake, Big Salmon Lake, Bitterroot River, Blackfoot River, Bowman Lake, Bull Lake, Clearwater River & Lakes, Coeur d'Alene Lake, Cyclone Lake, Doctor Lake, Flathead Lake, Frozen Lake, Harrison Lake, Holland Lake, Hungry Horse Reservoir, Isabel Lakes, Kootenai River, Lake Koocanusa, Lake Pend Oreille, Lincoln Lake, Lindbergh Lake, Logging Lake, Lower Quartz Lake, Middle Clark Fork River, Priest Lake, Quartz Lake, Rock Creek, Swan Lake, Trout/Arrow Lakes, Upper Clark Fork River, Upper Kintla Lake, Upper Stillwater Lake, Upper Whitefish Lake, West Fork Bitterroot River, Whitefish Lake.	35 core areas within the five geographic regions.
163 bull trout local populations (see USFWS 2015b).	163 local populations within the 35 core areas.
Saint Mary Recovery Unit	One of 6 recovery units in the coterminous United States
Saint Mary River, Slide Lakes, Cracker Lake and Red Eagle Lake core areas.	Four core areas within the Saint Mary Recovery Unit
Divide Creek, Boulder Creek, Kennedy Creek, Otatso Creek, Lee Creek, Slide Lake, Cracker Lake, Red Eagle Lake.	Eight local populations within the four core areas.

2. Jeopardy Analysis – Kootenai River White Sturgeon

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 Kootenai sturgeon range-wide conditions, the factors responsible for those conditions, and their survival and recovery needs; (2) the Environmental Baseline, which evaluates the conditions of the Kootenai sturgeon in the action area, the factors responsible for those conditions, and the relationship of the action area to the survival and recovery of the Kootenai sturgeon; (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 Kootenai sturgeon; and (4) Cumulative Effects, which evaluates the effects of future, non-Federal activities in the action area on the Kootenai sturgeon.

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 Kootenai sturgeon current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the Kootenai sturgeon in the wild.

3. Adverse Modification Analysis – Bull Trout Critical Habitat

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.

4. Adverse Modification Analysis – Kootenai River White Sturgeon Critical Habitat

In accordance with policy and regulation, the adverse modification analysis for Kootenai sturgeon in this BO relies on four components:

1. The Status of Critical Habitat, which evaluates the rangewide condition of designated critical habitat for Kootenai sturgeon 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 that will influence the

recovery role of affected critical habitat units.

4. Cumulative Effects, which evaluates the effects of future, non-Federal activities in the action area on the PCEs and how that will influence the recovery role of affected critical habitat units.

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

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

F. ANALYSIS OF BULL TROUT AND CRITICAL HABITAT LIKELY TO BE AFFECTED

1. Core Areas Not Likely and Likely to be Affected

The intended target of this SLOPES consultation is projects on private or non-federally owned land undertaken by private landowners, non-profit groups, or entities of state and local governments where no other federal nexus is present (USACE 2019). While other federal agencies may choose to follow the conservation measures specified in SLOPES and are encouraged to do so, such action agencies retain the responsibility to initiate consultation with the Service under section 7 of the ESA for their projects.

A geospatial analysis of federal vs. non-federal land ownership within each core area was completed for all core areas within the geographic scope of the consultation (see Figure 1; see also USACE 2019). Within the five geographic regions of the Columbia Headwaters Recovery Unit, all of the core areas in the Lower Clark Fork, Upper Clark Fork, Kootenai and Coeur d'Alene geographic regions contain significant portions of non-federal land. In the Flathead geographic region, 18 of 22 core areas are 98 to 100 percent federal land (i.e., Glacier National Park, Flathead National Forest; Table 3; see also USACE 2019). In the St. Mary Recovery Unit, three of four core areas are almost entirely federal land (Table 3; see also USACE 2019). The Corps had zero non-federal applications for NWPs during the period analyzed and expects no such applications during the timeframe covered by this consultation (USACE 2019). Therefore, we conclude that these core areas with over 98 percent federal land will not be affected under this consultation. They will not be discussed further, and no incidental take will be authorized.

The remaining core areas have been stratified by the expected level of impact from implementation of the SLOPES protocol by non-federal applicants, based on the level of activity observed during the period analyzed (2012-2017) and the percentage of non-federal ownership. A detailed account of the methodology used to determine the expected level of activity can be found in section 7.0 of the BA (USACE 2019). Expected permit activity is based on past permit activity, as it is primarily a function of the degree of private land development and population in the area. Information from local Corps project managers was also incorporated in projecting the expected future level of permit activity (USACE 2019).

For these affected core areas the percentage of non-federal ownership, 2012-2017 permit activity, and the expected aggregate impact of SLOPES is displayed in Table 4. Core areas with less than 25% non-federal land are categorized as "Minimal", core areas with 25-50% non-federal lands are categorized as "Low", core areas with 50-75% non-federal land are categorized as "Moderate", and core areas with greater than 75% non-federal lands are categorized as "High". Core areas with fewer than five expected permits are classified as "minimal" impact, those with 5 to 25 as "low," those with 26 to 50 as "moderate," those with 51 to 100 as "high," and those with over 100 as "very high." For core areas that extend into Washington, only the Idaho portion was included in the analyses of land ownership and permit activity. This initial analysis assesses only the degree of impact based on the level of permit activity. Further analysis will examine patterns of permit activity within the three impact categories, focusing most strongly on those core areas with moderate to very high levels of expected permit activity (Table 4).

Table 3. *Core Areas within the action area NOT covered by this consultation.*

Core Area	Geographic Region	Recovery Unit	Federal Ownership
Akokala Lake	Flathead	Columbia Headwaters	100%;Glacier National Park
Big Salmon Lake	Flathead	Columbia Headwaters	100%, US Forest Service
Bowman Lake	Flathead	Columbia Headwaters	100%, Glacier National Park
Cyclone Lake	Flathead	Columbia Headwaters	100%, US Forest Service
Doctor Lake	Flathead	Columbia Headwaters	100%, US Forest Service
Frozen Lake	Flathead	Columbia Headwaters	100%, US Forest Service
Harrison Lake	Flathead	Columbia Headwaters	100%, Glacier National Park
Holland Lake	Flathead	Columbia Headwaters	>95%, US Forest Service
Hungry Horse Reservoir	Flathead	Columbia Headwaters	100%, US Forest Service
Isabel Lakes	Flathead	Columbia Headwaters	100%, Glacier National Park
Lake McDonald	Flathead	Columbia Headwaters	100%, Glacier National Park
Lincoln Lake	Flathead	Columbia Headwaters	>95% US Forest Service
Logging Lake	Flathead	Columbia Headwaters	100%, Glacier National Park
Lower Quartz Lake	Flathead	Columbia Headwaters	100%, Glacier National Park
Cerulean/Quartz/Mid Quartz Lake	Flathead	Columbia Headwaters	100%, Glacier National Park
Trout and Arrow Lakes	Flathead	Columbia Headwaters	100%, Glacier National Park
Upper Kintla Lake	Flathead	Columbia Headwaters	100%, Glacier National Park
Upper Stillwater	Flathead	Columbia Headwaters	>95% US Forest Service
Cracker Lake		St. Mary	>98%, Glacier National Park
Red Eagle Lake		St. Mary	100%, Glacier National Park
Slide Lakes		St. Mary	100%, Glacier National Park

Table 4. Bull Trout Core Areas Likely to be affected by SLOPES projects.

Core Area	Geographic Region	Recovery Unit	Non-Federal Ownership	2012-17 Non-Federal NWPs	Anticipated SLOPES Activity
Upper Clark Fork River	Upper Clark Fork River	Columbia Headwaters	Moderate	76	Moderate
Rock Creek	Upper Clark Fork River	Columbia Headwaters	Minimal	2	Low
Blackfoot River	Upper Clark Fork River	Columbia Headwaters	Moderate	15	Low
Clearwater River and Lakes	Upper Clark Fork River	Columbia Headwaters	Minimal	2	Low
West Fork Bitterroot River	Upper Clark Fork River	Columbia Headwaters	Low	2	Low
Bitterroot River	Upper Clark Fork River	Columbia Headwaters	Minimal	53	Moderate
Middle Clark Fork River	Upper Clark Fork River	Columbia Headwaters	Minimal	37	Minimal
Lake Pend Oreille	Lower Clark Fork River	Columbia Headwaters	Moderate	215	Very High
Priest Lakes	Lower Clark Fork River	Columbia Headwaters	Moderate	7	Low
Flathead Lake	Flathead	Columbia Headwaters	Minimal	73	Moderate
Whitefish Lake	Flathead	Columbia Headwaters	High	5	Minimal
Swan Lake	Flathead	Columbia Headwaters	Minimal	10	Low
Lindbergh Lake	Flathead	Columbia Headwaters	Low	1	Low
Lake Koocanusa	Kootenai	Columbia Headwaters	Minimal	2	Low
Kootenai River	Kootenai	Columbia Headwaters	Minimal	29	Minimal
Bull Lake	Kootenai	Columbia Headwaters	Low	1	Low
Coeur d'Alene Lake	Coeur d'Alene	Columbia Headwaters	Minimal	101	High
St. Mary River	N/A	St. Mary	Moderate	0	Low

2. Bull Trout Critical Habitat Not Likely and Likely to be Affected

Critical habitat on non-federal land in the Clark Fork, Coeur d'Alene, and Kootenai River Basins Critical Habitat Units (CHUs) will be affected by the SLOPES protocol (see Appendix G). The Clark Fork CHU (CHU 31) is comprised of 12 Critical Habitat Subunits (CHSUs), and includes 3,328.1 miles of stream and 295,586.6 acres of lakes and/or reservoirs. The Coeur d'Alene River Basin CHU is not split into CHSUs, and includes 510.5 miles of streams and 31,152.1 acres of lake surface. The Kootenai River Basin CHU is comprised of two CHSUs, and includes 324.7 miles of streams and 29,873 acres of lake and/or reservoir.

In the St. Mary River Basin CHU, critical habitat was designated only within Glacier National Park, and no critical habitat was designated on the Blackfeet Indian Reservation in the Final Rule Designating Critical Habitat for Bull Trout (75 FR 63898). Therefore, critical habitat in the St. Mary River Basin will not be affected by this SLOPES protocol and will not be further discussed in the biological opinion.

G. ENVIRONMENTAL BASELINE

This section assesses the effects of past and ongoing human and natural factors that have led to the current status of the species, its habitat and ecosystem in the action area. Environmental baseline is defined as "…the past and present impacts of all Federal, State, or private actions and other human activities in an action area, the anticipated impacts of all proposed Federal projects in an action area that have already undergone formal or early Section 7 consultation, and the impact of State or private actions that are contemporaneous with the consultation in process." (50 CFR 402.02).

1. Status of Bull Trout in the Action Area

The geographic area for the SLOPES protocol spans western Montana, northern Idaho, and northeastern Washington. Major river basins include the Clark Fork, Pend Oreille, Flathead, Kootenai, and Coeur d'Alene west of the continental divide; east of the divide it includes the St. Mary basin. Within this geographic area, significant portions are not within the action area, as federal land is not part of the action. Eighteen core areas have some land within the action area, which includes private, state, tribal, and local government ownerships. These core areas, along with the percentage of non-federal land and expected project activity and aggregate impacts, are displayed in Table 4 above.

The status of bull trout populations within affected core areas varies widely, and resident, adfluvial, and fluvial migratory populations can all be found within the action area. We do not have reliable abundance data for all these basins, but we can characterize them in a qualitative way based on number of local populations and some incomplete abundance information. For the purposes of this document, strong populations are those that are well distributed and relatively abundant within the capability of the watersheds in which they exist. Basins known to have the strongest populations of bull trout include Lake Pend Oreille and Lake Koocanusa. Moderate populations, relative to core area size and habitat potential are present in Blackfoot River, Clearwater Lakes and River, Flathead Lake and Swan Lake. Other core areas hold weak populations, for a variety of reasons. Some are core areas isolated with artificial barriers (e.g., Clark Fork River core areas); some have naturally limiting habitat (e.g. Lee Creek), while others have habitat degraded by factors such as streambank armoring, predation or competition from introduced species, or water diversions (e.g., Rock Creek and Bitterroot River).

The action area includes the range of bull trout within non-federal lands in the Columbia Headwaters and St. Mary Recovery Units. The species listing, the current condition of the species in these two recovery units, and the factors responsible for the condition of the species in the action area are described in the Status of the Species - Appendix A.

2. Status of Bull Trout Critical Habitat in the Action Area

Bull trout critical habitat for the action area is displayed by core area in maps in Appendix G. Foraging-migrating-overwintering comprises the vast majority of bull trout habitat, including designated critical habitat, within the action area. Most of the FMO habitat in affected core areas occurs on non-federal land, with the exception of Flathead Lake core area. In contrast, most spawning and rearing habitat occurs on federal land, with spawning in the mid to upper elevations (USFS 2013). In general, the status of bull trout critical habitat varies with the degree of human use and development. Areas with high levels of urbanization, residential development, or extensive irrigated agriculture have generally poorer quality habitat than those areas that are relatively undeveloped. Where urban, residential, and agricultural development are lacking, road networks associated with forest management constitute the primary impact to critical habitat.

The action area includes designated bull trout critical habitat on non-federal lands in the Columbia Headwaters and St. Mary Recovery Units. The species listing, the current condition of the species in these two recovery units, and the factors responsible for the condition of the species in the action area are described in the Status of Critical Habitat - Appendix B.

3. Status of Kootenai River White Sturgeon in the Action Area

The geographic area for the SLOPES protocol includes the range of Kootenai River white sturgeon within non-federal lands throughout the range of the species in the United States. The species listing, the current condition of the species, and the factors responsible for the condition of the species in the action area are described in the Status of the Species – Appendix C.

4. Status of Kootenai River White Sturgeon Critical Habitat in the Action Area

The action area includes all designated Kootenai River white sturgeon critical habitat on non-federal lands in the United States. The species listing, the current condition of the species in these two recovery units, and the factors responsible for the condition of the species in the action area are described in the Status of Critical Habitat – Appendix C.

H. EFFECTS OF THE ACTION ON BULL TROUT AND CRITICAL HABITAT

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 C.F.R. § 402.01, as revised by 84 FR 44976).

1. Factors to be Considered for Bull Trout and Critical Habitat

Projects authorized under a Corps permit by definition have impacts below the ordinary high water mark (OHW) within the active channel of a stream or the regularly inundated/saturated area of lake/wetland. As detailed in the description of the proposed action, all the activities authorized under the proposed SLOPES protocol may entail a short term disturbance associated with construction that may affect any bull trout present in the area at the time. Some activities entail only a short term disturbance with little lasting habitat modification (Impact Category 1), others entail short term disturbance and habitat modification, either primarily detrimental (Impact Category 2) or primarily beneficial (Impact Category 3). The SLOPES protocol incorporates required conservation measures to minimize the effects of such activity, but cannot completely eliminate these effects.

We do not expect that every project carried out under SLOPES will have adverse effects to bull trout. Even for projects in occupied habitats there will be a range of effects depending on the size of the stream, the geology of the basin, soil types, condition of the riparian area, the type of project, the nature of bull trout use at the project site, the ability of fish to escape to unaffected areas, the type of habitat provided at the site, and other factors. In some cases the effects to bull trout will be insignificant because of their limited extent or discountable when fish are unlikely to be present or absent. In other circumstances, such as a project going in occupied spawning and rearing habitat, the temporary (occurring during project implementation) effects are likely to be adverse. The programmatic nature of this consultation limits our ability to consider the site specific factors.

Given the programmatic framework for this consultation, the short term and long term effects that may accompany implementation of a single permit must be aggregated to consider the effects of the expected project activity to a given core area population over the five-year time frame. The nature of the short term and long term effects to the species and habitat will be discussed first, followed by an analysis of effects expected in a given core area over the five-year time frame.

Sediment

A temporary increase in suspended sediment and turbidity is the most significant potential effect of construction activities below OHW. Habitat indicators affected will include sediment and substrate embeddedness.

Increases in suspended sediment can affect salmonids in several ways. Sublethal behavioral effects of suspended sediment on salmonids include habitat avoidance and subsequent effects on fish distribution (Servizi and Martens 1991), reduced feeding and repressed growth rates (Newcombe and MacDonald 1991), respiratory impairment (Servizi and Martens 1991), reduced tolerance to disease and toxicants (Goldes et al. 1988), and physiological stress (Servizi and Martens 1991). Harvey and Lisle (1998) reported that slight elevations in suspended sediment may reduce feeding efficiency and growth rates of some salmonids and high concentrations of suspended sediment can affect survival, growth, and behavior of stream biota. At high concentrations, fish may cease feeding completely (Sigler et al. 1984) or may avoid high concentrations of suspended sediments altogether (Hicks et al. 1991). Even temporary spikes of suspended sediment may negatively affect salmonid behavior and may be lethal (Hicks et al. 1991). In addition, social behavior may be altered by suspended sediment (Berg and Northcote 1985). Suspended sediment may alter food supply by decreasing abundance and availability of aquatic insects; however, the precise thresholds of fine sediment in suspension or in deposits that result in harmful effects to benthic invertebrates are difficult to characterize (Chapman and McLeod 1987).

High levels of deposited sediments in spawning gravels (12 to 20 percent, typically) can increase mortality of salmonid eggs and alevins by reducing waterflow through spawning gravel, which can suffocate eggs, and by preventing fry from emerging from the gravel. Levels of fine sediment in streambed gravels have been negatively correlated with salmonid embryo survival (Tappel and Bjornn 1983) and the quality of juvenile rearing habitat (Bjornn et al.

1977). Weaver and Fraley (1991) observed an inverse relationship between the percentage of fine sediment in substrates and survival to emergence of bull trout embryos. Entombment was the major mortality factor in these tests. Densities of juvenile bull trout were found to be lower in areas of high sediment levels and cobble embeddedness (MBTSG 1998). Because of their close association with the substrate, juvenile bull trout distribution and rearing capacity are affected by sediment accumulations (Baxter and McPhail 1997). As deposition of fine sediments in salmonid spawning habitat increases, mortality of embryos, alevins, and fry increases (Chamberlain et al. 1991).

Downstream migration by bull trout provides access to more prey, better protection from avian and terrestrial predators, and alleviates potential intraspecific competition or cannibalism in rearing areas (MBTSG 1998). One of the benefits of migration from tributary rearing areas to larger rivers or estuaries is increased growth potential. However, increased sedimentation may result in premature or early migration of the juveniles and adults, avoidance of habitat, and migration of non-migratory, resident bull trout. Migration exposes fish to many new hazards, including passage of sometimes difficult and unpredictable physical barriers, increased vulnerability to predators, exposure to introduced species, exposure to pathogens, and the challenges of new and unfamiliar habitats (MBTSG 1998). High turbidity may delay migration back to spawning sites by interfering with cues necessary for orientation, although turbidity alone does not seem to affect homing. Delays in spawning migration and associated energy expenditure may reduce spawning success and, therefore, population size (Bash et al. 2001). Noggle (1978) reported that extremely high concentrations of suspended sediments can cause fish mortality through gill abrasion. Furthermore, he observed that feeding rates of coho salmon decreased when turbidity levels reached certain thresholds. Turbidity is usually a near- linear function of suspended sediment such that as turbidity increases concentration of suspended sediment increases in proportion (Bash et al. 2001).

Foltz et al (2008) monitored sediment and turbidity during culvert removals, and found that without mitigation sediment yields ranged from 170 to 2.6 kg in the 24 hour period following culvert removal. Mitigation using two straw bales placed in the stream reduced the 24-hour sediment yield to between 3.1 to 0.2 kg. Lacking any mitigation, sediment concentrations exceeded the sublethal stress criterion of 500 mg/l for three hours immediately below the culvert removal site in 4 out of 11 locations, and was never exceeded 810 meters below the site. Peak sediment concentrations without mitigation ranged from 28,400 to 9900 mg/l at the removal site vs. 1300 to 900 mg/l with mitigation. The criterion for decreased feeding in juvenile coho salmon of 25 mg/l for 1 hour was always exceeded at the culvert site and 100 m downstream, irrespective of mitigation (Foltz et al. 2008).

Additional suspended sediment associated with a project is expected to move through the water column, becoming deposited on the substrate in areas of lower velocity, including pools or slack waters. Higher flows within the year following project implementation are expected to remobilize sediments, carrying them further downstream to be deposited. Eventually most sediments mobilized during project implementation will be carried downstream to larger streams, rivers, or water bodies within the watershed. Because high flows that re-mobilize project-related sediments are expected to occur when background sediment levels are naturally elevated, they are expected to have less potential for effects to bull trout. High flow events during the spring following project implementation are expected to flush any deposited sediment from the project area (Bash et al 2001).

The Service anticipates that permit actions may increase substrate embeddedness within 600 feet downstream of project sites in spawning-rearing habitat where juvenile bull trout exist. Any change to substrate embeddedness below project sites is considered a significant temporary disruption in the normal feeding and sheltering behavior of juvenile bull trout, which are typically less mobile than adults. Increased levels of substrate embeddedness are expected to be temporary (less than a year) in nature, as we expect either fall or winter storm events or natural high spring flows to mobilize any sediment that was deposited due to permitted activities within one year of implementation.

<u>Minimization Measures for Sediment</u>
The intensity, severity, and duration of sediment impacts from activities incorporating the SLOPES protocol will be minimized by the following requirements (see Conservation Measures and Exclusions in Section B above and in Appendix E and F):

- All work to be performed in the dry when possible;
- Timing of in-water work constrained;
- Isolation of in-water work by cofferdams, silt curtains, sand bags, and other methods;
- Timing stipulations specific to FMO and SR habitats to reduce bull trout vulnerability and the likelihood of presence (FMO: 7/1 – 9/30; SR 5/1 – 8/31);
- Limited removal of native material only to that which is necessary to maintain the function of the structure;
- Directional drilling or dry trenching for utility stream crossings (wet trenching is not allowed);
- Limit the size of excavations to less than 10 cubic yards and the volume of fill to one cubic yard per linear foot below OHW;
- Individual placement of rock without end dumping;
- Limit the extent of bank stabilization or stream channel relocation to 300 linear feet;
- Incorporate measures to ensure the retention of fine soil particles beneath riprap materials;
- Design culverts and bridges with grade controls to prevent culvert failure and with features to prevent runoff from directly entering the waterway;
- Limit temporary bypass channels to 300 feet;
- Limit dam removals to a 10 foot head difference.

These measures will greatly reduce the amount and duration of sediment increases, and the direct effects on any fish that may be present. Particularly in FMO habitat, they are likely to eliminate lethal effects and may often reduce impacts below the level at which take is reasonably certain to occur. As discussed above, egg, fry, and juvenile life stages are more vulnerable to sediment impacts, so lethal effects are more likely to occur in occupied spawning and rearing habitat. From a programmatic standpoint, we expect that adverse effects are likely to occur within the five-year timeframe. The likelihood of adverse effects from sediment is directly proportional to the level of permit activity within a given core area during the five-year time frame.

Conservation measures and exclusions designed into the SLOPES protocol are intended to prevent the majority of sediment from being delivered to stream habitat and to minimize release of sediment in the water during in-channel work. The requirement for all projects authorized under the SLOPES to adhere to habitat-specific construction timeframes reduces the likelihood of bull trout presence in FMO habitat and reduces vulnerability for young-of-the-year in spawning-rearing habitat. Prolonged exposure to increased suspended sediment levels will not occur and most potential effects to bull trout are expected to be sublethal.

Dewatering

Potential impacts of dewatering include temporary stranding of fish, temporary loss of wetted channel, temporary barriers to movement, temporary loss of areas for feeding, migrating, and cover, and potential entrainment in pumps and diversions. Direct effects would generally result from the introduction of sediment into stream channels, temporary blockage of upstream and/or downstream fish passage, and fish handling and direct disturbances associated with dewatering and construction activities. A requirement for fish salvage prior to dewatering is not included in the SLOPES Conservation Measures.

Minimization Measures for Dewatering
Consultation with a local biologist is required regarding whether listed species are likely to be present during the proposed period of dewatering, and appropriate timeframes will be added as special permit conditions to minimize adverse effects. The requirement for all projects authorized under the SLOPES to adhere to habitat-specific construction timeframes reduces the likelihood of bull trout presence, especially in FMO habitat. Given the limits on the size of projects under SLOPES, we do not anticipate lethal effects to occur in FMO habitat. Dewatering that occurs in occupied spawning-rearing habitat is may result in some mortality.

Chemical Contamination

Bull trout could also be affected through impacts to water quality through chemical contamination. Heavy machinery use in stream channels raises concern for the potential of an accidental spill of fuel, lubricants, hydraulic fluid, and similar contaminants into the riparian zone, or directly into the water where they could adversely affect habitat, injure or kill aquatic food organisms, or directly impact bull trout.

Petroleum-based contaminants such as fuel, oil, and some hydraulic fluids, contain poly-cyclic aromatic hydrocarbons, which can cause chronic sublethal effects to aquatic organisms (Neff 1985). Fuels and petroleum products are moderately to highly toxic to salmonids, depending on concentrations and exposure time. Free oil and emulsions can adhere to gills and interfere with respiration, and heavy concentrations of oil can suffocate fish. Evaporation, sedimentation, microbial degradation, and hydrology act to determine the fate of fuels entering fresh water (Saha and Konar 1986). Ethylene glycol (the primary ingredient in antifreeze) has been shown to result in sublethal effects to rainbow trout at concentrations of 20,400 mg/L (Staples 2001). Brake fluid is also a mixture of glycols and glycol ethers, and has about the same toxicity as antifreeze.

During project implementation, heavy machinery will be used adjacent to the stream channel and within the dewatered stream channel. Therefore, there is the potential to introduce petroleum products into waterways during work activities. The relevant mechanism of effect is the accidental spill of petroleum-based products during fueling and equipment operations. The likelihood of a fuel spill occurring on travel routes is low due to the limited potential for refueling or maintenance of motorized vehicles. Any adverse effect related to a fuel spill is dependent upon the size of the spill, proximity of the spill to action area streams, and success of containment.

Minimization Measures for Chemical Contamination
Project design features are incorporated as part of the SLOPES protocol to prevent toxic materials from entering live water. The majority of work is anticipated to occur outside of flowing water, which limits the potential for chemical contamination. Due to the project's design features, the possibility of petroleum-based products reaching occupied waters is very unlikely. If a spill occurs, amounts will likely be small because they will be related to individual vehicles and not associated with larger fuel transport and related transfer operations. No fueling of equipment is allowed within 100 linear feet of the OHW or wetland boundary. Equipment must have a 5-gallon capacity spill kit on board at all times when working near water, thus making it unlikely that any machinery or equipment fluids will be spilled in volumes or concentrations large enough to harm bull trout in or downstream of the project area. The requirement for all projects authorized under the SLOPES to adhere to habitat-specific construction timeframes reduces the likelihood of bull trout presence in FMO habitat and reduces vulnerability for young-of-the-year in spawning-rearing habitat. In light of these features, we expect the effects to bull trout associated with chemical contamination to be discountable.

Entrainment

Intake structures may be associated with excavation or discharge activities that are usually authorized under NWP 18 (Minor Discharge) or NWP 19 (Excavation). Such activities do not include intake structures for agricultural or forestry operations, which are exempt from the requirements of section 404 (USACE 2019). Intake structures may result in entrainment of bull trout if they are not screened. If a return or bypass channel does not provide egress from the intake, we expect that any fish that become entrained will be killed or effectively removed from the population.

Minimization Measures for Entrainment in Intake Structures
The SLOPES protocol requires that all permitted activities that include an intake structure must be screened to prevent entrainment of fish and other aquatic organisms. Screening must adhere to NOAA standards (NMFS 2008) when the intake structure is located in an occupied stream. Screening of intake structures following the appropriate standards for the most vulnerable life-stage that is likely to be present will prevent entrainment; swimming ability of the fish is the primary consideration, along with type of screen, structure placement, orientation to the flow, hydraulics, screen material, and other factors (NMFS 2008). Nonetheless, some take may still occur because of the potential for impingement of juvenile fish against the screen (Rochester et al. 1984). Such impingement is most likely for juvenile fish in spawning and rearing habitat, depending on flow conditions, but unlikely for subadult and adult bull trout. NWP 18 and 19 both limit projects to no more than 25 cubic yards of fill or excavation below OHW. The SLOPES protocol further excludes any excavation greater than 25 cubic yards total. Given these

size limitations and adult and subadult life stage, we do not expect take associated with intake structures in FMO habitat.

Bank and Channel Modification

Bank Stabilization and Linear Transportation Activities

Within the context of this SLOPES, activities to modify banks of streams and lakes are generally permitted under NWP 13 (bank stabilization) or NWP 14 (linear transportation). Stabilization activities include the placement of material along or adjacent to streambanks or shorelines for the purpose of increasing resistance to erosion by moving water. Methods may include hardening the bank with vegetation, soil, large wood, rock, or by creating structures to divert stream flow away from the bank or reduce the effects of wave action by utilizing in-water structures such as dikes, groins, buried groins, drop structures, porous weirs, weirs, riprap, rock toes, and similar structures. Streambank stabilization usually includes the placement of fill material below the ordinary high water mark of streams in order to prevent damage to existing adjacent structures caused by the erosive force of flowing water. Shoreline stabilization involves placing fill material below the ordinary high water mark in order to protect lake and reservoir shorelines from erosion caused by wind and wave action (USACE 2019). Linear transportation projects may also involve excavation, grading, filling, placement of culverts, construction and maintenance of bridges or trestles, and construction of drainage features. In addition to the direct effects of construction detailed above, activities associated with bank stabilization and linear transportation projects modify habitat by preventing natural channel migration and reducing riparian vegetation. Affected habitat indicators may include large woody debris, pool frequency and quality, large pools, off-channel habitat, refugia, wetted-width/max depth ratio, streambank condition, and floodplain connectivity. Depending on the project, they may also encroach on the stream channel with fill or crossing structures, such as bridge abutments and culverts.

All stabilization measures are intended to prevent or reduce lateral stream migration. Such changes tend to simplify in-channel habitat directly, or through geomorphic changes that precipitate channelization and downcutting, reducing instream heterogeneity in general and pool habitat, in particular (Fischenich 2003, Bowen et al. 2003). Sources for large woody debris in the riparian area are often reduced by bank modification activities. Stream functions most likely to be impacted by stabilization measures include stream evolution processes, riparian succession, sedimentation, habitat, and biological community interaction (Fischenich 2003).

Shallow low-velocity areas such as channel margins and side channels are preferentially used by subadult bull trout for foraging (Muhlfeld et al. 2003). Channel simplification results in decreased availability of shallow, low velocity areas that are important refugia and foraging habitat for young salmonids, particularly during runoff (Bowen et al. 2003). Channel modifications that reduce the frequency and duration of inundation of side channels, or reduce side-channel formation rates, or directly preclude inundation or accessibility of side channels reduce the foraging and escape habitat for juvenile and subadult fish, thus possibly reducing recruitment (Zale and Rider 2003). On the positive side, artificially placed boulders and shoreline irregularities associated with rip rap, barbs and jetties may provide increased complexity that benefits juvenile salmonids in rivers that currently lack heterogeneity (Zale and Rider 2003). Depending on size and placement, riprap provides interstitial spaces and high amount of surface area where aquatic invertebrates flourish, thus adding productivity in rivers where such habitat is lacking (Craig and Zale 2001). Deflection structures tend to create habitats with low water velocities and more heterogeneity of depth, velocity, and streambed than revetted banks (Craig and Zale 2001).

In general, the net impact of bank and channel modification depends on whether the new structure results in more simple or complex habitats. In relatively complex systems, stabilization reduces channel braiding and meandering, thereby reducing habitat diversity, resulting in less diverse and productive fish assemblages (Craig and Zale 2001).

In a lake environment, the effects of shoreline stabilization are not well-studied. Analogous to habitat use in rivers (Muhlfeld et al. 2003) we would expect subadults would be most likely to use shallow, near-shore habitats of lakes for foraging. However, in one study at Lake Pend Oreille (Bellgraph et al. 2012), bull trout were not detected in snorkeling surveys of littoral areas or in the stomach contents of predator fish taken from these areas, even though bull trout are fairly abundant in Lake Pend Oreille. Effects from shoreline stabilization under the SLOPES protocol are therefore expected to be insignificant.

Stream Restoration Activities

Stream restoration activities are generally permitted under NWP 27 and may include road decommissioning; actions to set-back or remove water control structures (e.g., small dams (<10' head difference), levees, dikes, berms, weirs); remove trash and other artificial debris dams that block fish passage; provide stormwater management that restores natural or normative hydrology; remove sediment bars or terraces that block fish passage within 50 feet of a tributary mouth; place large wood within the channel or riparian area; installation of stream flow and current deflectors; enhancement, restoration or creation of riffle and pool stream structure; placement of instream habitat structures; modifications of the stream bed and/or banks to restore or create stream meanders; reshaping of streambanks to reconnect with adjacent floodplain; installation of streambank vegetation; backfilling of artificial channels and drainage ditches; removal of existing drainage structures; construction of small nesting islands; construction of open water areas; activities needed to reestablish vegetation; and other related activities (USACE 2019).

Stream restoration activities are intended to remediate past impacts which have resulted in down-cutting of streams, habitat simplification, and the interruption of channel evolution and riparian succession. Beyond the immediate construction impacts, these activities are deemed beneficial to bull trout and their habitat. By adding complexity and heterogeneity to stream habitats that are relatively uniform and lacking in elements such as boulders, vegetation, large woody debris, and deep pools, foraging and sheltering habitat increases in quantity and quality for all life history stages. Such improvements are expected to benefit recruitment to the population (Zale and Rider 2003). The degree of such benefit will depend on the location and relative improvement for the site. Habitat improvements carried out in areas dominated by non-native fish or where elevated stream temperatures preclude occupation may result in little benefit for bull trout. Community-level shifts from nonnative to native trout were limited to restoration activities in the mid to upper basin that were designed to emulate natural channel conditions (Pierce et al. 2013).

The indirect effects of placing boulders and large wood for restoration purposed in areas where these natural features have been reduced or removed are likely to include increased habitat diversity and complexity, greater flow heterogeneity, increased coarse sediment storage, gravel retention for spawning habitat, more long-term nutrient storage and more substrate for aquatic vertebrates, moderation of flow disturbances, and refugia for fish during high flow events (Negeshi and Richardson 2003, Roni et al. 2006). The indirect effects of gravel placement are likely to compensate for an identified loss of the natural gravel supply, thus increasing the quantity and quality of spawning habitat (WDFW 2004).

The rate and extent of stream restoration and recovery of natural function will vary from site to site. Sites that are surrounded by intensive land use and severe upstream disturbance are less likely to be successful than sites surrounded by wildlands where the headwaters are protected. Stream restoration activities are expected to generally result in positive benefits to fish habitat, but they are unlikely to overcome the constraints of a severely degraded site. Benefits of stream restoration to bull trout are expected to be greatest in locations where spawning- rearing habitat is enhanced or expanded near to source populations (Pierce et al. 2013) or where activities provide fish passage to suitable habitat that was previously blocked.

Minimization Measures for Bank and Channel Modification

The SLOPES protocol specifies many required conservation measures and exclusions that are designed to minimize the expected long-term detrimental habitat modification associated with bank stabilization and linear transport activities. All the minimization measures discussed above for sediment, dewatering, and chemical contamination are required for construction associated with bank and channel modification, as applicable to the specific project. The most significant minimization measures specific to bank and channel modification include:

- Incorporation of bioengineering principles (including for repair and maintenance of existing stabilization) and the requirement for a vegetative component using native species;
- A prohibition against riprap that extends above OHW;
- Requirement for design by a professional engineer or hydrologist for any structure that protrudes into the river;
- Maintaining existing channel form and dimension to the maximum extent possible;
- A limit of 300 linear feet per continuous run of material and 300 feet of channel relocation;
- Maximum barb length limited to ¼ of the bankfull channel width;
- Requirement for a revegetation plan using native species that will be implemented within the first planting season after construction and will ensure 80% coverage after three years;
- Precautions to prevent post-construction stranding of fish;
- Review and approval by a state fisheries biologist for additions of spawning gravel.

Minimization measures specifically applicable to linear transportation projects include:

- Exclusion of new road construction within 300 feet of an occupied stream;

- Exclusion of new bridge abutments in occupied streams where none previously existed;
- Complete removal of all existing structures and fill when replacing a bridge or trestle;
- Stream crossings must be designed to promote natural sediment and debris transport and maximize connectivity with the floodplain; full-span bridges or streambed simulation are required in known spawning areas;
- Grade controls are required to prevent culvert failure from changes in stream elevation;
- Crossing structures must be designed to direct surface drainage so as to prevent erosion and direct entry of runoff into waterways.

The Corps has formally adopted Stream Mitigation Procedures for Montana (USACE 2013), which may be required for projects under 300 linear feet depending on the degree of existing bank modification in the immediate and adjacent reaches. Mitigation emphasizes activities to enhance the riparian area, such as by planting trees or establishing a grazing exclosure. Other actions may be pursued if on-site riparian enhancements are not practicable. Idaho will also follow the procedure where applicable (USACE 2019). The requirement for all projects authorized under the SLOPES to adhere to work habitat- specific construction timeframes reduces the likelihood of bull trout presence in FMO habitat and reduces vulnerability for young-of-the-year in spawning-rearing habitat.

In all, these minimization measures reduce the direct effects of construction, as discussed under the effects for sediment, dewatering, and chemical contamination. Limits to the size of projects, limited use of riprap, and an emphasis on bioengineering, and revegetation or enhancement with native species greatly reduces the long-term detrimental effects to habitat that may accompany bank stabilization and other treatments that seek to restrict lateral movement of streams and rivers by providing shade and nutrient inputs and allowing for some degree of riparian succession (Fischenich 2003).

2. Analysis of Effect to Bull Trout

For discussion of the analysis of effects of the action for bull trout, core areas will be grouped together based on the expected activity and aggregate impact of the SLOPES protocol over five years. Such grouping naturally separates the relatively rural and wildland dominated core areas from those that are increasingly developed and managed, often with substantial urban centers, as these are the areas with the greatest permit activity, and therefore the greatest potential effects from the SLOPES protocol.

Activities Occurring in Unoccupied Habitats

The BA identifies permit actions which may affect, are not likely to adversely affect (NLAA), as well as actions which may affect, are likely to adversely affect (LAA), bull trout and their designated critical habitat (USACE 2019). The distinction between the LAA and NLAA determinations rests on project occurrence and proximity relative to occupied streams and designated critical habitat. The NLAA determination applies to projects occurring in an unoccupied stream with direct downstream connectivity to an occupied stream and one stream-mile or more from the confluence with the occupied stream. Additionally, the BA specifies applicable conservation measures that will be incorporated into each project. Applicants may still utilize the listed NWPs without incorporating the conservation measures, but such projects must undergo individual consultation and are not covered under this programmatic consultation.

Due to the proximity of the projects to occupied bull trout habitat (described above), as well as implementation of conservation measures, effects to bull trout and their designated critical habitat from projects in the NLAA category are expected to be insignificant. Therefore, we concur that these projects may affect, are not likely to adversely affect bull trout and their critical habitat. We do not anticipate any incidental take of bull trout as a result of the specified subset of permit actions.

The following analysis of effects applies to SLOPES activities occurring in, or within one stream- mile of, occupied bull trout habitat.

Anticipated Aggregate Effects by Core Area

Because this program entails agency response to individual permit applications initiated by private parties and local governments, it is not possible to determine precisely the number and location of activities that will be covered by the SLOPES during the next five year window. In order to analyze the effects, the various activities which may occur under this SLOPES must be aggregated across the expected amount of SLOPES activity within each core area over the five-year timeframe. The expected amount of activity is based on patterns observed during the last two five-year analysis periods, 2007-2011 and 2012-2017 (Table 5).

Table 5: *Past activity by core area (Adopted from USACE 2019).*

Baseline Actions									
All Permits	Impact Category 1		Impact Category 2		Impact Category 3		Totals		
CORE Area	2007-2011	2012-2017	2007-2011	2012-2017	2007-2011	2012-2017	2007-2011	2012-2017	Difference
Bitterroot River	41	25	99	27	9	1	149	53	-96
Blackfoot River	18	3	22	4	27	8	67	15	-52
Bull Lake	10	1	1	0	1	0	12	1	-11
Clearwater River & Lakes	4	1	2	1	2	0	8	2	-6
Coeur d'Alene Lake	84	36	161	45	23	20	268	101	-167
Flathead Lake	54	36	91	34	8	3	153	73	-80
Kootenai River	20	15	20	8	37	6	77	29	-48
Lake Koocanusa	8	0	6	1	4	1	18	2	-16
Lake Pend Oreille	285	123	134	78	264	14	683	215	-468
Lindbergh Lake	5	1	0	0	0	0	5	1	-4
Middle Clark Fork River	25	11	37	23	5	3	67	37	-30
Priest Lakes	15	4	7	3	2	0	24	7	-17
Rock Creek	2	2	1	0	0	0	3	2	-1
St. Mary River	4	0	0	0	0	0	4	0	-4
Swan Lake	13	5	4	4	4	1	21	10	-11
Upper Clark Fork River	79	54	55	16	6	6	140	76	-64
West Fork Bitterroot River	1	1	0	1	0	0	1	2	1
Whitefish Lake	16	2	3	2	11	1	30	5	-25
		320	643	247	403	64	1730	631	-1099

Table 6: *The anticipated amount and impact category of future permit actions (adopted from USACE 2019). Category of number of anticipated activities: <25 Low; 25-50 Minimal; 51-75 Moderate; 76-100 High; >100 Very High.*

Bull Trout Core Area	Relative Potential for Future Permit Actions			
	Non-federal Land	Estimated Number of Permits		
		Impact 1	Impact 2	Impact 3
Bitterroot River	Minimal	Minimal	Moderate	Low
Blackfoot River	Moderate	Low	Low	Low
Bull Lake	Low	Low	Low	Low
Clearwater River & Lakes	Minimal	Low	Low	Low
Coeur d'Alene Lake	Minimal	Moderate	Very High	Low
Flathead Lake	Minimal	Minimal	Minimal	Low
Kootenai River	Minimal	Low	Low	Low
Lake Koocanusa	Minimal	Low	Low	Low
Lake Pend Oreille	Moderate	Very High	High	Very High
Lindbergh Lake	Low	Low	Low	Low
Middle Clark Fork River	Minimal	Low	Minimal	Low
Priest Lakes	Moderate	Low	Low	Low
Rock Creek	Minimal	Low	Low	Low
Saint Mary River	Moderate	Low	Low	Low
Swan Lake	Minimal	Low	Low	Low
Upper Clark Fork River	Moderate	Moderate	Minimal	Low
West Fork Bitterroot River	Low	Low	Low	Low
Whitefish Lake	High	Low	Low	Low

Using an average of the permit numbers from the two 5 year periods for each Impact Category and each core area shown in Table 5 above, the relative potential for future permit actions was estimated as shown in Table 6. Most of the core areas in the action area are anticipated to have a minimal to low number of future permit actions. Two core areas are anticipated to have moderate future permit actions (Bitterroot River and Upper Clark Fork River) and two core areas are anticipated to have very high future permit actions (Coeur d'Alene Lake and Lake Pend Oreille).

Of the 39 core areas within the geographic area of this SLOPES protocol, 21 will not be affected because they have no potential for projects on non-federal land (see Table 3 above). We anticipate that the proposed action will result in adverse effects to bull trout in the 17 of the remaining 18 core areas likely to be impacted in the action area. The exception is the Lindbergh Lake core area. Private land in the Lindbergh Lake core area is limited to the northeast corner of the lake and comprises less than five percent of the core area; no streams occur on private land, only lakeshore habitat. Bull trout use of shallow shoreline habitat appears minimal, even where robust populations are known to exist in a lake environment (Bellgraph et al. 2012).

We anticipate that lethal adverse effects may occur if projects occur on or within ½ mile upstream of spawning and rearing habitat on non-federal land. In these instances, we expect that lethal take will be due to project effects on eggs and emergent fry in spawning areas. We anticipate that projects in FMO habitat will result in sublethal adverse effects to adult and subadult bull trout. Table 7 below summarizes each core area potentially affected by the proposed action, as well as the anticipated activity level and anticipated nature of adverse effects.

Table 7. *Bull Trout Core Areas Likely to be affected by SLOPES projects.*

Core Area	Geographic Region	Recovery Unit	Non-Federal Ownership	Nature of Expected Adverse Effects	Anticipated SLOPES Activity
Upper Clark Fork River	Upper Clark Fork River	Columbia Headwaters	Moderate	Lethal and Sublethal	Moderate
Rock Creek	Upper Clark Fork River	Columbia Headwaters	Minimal	Lethal	Low
Blackfoot River	Upper Clark Fork River	Columbia Headwaters	Moderate	Lethal and Sublethal	Low
Clearwater River and Lakes	Upper Clark Fork River	Columbia Headwaters	Minimal	Lethal*	Low
West Fork Bitterroot River	Upper Clark Fork River	Columbia Headwaters	Low	Lethal*	Low
Bitterroot River	Upper Clark Fork River	Columbia Headwaters	Minimal	Lethal and Sublethal	Moderate
Middle Clark Fork River	Upper Clark Fork River	Columbia Headwaters	Minimal	Sublethal	Minimal
Lake Pend Oreille	Lower Clark Fork River	Columbia Headwaters	Moderate	Lethal and Sublethal	Very High
Priest Lakes	Lower Clark Fork River	Columbia Headwaters	Moderate	Lethal*	Low
Flathead Lake	Flathead	Columbia Headwaters	Minimal	Lethal and Sublethal	Moderate
Whitefish Lake	Flathead	Columbia Headwaters	High	Lethal*	Minimal
Swan Lake	Flathead	Columbia Headwaters	Minimal	Lethal and Sublethal	Low
Lake Koocanusa	Kootenai	Columbia Headwaters	Minimal	Sublethal	Low
Kootenai River	Kootenai	Columbia Headwaters	Minimal	Lethal and Sublethal	Minimal
Bull Lake	Kootenai	Columbia Headwaters	Low	Sublethal	Low
Coeur d'Alene Lake	Coeur d'Alene	Columbia Headwaters	Minimal	Sublethal	High
St. Mary River	N/A	St. Mary	Moderate	Sublethal	Low

* Lethal effects are expected if projects occur at or within ½ mile upstream of spawning sites. Project activity in the core area is too low to confidently predict where projects will occur; however, some lethal effects may occur, as SR habitat and known spawning areas occur on non-federal lands.

3. Analysis of Effects to Bull Trout Critical Habitat

The analysis of the effects of the SLOPES protocol on the species includes an assessment of how the value and functionality of habitat for bull trout is affected by the action. The analysis of the effects to designated critical habitat is comparable, though conducted using a slightly different approach addressing the functionality of the primary constituent elements (PCEs).

Construction associated with SLOPES activities in all impact categories is expected to create temporary disturbance which may temporarily degrade critical habitat; bank stabilization and linear transport activities in Impact Category 2 are expected to have long-term negative effects to critical habitat with some minor benefits; stream restoration activities in Impact Category 3 are expected to have long-term benefits to critical habitat. An analysis of the effects of SLOPES activities on the functionality of the PCEs follows and is summarized in Table 8.

Table 8. *Primary constituent elements for bull trout critical habitat and expected effects from SLOPES activities.*

PCE #	PCE Description	Impact Category 1	Impact Category 2	Impact Category 3
1	Permanent water having low levels of contaminants such that normal reproduction, growth and survival are not inhibited	Temporary degrade	Temporary degrade/ minor long-term benefit	Temporary degrade/ long-term benefit
2	Water temperatures ranging from 2° to 15°C (36° to 59°F), with adequate thermal refugia available for temperatures at the upper end of this range. Specific temperatures within this range will vary depending on bull trout life history stage and form, geography, elevation, diurnal and seasonal variation, shade, such as that provided by riparian habitat, and local groundwater influence	No effect	Minor degrade	Long-term benefit
3	Complex stream channels with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and instream structures	Temporary degrade	Long-term degrade	Temporary degrade/ long-term benefit
4	Substrates of sufficient amount, size, and composition to ensure success of egg and embryo over-winter survival, fry emergence, and young-of- the-year and juvenile survival. A minimal amount of fine substrate less than 0.63 cm (0.25 in) in diameter and minimal substrate embeddedness are characteristic of these conditions	Temporary degrade in SR habitat	Temporary degrade/ minor long- term benefit in SR habitat	Temporary degrade/ long-term benefit in SR habitat
5	A natural hydrograph, including peak, high, low, and base flows within historic ranges or, if regulated, a hydrograph that demonstrates the ability to support bull trout populations	No effect	No effect	No effect
6	Springs, seeps, groundwater sources, and subsurface water connectivity to contribute to water quality and quantity	No effect	Long-term degrade	Long-term benefit
7	Migratory corridors with minimal physical, biological, or chemical barriers between spawning, rearing, over-wintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows	No effect	No effect	Long-term benefit
8	An abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish	Temporary degrade	Temporary degrade/ minor long- term benefit	Temporary degrade/ substantial long-term benefit
9	Few or no predatory, interbreeding, or competitive nonnative species present	No effect	No effect	No effect

Temporary negative impacts to PCEs 1, 4 and 8 will occur from construction activities that produce a temporary increase in sediment or possibly minor chemical contamination or that require temporary dewatering. Conservation measures that reduce raw, eroding banks and require the incorporation of bioengineering and riparian vegetation applicable to Impact Category 2 activities may have minor long-term beneficial effects, especially in spawning areas. Stream restoration activities in Impact Category 3 are expected to provide long-term benefits when projects are designed to reduce delivery of background sediment or other pollutants.

Activities in Impact Category 2 are expected to reduce the functionality of PCEs 3 and 6 by limiting natural horizontal migration of streams and thus development of channel complexity, side channel habitat and riparian succession. These activities may also affect long-term reductions in floodplain connectivity, either directly or indirectly. The effect on PCE 2 is expected to be minor or even insignificant because of the requirement to incorporate streambank vegetation above OHW. In a similar but opposite fashion, stream restoration activities are expected to result in long-term improvement in functionality for these PCEs.

SLOPES activities are expected to have no effect on PCEs 5, 7, and 9 except when restoration activities are specifically undertaken to restore fish passage, as in removing a small dam. In such cases, we expect a long-term benefit to the function of migratory corridors.

I. EFFECTS OF THE ACTION ON KOOTENAI RIVER WHITE STURGEON AND CRITICAL HABITAT

1. Activities Occurring in Unoccupied Habitats

The BA identifies permit actions which may affect, are not likely to adversely affect (NLAA), as well as actions which may affect, are likely to adversely affect (LAA), Kootenai sturgeon and their designated critical habitat. The distinction between the LAA and NLAA determinations rests on project occurrence and proximity relative to occupied streams and designated critical habitat. The NLAA determination applies to projects occurring in an unoccupied stream with direct downstream connectivity to an occupied stream and one stream-mile or more from the confluence with the occupied stream. Additionally, the BA specifies applicable conservation measures that will be incorporated into each project. If applicants utilize the listed NWPs without incorporating the conservation measures, such projects must undergo individual consultation and are not covered under this programmatic consultation.

Due to the proximity of the projects to occupied Kootenai sturgeon habitat (described above), as well as implementation of conservation measures, effects to Kootenai sturgeon and their designated critical habitat from projects in the NLAA category are expected to be insignificant. Therefore, we concur that these projects may affect, are not likely to adversely affect Kootenai sturgeon and their critical habitat. We do not anticipate any incidental take of Kootenai sturgeon as a result of the specified subset of permit actions.

The following analysis of effects applies to SLOPES activities occurring in, or within one stream- mile of, occupied Kootenai sturgeon habitat.

2. Activities Occurring in Occupied Habitat and Critical Habitat

Adult Kootenai sturgeon typically inhabit the Kootenai River-Kootenay Lake delta and/or Kootenay Lake (approximately 18 miles downstream of the action area), except during the pre-spawning and spawning periods, typically between mid-May and late June, when they migrate upstream primarily to the upper meander reach to spawn (Paragamian et al. 2001; Paragamian et al. 2002). By the end of spawning season (mid-June), telemetry data shows that adult Kootenai sturgeon migrate downstream to the Kootenai River-Kootenay Lake delta and/or Kootenay Lake. Based on this data and given the in-water work window of August- November described in the BA, adult Kootenai sturgeon are not expected to be present in the project areas during project implementation. Therefore, no effects to adults (including spawning behavior) or recruitment-related activities are anticipated.

Due to the projects taking place during the Service-identified in-water work window, which is specifically designed to fall outside the period when larval and young-of-year Kootenai sturgeon would be expected to remain in spawning areas (i.e., larvae and young-of-year Kootenai sturgeon will have already migrated to downstream habitats, e.g., Kootenay Lake), larval and young-of-year Kootenai sturgeon are not expected to be in the project areas during project implementation. Therefore, no effects to larval and young-of-the-year Kootenai sturgeon are anticipated.

Juvenile and sub-adult Kootenai sturgeon have been documented to occur in the Kootenai River from Kootenai Falls downstream to Kootenay Lake, (Rust and Wakkinen 2009; Stephens and Sylvester 2011). Their presence in the action area can be broken down into the following reaches:

Canyon Reach

Field survey data from Montana Fish Wildlife and Parks shows that sub-adult Kootenai sturgeon are present in the canyon reach (Kootenai Falls in Montana (RM 190.5), downstream to the mouth of the Moyie River in Idaho (RM 159.7)), with approximately 92% of the captures occurring within 3 miles of the "sturgeon hole" immediately downstream of Kootenai Falls (Stephens and Sylvester 2011). Kootenai sturgeon do not exist upstream of Kootenai Falls (USFWS 1999). As discussed previously, several thousand juvenile Kootenai sturgeon were released into this reach of the Kootenai River between 1994 and 2007 (Stephens and Sylvester 2011). As stated in the Kootenai Sturgeon Presence in the Action Area section above, telemetry data described by Montana Fish, Wildlife and Parks (MFWP) in the Canyon Reach section indicates that some hatchery juveniles released into the "sturgeon hole" below Kootenai Falls remained there for at least 4-5 months, whereas a larger telemetry study showed that 100% of hatchery- origin juvenile Kootenai sturgeon released into the canyon and braided reaches immediately migrated downstream to the lower-gradient foraging areas within 2 months (Neufeld 2006). The latter telemetry data is consistent with laboratory study results showing that Kootenai sturgeon larvae and juveniles exhibit a strong downstream dispersal, likely evolved in order to reach quality foraging habitats in Kootenay Lake, its delta, and the lower meander reach (Kynard et al. 2010). Based on this information, it is likely that juvenile and sub-adult Kootenai sturgeon will be present in the canyon reach of the Kootenai River during project activities.

Braided Reach

The braided reach of the Kootenai River extends from the mouth of the Moyie River (RM 159.7) downstream to the Interstate 95 Bridge in Bonners Ferry (RM 152). The braided reach is typified by a wide, shallow channel with very little instream diversity or complexity. Field survey data shows that Kootenai sturgeon presence in the braided reach is very sparse. Between 2001 and 2011, Idaho Department of Fish and Game (IDFG) field crews captured only 3 juvenile Kootenai sturgeon in the braided reach upstream of Bonners Ferry (in a deep hole at RM 160) (Rust and Wakkinen, 2013). Also, telemetry data shows that 100% of hatchery-origin juvenile Kootenai sturgeon released into the braided immediately migrate downstream to lower-gradient foraging areas (Neufeld 2006). This information indicates that juvenile and sub-adult Kootenai sturgeon are present in the braided reach in very low numbers, and the handful that are in this reach exist in the only "eddy-like" deep hole at RM 160 described above.

Based on this information, it is likely that juvenile and sub-adult Kootenai sturgeon will be present in the braided reach of the Kootenai River during project activities, albeit in very small numbers.

Straight Reach

IDFG field surveys regularly capture significant numbers of juvenile and sub-adult Kootenai sturgeon in the hole at Ambush Rock (at the downstream end of the straight reach), but not in the remainder of the straight reach. Therefore, juvenile and/or sub-adult Kootenai sturgeon are expected to be foraging in the Ambush Rock hole during project implementation.

Based on this information, it is likely that juvenile and sub-adult Kootenai sturgeon will be present in the lower straight reach of the Kootenai River during project activities. Kootenai sturgeon may also be in the remainder of the straight reach, albeit in very small numbers.

Meander Reach

The meander reach of the Kootenai River extends from the deep hole at Ambush Rock (RM 151) downstream to the U.S.-Canada border (RM 105.6). The meander reach is a low-gradient depositional area with multiple deep holes and a river bottom composed of sand-silt with small areas of exposed lacustrine clay. Field data from IDFG has shown that significant numbers of juvenile and sub-adult Kootenai sturgeon reside in the meander reach year-round (Rust and Wakkinen 2013).

Based on this information, juvenile and/or sub-adult Kootenai sturgeon are expected to be present in the braided reach of the Kootenai River during project implementation.

3. Factors to be Considered for Kootenai River White Sturgeon and Critical Habitat

The SLOPES BA lists the eight categories of proposed activities (USACE 2019). These activities are discussed below:

Maintenance

Due to the relatively large size of the mainstem Kootenai River, proposed activities in this category will be too large in scope to be included in this SLOPES, and will be consulted on individually (in the mainstem Kootenai River).

Utility Lines

Due to the relatively large size of the mainstem Kootenai River, proposed activities in this category will be too large in scope to be included in this SLOPES, and will be consulted on individually (in the mainstem Kootenai River).

Minor Discharge and Excavation

Due to the relatively large size of the mainstem Kootenai River, proposed activities in this category will be too large in scope to be included in this SLOPES, and will be consulted on individually (in the mainstem Kootenai River).

Temporary Construction, Access, and Dewatering

Due to the relatively large size of the mainstem Kootenai River, proposed activities in this category will be too large in scope to be included in this SLOPES, and will be consulted on individually (in the mainstem Kootenai River).

Streambank and Shoreline Stabilization

The following streambank and shoreline stabilization methods, individually or in combination, are included in this SLOPES: woody plantings; herbaceous cover; deformable soil reinforcement; coir logs, straw bales and straw logs to trap sediment; engineered log jams (use of concrete logs is not proposed); and stream barbs made of wood. The use of quarried stone riprap or barbs would be limited as follows: 1) the elevation of the rock toe would be limited to the ordinary high water mark; 2) the portion of bank above the rock toe will be vegetated with native trees, shrubs, grasses and forbs according to an approved revegetation plan submitted concurrently with the application; and 3) stabilization activities will not exceed 300 linear feet per continuous run of material and will not exceed one cubic yard of riprap per linear foot below the ordinary high water mark. All in-channel disturbances will occur within the August 1 to April 1 work window for Kootenai sturgeon.

Linear Transportation Projects

Due to the relatively large size of the mainstem Kootenai River, proposed activities in this category will be too large in scope to be included in this SLOPES, and will be consulted on individually (in the mainstem Kootenai River).

Aquatic Habitat Restoration, Establishment, and Enhancement Activities

Due to the relatively large size of the mainstem Kootenai River, all but "installation of streambank vegetation" proposed activities in this category will be too large in scope to be included in this SLOPES, and will be consulted on individually (in the mainstem Kootenai River).

Effects to Kootenai sturgeon from implementation of bank stabilization and installation of streambank vegetation projects fall into the following categories: 1) temporary increases in sediment and turbidity in the Kootenai River in the vicinity of each project, 2) disturbance of Kootenai sturgeon from general construction noise, and 3) displacement of, and/or injury to, Kootenai sturgeon from construction materials as they are placed in the Kootenai River. Effects of these actions on Kootenai sturgeon are discussed further below.

Sediment and Turbidity

White sturgeon are found in large rivers along the Pacific Coast between Monterey, California and Alaska (Page and Burr 1991). Such large river systems typically carry large suspended sediment loads and are highly turbid, particularly during the spring runoff period (Cole 1983). In response, white sturgeon have evolved specific life strategies to persist in these conditions. Hildebrand et al. (1999) states about Columbia River white sturgeon in British Columbia:

"White sturgeon are broadcast spawners and the eggs and post-hatch larvae are relatively large and black in colour. Post-hatch white sturgeon larvae undergo a passive downstream migration to rearing habitats. Turbid water conditions during the egg incubation and early pelagic larval stage would provide protection from visual predators for these life stages and also for the early benthic feeding stage of sturgeon fry. This suggests historical spawning habitats may have been situated in systems that had a high suspended sediment load such as the upper Columbia River or the lower Pend d'Oreille River."

Additional white sturgeon adaptations to higher turbidity and suspended sediment levels include: 1) influencing spawning site selection, with higher levels being associated with spawning in shallower habitats (likely due to increased cover) (Perrin et al. 2003; Hildebrand 1999); 2) hatching and emergence into the water column occurring in low- light conditions (Brannon et al. 1985); and 3) larval white sturgeon being photophobic (Brannon et al. 1985). The latter two adaptations appear to be related to predator avoidance. Gadomski and Parsley (2005) found that significantly more white sturgeon larvae were eaten by prickly sculpins (*Cottus asper*) at lower turbidity levels in a controlled laboratory experiment.

When dams are constructed on large rivers, they store much of the sediment that enters their reservoirs, disrupting the movement of these materials through the river system. In the Kootenai River, Libby Dam has trapped much of the sediment in the system, reducing suspended sediment and turbidity below the dam by more than 80% compared to pre-Libby Dam (Barton 2004). Given the adaptations described above, the significant loss of suspended sediment and turbidity in the Kootenai River may: 1) cause Kootenai sturgeon to restrict spawning sites to deeper habitats; 2) increase predation on incubating eggs; 3) disrupt larval behavior; and 3) increase predation on larvae.

The sum of this data/information demonstrates that Kootenai sturgeon have adapted and evolved specific life history strategies in response to naturally high levels of turbidity and suspended sediment that are typical of the large river systems in which they exist. Due to the proposed projects being implemented during the Service's in-water work window for Kootenai sturgeon, and the conservation measures required by the NWPs that are specifically designed to minimize sediment input into the Kootenai River during project implementation (e.g. limiting projects to 300 linear feet, individual placement of rock (no end dumping), resulting turbidity and suspended sediment levels from implementation of the proposed projects is not expected to exceed the 80% loss of turbidity and suspended sediment in the Kootenai River that resulted from the construction of Libby Dam. Therefore, the effects to Kootenai sturgeon from relatively small (compared to historical, pre-Libby Dam conditions) and temporary increases in suspended sediment resulting from implementation of the proposed projects are expected to be insignificant.

Implementation of bank stabilization projects and installation of streambank vegetation projects may also have direct sediment and turbidity-related effects on Kootenai sturgeon critical habitat, primarily in the form of increased turbidity during in-water work. However, due to implementation of conservation measures designed to minimize the effects of turbidity (e.g. limiting projects to 300 linear feet, individual placement of rock (no end dumping), the sediment and turbidity-related effects to Kootenai sturgeon critical habitat are expected to be insignificant.

Construction-Related Noise

Implementation of bank stabilization projects and installation of streambank vegetation projects may involve the use of large construction equipment near and in the Kootenai River, resulting in temporary increases in noise levels. However, due to implementation of BMPs designed to minimize the effects of equipment use and general noise (e.g. limiting equipment to working from the top of the bank), these effects to Kootenai sturgeon are expected to be insignificant.

No effects to Kootenai sturgeon critical habitat from general construction noise are anticipated.

Bank and Channel Modification

Implementation of bank stabilization and streambank vegetation projects may involve placement of materials (e.g. rock, logs) into the Kootenai River. As the material is placed, Kootenai sturgeon present in the work areas would be forced to retreat to adjacent habitat, potentially increasing energy expenditure. Some Kootenai sturgeon—especially juveniles—may not evacuate the work sites as the material is placed, and could potentially be killed or injured. These activities would cause stress, injury, or possible mortality to some Kootenai sturgeon. We anticipate adverse effects to Kootenai sturgeon from bank stabilization projects. Juvenile and sub-adult Kootenai sturgeon are expected to be in the canyon, braided, and upper straight reaches primarily in deep holes and in small numbers (due to the largely poor quality of habitat). Therefore, Kootenai sturgeon displaced from those areas would be leaving poor quality habitats. In the meander reach, while some individual Kootenai sturgeon may be adversely affected, effects upon the Kootenai sturgeon population as a whole are expected to be insignificant because bank stabilization and streambank vegetation projects typically occur in poor-quality habitats, and therefore the number of Kootenai sturgeon expected to be in the project areas will be small relative to the population as a whole.

Placement of materials may also affect Kootenai sturgeon critical habitat, primarily in the form of liberating sediment. However, as described previously, the NWP's under which the bank stabilization projects will be authorized include conservation measures designed to minimize the effects of turbidity (e.g. limiting projects to 300 linear feet, individual placement of rock (no end dumping)). Therefore, effects to Kootenai sturgeon critical habitat from placement of materials are expected to be insignificant.

J. 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.

Bull Trout

For the purpose of this consultation, cumulative effects are primarily the effects attributable to state and private landowners. It is likely that ongoing and reasonably foreseeable actions on private lands within the action area include timber harvest, road building, subdivision, home site and septic system development, road construction and maintenance, riparian disturbance, streambank armoring, and water withdrawals. Effects to fish habitat, including bull trout critical habitat, resulting from these practices include reduced channel stability, decreased habitat complexity, increased nutrient inputs, increased sedimentation, increased stream temperature, and reduced base flows. Although all of these activities are likely to occur, the amount and intensity on private land would not change the scope or magnitude of effects anticipated from this proposal.

Non-native fish species are identified as a primary threat to bull trout in many core areas within the action area (USFWS 2015b). The extent to which non-native fish populations grow in both size and distribution is largely under the jurisdiction of non-federal natural resource agencies. As such, the impact of non-native fish proliferation to bull trout in the action area remains difficult to determine.

Angler harvest and poaching has been identified as one reason for bull trout decline (USFWS 2015b). It is likely that recreational fishing, especially in known spawning streams in the fall, will increase as the human population in western Montana increases. Misidentification of bull trout has been a concern because of the similarity of appearance with brook trout. Although harvest of bull trout in the majority of the action area is illegal, incidental catch likely occurs. The fate of released bull trout is unknown, but some level of hooking mortality is likely due to the associated injuries and the stress of handling fish (Long 1997). Unintentional and illegal harvest could have a direct effect on the bull trout in the action area. The extent of the effect is dependent on the amount of increased recreational fishing pressure, which is a function of the increased number of people fishing each season. Illegal poaching is difficult to quantify, but generally increases in likelihood as the human population in the vicinity grows (Ross 1997). This may increase as the human population grows, but we anticipate that closed roads and limited public access will keep this low.

Global climate change and the related warming of our climate have been well documented. Evidence of global climate change/warming includes widespread increases in average air and ocean temperatures, accelerated melting of glaciers, and rising sea level. Given the increasing certainty that climate change is occurring and is accelerating (IPCC 2007; Battin et al. 2007), we can no longer assume that climate conditions in the future will resemble those in the past. The causes and effects of climate change transcend the action area. However, potential increases in water temperature – locally and within the range of bull trout - due to climate change, and the impact these factors have on habitat, provide more favorable conditions for non-native fish – and all affect bull trout.

The cumulative effects within the action area are reflected in bull trout population numbers and life history forms and the habitat conditions described herein. All core areas are at risk of the continued increase of non-native fish species and fisheries management; and concern for the viability and effects to bull trout populations are well documented (USFWS 2015). Activities occurring on private lands at the same time that the proposed federal activities may exert cumulative adverse effects on bull trout. However, some non-federal activities will likely improve conditions for bull trout over the long-term and will work in conjunction with federal actions toward recovery of bull trout in some instances.

Kootenai River White Sturgeon

As the human population in the State of Idaho continues to grow, residential growth and demand for dispersed and developed recreation is likely to occur. This trend is likely to result in increasing habitat degradation from riparian road construction, levee building, bank armoring, and campsite development on private lands. These activities tend to remove riparian vegetation, disconnect rivers from their floodplains, interrupt groundwater-surface water interactions, reduce stream shade (and increase stream temperature), reduce off-channel rearing habitat, and reduce the opportunity for large woody debris recruitment. Each subsequent action by itself may have only a small incremental effect, but taken together they may have a substantive effect that would further degrade the watershed's environmental baseline and undermine the improvements in habitat conditions necessary for listed species to survive and recover. Watershed assessments and other education programs may reduce these adverse effects by continuing to raise public awareness about the potentially detrimental effects of residential development and recreation on sturgeon habitats and by presenting ways in which a growing human population and healthy fish populations can co-exist.

The Service is not aware of any other future actions that are reasonably certain to occur in the action area that are likely to contribute to cumulative effects on Kootenai sturgeon. For this description of cumulative effects, the Service assumes that future non-Federal activities in the area of the proposed action will continue into the immediate future at present or increased intensities. Accordingly, these actions will contribute to maintenance of at risk and not properly functioning habitat indicators.

K. CONCLUSIONS

1. Jeopardy Determination

Bull Trout

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 (USFWS 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 [then] 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 in Section E of this BO, the approach to the jeopardy analysis in relation to the proposed action follows a hierarchal relationship between units of analysis that characterize effects at the lowest unit or scale of analysis (the local population) toward the highest unit or scale of analysis (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. 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 would result in a no-jeopardy finding.

After reviewing the current status of bull trout, the environmental baseline (including effects of federal actions covered by previous consultations) for the action area, the effects of the proposed project, and cumulative effects, it is the Service's biological opinion that the proposed action, as proposed and conditioned, 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." Our conclusion is based on, but not limited to, the information presented in the 2019 biological assessment (USACE 2019), information exchanged between the Corps and the Service, and information in our files cited throughout.

Our conclusion is based on the magnitude of the project effects in relation to the core area bull trout populations, aggregated to the geographic region (where applicable), then to the recovery unit, and finally to the range-wide population in the United States. Our rationale for this no jeopardy conclusion is based on the following:

- Minimization measures implemented through required Conservation Measures and Exclusions (See Section B above and Appendix E and Appendix F) for all SLOPES activities are likely to be effective in short-term impacts of construction for all projects and long-term habitat degradation from reduced complexity for projects in Impact Category 2. Long-term habitat improvements will result from projects in Impact Category 3.

- Because of the nature and location of non-federal lands which comprise the action area within the larger geographic area (see maps in Appendix G), the vast majority of projects in occupied bull trout waters will occur in FMO habitat, where we expect few, if any, lethal adverse effects from SLOPES projects. The analysis of past activity further shows that for many core areas a high percentage of projects occur in waterways not occupied by bull trout. Most spawning and rearing habitat within the action area is located at lower elevations, while spawning sites occur in mid to upper elevations, predominantly on federal lands, thus making impacts to eggs and fry unlikely and limiting expected impacts to juvenile, subadult, and adult bull trout. Lethal effects that may occur in spawning habitat are expected to be uncommon, relative to the SLOPES program as a whole.

- Through core area specific analysis of the expected level of project activity, the location of activity, and the level of take, we conclude that discernible effects are not expected for any core area populations within the covered geographic area.

As a result, the Service concludes that implementation of this project is not likely to appreciably reduce the reproduction, numbers, or distribution of bull trout at the scale of any of the affected core areas, and by extension in the Lower Clark Fork, Upper Clark Fork, Flathead, Kootenai, and Coeur d'Alene Geographic Regions and the larger scale of the Columbia Headwaters and St. Mary Recovery Units. Therefore, the Service concludes that this program will not appreciably reduce both the survival and recovery and would not jeopardize bull trout at the range-wide scale of the listed entity, the coterminous population of the United States.

Kootenai River White Sturgeon

After reviewing the current status of Kootenai River White Sturgeon, the environmental baseline (including effects of federal actions covered by previous consultations) for the action area, the effects of the proposed project, and cumulative effects, it is the Service's biological opinion that the proposed action, as proposed and conditioned, is not likely to jeopardize the continued existence of Kootenai River White Sturgeon. 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." Our conclusion is based on, but not limited to, the information presented in the 2019 biological assessment (USACE 2019), information exchanged between the Corps and the Service, and information in our files cited throughout.

Direct effects to Kootenai sturgeon that may occur during in-water work include harassment of Kootenai sturgeon from construction activities (e.g. general noise); and displacement of, stress to, and injury to or mortality of Kootenai sturgeon from placement of bank stabilization material. However, adverse effects to individual Kootenai sturgeon are not expected to result in population level effects for the following reasons:

- Outside of the meander reach, and deep holes in the canyon, braided, and straight reaches, Kootenai sturgeon presence is expected to be low, primarily consisting of temporary occurrence during the course of migrating between deep holes (if at all).

- The projects include best management practices designed to minimize effects to individual Kootenai sturgeon and critical habitat.

- The projects will occur during the Services in-water work window for Kootenai sturgeon, which is specifically designed to minimize effects to Kootenai sturgeon.

- The project sites are small (each bank stabilization project is limited to no more than 300 linear feet, and one cubic yard of rock per linear foot below the ordinary high water mark) relative to the overall available habitat.

2. Adverse Modification Determination

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).

It should be noted that this section only contains an adverse modification analysis for bull trout critical habitat. Section I.3 in the above BO indicates that we do not anticipate the proposed action to result in adverse effects to Kootenai River White Sturgeon critical habitat. Thus there is no need for an adverse modification analysis.

Bull Trout Critical Habitat

After reviewing the current status of bull trout critical habitat in the action area (Clark Fork, Coeur d’Alene, and Kootenai River Basins Critical Habitat Units), 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 implementation of the proposed action is not likely to destroy or adversely modify bull trout critical habitat.

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 proposed action is anticipated to adversely affect designated critical habitat Clark Fork, Coeur d'Alene, and Kootenai River Basins Critical Habitat Units by diminishing the function of some of the PCEs due to implantation of projects permitted by SLOPES (see Section H.3). However, we do not anticipate that these effects will to reduce the conservation value within the critical habitat unit as a whole, and, therefore, are not expected to adversely modify critical habitat on a range-wide basis.

The approach to the adverse modification analysis in relation to the proposed action follows a hierarchical relationship between units of analysis (discussed in detail in Sections E.3). 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. Should the adverse effects of the proposed action 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, 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 (i.e., range wide). Therefore, the determination will result in a no adverse modification finding. In this BO, the Service concludes that the proposed action will not appreciably reduce the value of bull trout critical habitat in the Critical Habitat Subunits within the affected Critical Habitat Units, and by extension it will not destroy or adversely modify bull trout critical habitat at the scale of the Clark Fork River, Coeur d'Alene or Kootenai River Basin Critical Habitat Units (Units 29, 30 and 31).

L. INCIDENTAL TAKE STATEMENT – BULL TROUT

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

The measures described below are non-discretionary, and must be undertaken by the Corps so they become binding conditions of any contract issued for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require applicants to adhere to the terms and conditions of the incidental take statement, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps 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 biological assessment (USACE 2019) describes actions anticipated to occur during implementation of the SLOPES protocol and proposes actions that, when implemented, are likely to adversely affect bull trout. The Service anticipates that implementation of the SLOPES protocol as described in the biological assessment would likely impart a level of adverse effect to individual bull trout to the extent that incidental take occurs.

1. Amount of Extent of Take Anticipated

The Service anticipates that project activities may result in incidental take of bull trout in the form of harm, harassment, or mortality related to the expected short-term impacts associated with construction for all impact categories and long-term impacts associated with habitat degradation for activities in Impact Category 2 that are intended to limit lateral movement of stream channels. Construction effects are expected to include temporary increases in suspended sediment, temporary displacement of fish or blockage of migration from dewatering, and the possibility of minor chemical contamination from equipment leaks. Habitat indicators that may be affected include sediment, chemical contaminants/nutrients, physical barriers, and substrate embeddedness. Bank stabilization and activities associated with linear transportation projects may have long-term effects on large woody debris, pool frequency and quality, large pools, off-channel habitat, refugia, wetted-width/max depth ratio, streambank condition, and floodplain connectivity. Temporary and long-term effects from the proposed activities are anticipated to have adverse effects and likely result in mostly sublethal effects, impairing feeding and sheltering patterns of juvenile, subadult and adult bull trout and some lethal effects for eggs, fry, and juveniles in active spawning areas.

The amount of take that may result from implementation of the proposed action is difficult to quantify for the following reasons:

- The duration and magnitude of sediment and associated construction effects will be related to weather conditions and the effectiveness of the mitigation measures.
- The amount and precise location of temporary sediment plumes depends on numerous factors (flow regime, size of stream, channel roughness).
- Measures proposed by the Corps to minimize impacts to bull trout habitat will likely be effective to varying degrees depending upon site-specific conditions and factors explained above.
- Losses of bull trout in any life stage caused by project-related effects are expected to be low and may be masked by, or impossible to differentiate from, those occurring as a result of wide seasonal fluctuations in numbers.

For these reasons, the Service concludes that the actual amount or extent of the anticipated incidental take is difficult to determine, as is detection of incidental take. In these cases, we use surrogates to measure the amount or extent of incidental take, and determine when the amount of take anticipated has been exceeded.

The action area consists of only non-federal lands and is comprised primarily of FMO habitat where adult and subadult bull trout may be present. For most core areas, most of the spawning-rearing habitat occurs in the higher elevations on federal land, with the action area generally including the lower portions of spawning-rearing habitat near the confluence with FMO habitat. In such areas juvenile bull trout may also be present, and eggs and fry are not likely to be present. The potential for take of eggs and fry has been analyzed for bull trout core areas where substantial spawning and rearing habitat occurs in the action area. The past pattern of project activities has been used to infer the expected level of activity and to reasonably limit the level of take by core area.

Table 9. *Authorized incidental take for bull trout from anticipated SLOPES projects by core area for the next five years.*

Core Area	Geographic Region	Recovery Unit	# SLOPES Projects Authorized in 5 Years	Max # SLOPES Project Authorized/Year
Upper Clark Fork River	Upper Clark Fork River	Columbia Headwaters	75	25
Rock Creek	Upper Clark Fork River	Columbia Headwaters	10	3
Blackfoot River	Upper Clark Fork River	Columbia Headwaters	40	15
Clearwater River and Lakes	Upper Clark Fork River	Columbia Headwaters	10	3
West Fork Bitterroot River	Upper Clark Fork River	Columbia Headwaters	5	2
Bitterroot River	Upper Clark Fork River	Columbia Headwaters	100	25
Middle Clark Fork River	Upper Clark Fork River	Columbia Headwaters	30	10
Lake Pend Oreille	Lower Clark Fork River	Columbia Headwaters	120	30
Priest Lakes	Lower Clark Fork River	Columbia Headwaters	20	6
Flathead Lake	Flathead	Columbia Headwaters	75	25
Whitefish Lake	Flathead	Columbia Headwaters	20	6
Swan Lake	Flathead	Columbia Headwaters	20	6
Lake Koocanusa	Kootenai	Columbia Headwaters	20	6
Kootenai River	Kootenai	Columbia Headwaters	30	10
Bull Lake	Kootenai	Columbia Headwaters	10	3
Coeur d'Alene Lake	Coeur d'Alene	Columbia Headwaters	100	25
St. Mary River	N/A	St. Mary	5	2

Take is authorized for Corps activities permitted under the SLOPES protocol according to Table 9 as total number of projects over five years and the maximum number per year for each core area. Only those projects which occur in occupied streams or less than one stream-mile upstream from occupied streams are expected to have adverse effects. SLOPES projects which occur on unoccupied streams more than one stream-mile from the confluence with an occupied stream, and projects which occur in lakes or reservoirs, are deemed not likely to adversely affect bull trout and their habitat, and thus are not tallied against these limits for allowable take. The Lindbergh Lake core areas have no take authorized as they include only lake/reservoir habitat within the action area and adverse effects are not expected to occur.

2. Effect of Take

Through the analysis in this biological opinion, the Service has determined that this level of incidental take is not likely to jeopardize the continued existence of the coterminous United Stated population of bull trout.

3. Reasonable and Prudent Measures

Biological opinions provide "reasonable and prudent measures" that are expected to reduce the amount of incidental take. Reasonable and prudent measures refer to those actions the Director believes are necessary or appropriate to minimize the impacts, i.e., amount or extent, of incidental take resulting from proposed actions [50 CFR §402.02]. Reasonable and prudent measures are nondiscretionary and must be implemented by the action agency in order for the exemption in section 7(o)(2) to apply.

The Service concludes that the following reasonable and prudent measures (RPM) are necessary and appropriate to minimize the take of bull trout caused by the proposed action:

RPM # 1: Assess, identify and implement means to reduce the potential for incidental take of bull trout resulting from construction and maintenance of projects authorized under the SLOPES protocol.

RPM # 2: Implement monitoring and reporting requirements for the each Regulatory Office as outlined below.

4. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Corps and any cooperators (including applicants) must comply with the following terms and conditions that implement the reasonable and prudent measure described above. These terms and conditions are non-discretionary:

To fulfill RPM #1, the following terms and conditions shall be implemented:

1. Utilize the Effects Screen for SLOPES projects, as shown in Appendix D, to assess the likelihood of level of affect for each project.

2. Incorporate all applicable Conservation Measures and Exclusions as proposed by the Corps and listed in Appendix E and Appendix F as required conditions.

3. For in-water work apply work windows as listed in Appendix E, Conservation Measure 3, or as specified by the local state or tribal fisheries biologist based on local knowledge and conditions.

4. For any project that entails dewatering, conduct fish salvage operations prior to construction, following recommendations of the local state or tribal fisheries biologist.

<u>To fulfill RPM #2, the following terms and condition shall be implemented:</u>

5. To implement RPM 2#, the Army Corps of Engineers, Montana and Idaho Regulatory Offices shall each maintain a list of projects authorized each year under the SLOPES protocol, including:

a. Bull trout core area

b. Waterbody and type of bull trout habitat (SR vs FMO) for any occupied waterbody or designated critical habitat

c. Impact category and type of permit

d. Date implemented (beginning/end)

e. Any bull trout that are captured, handled, or killed

5. Notification, Reporting and Coordination Requirements

The following project notification and reporting information must be collected and forwarded to the Service, as necessary and included in the annual monitoring report and the annual coordination meeting between the Service and the Corps:

1. Request for variance: A request for approval of an alternative condition than is identified in this document as appropriate for "approval in writing by Service" may be included in the Project Notification Form or other appropriate means. The request must be in writing and include the following information. Any variance that will result in greater effects or greater take than provided in this biological evaluation is not authorized by this SLOPES protocol. The Service will approve or disapprove the request, in writing, within 30 calendar days of receipt of the variance request. The variance request must include the following:

   i. Justification for the proposed variance.
   ii. Description of additional actions necessary to offset any likely adverse effects

of the variance, as appropriate.

iii. An explanation of how the resulting effects are within the range of effects considered in this SLOPES.

2. Project Completion Report or Memo to File: Each permit issued by the Corps under this SLOPES must require the applicant to submit a project completion report to the Corps within 60 days of finishing work below ordinary high water. For civil works projects, the Corps project manager must prepare a project completion memo to file. Each report or memo must contain the following information and be available for inspection on request by the Service.

   i. Applicant's name and permit number (if any).
   ii. Corps contact person.
   iii. Project name.
   iv. Type of activity.
   v. Project site, including any compensatory mitigation site, by 5th field HUC
   vi. Start and end dates for work completed.
   vii. Photos of habitat conditions at the project site, which may include any compensatory mitigation site, before, during, and after project completion.
   viii. Projects with the following work elements must include these data.

3. Work cessation – Dates work ceased due to high flows.

4. Site preparation – Riparian area cleared within 150 feet of ordinary high water; upland area cleared; new impervious area created.

5. Streambank stabilization – Type and amount of materials used; project size (one bank or two, width and linear feet).

6. Compensatory Mitigation Report: For each project requiring compensatory mitigation, the applicant must submit a compensatory mitigation report by December 31 each year after the project is completed until the Corps approves that performance standards have been met. This report must describe the date and purpose of each visit to a compensatory mitigation site, site conditions observed during that visit, and any corrective action planned or taken.

7. Annual Program Report: An annual monitoring report must be completed by February 15 each year that describes the Corps' efforts to carry out this SLOPES. The report must include the cumulative list of projects by bull trout core area, an assessment of overall program effectiveness, and any other data or analyses the Corps deems necessary or helpful to assess habitat trends as a result of actions authorized by this SLOPES.

8. Annual Coordination Meeting: A coordination meeting must take place with the Service and interested Tribal representatives by March 31 each year to discuss the annual monitoring report and any actions that will improve conservation or make the program more efficient or more accountable. The Corps will provide for review a

sample of 10 project completion reports representing the range of activities authorized under SLOPES. At each coordination meeting the number of yearly and cumulative SLOPES projects will be reviewed, along with an assessment of impacts, and effectiveness of conservation measures.

Annual coordination meetings are intended to serve an adaptive management purpose. Conservation measures may be revised as experience and knowledge is gained in implementation of SLOPES projects. The number of projects allowed as the surrogate measure for incidental take may be adjusted by amendment to this biological opinion based on assessment of program activity and the validity of assumptions for incidental take.

M. INCIDENTAL TAKE STATEMENT – KOOTENAI RIVER WHITE STURGEON

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

The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps fails to ensure that the action is implemented in the manner described in the biological opinion, then the protective coverage of section 7(0)(2) may lapse. In order to monitor the impact of incidental take, the Corps must report the progress of implementing the action and mitigation measures to the Service as specified in the incidental take statement [50 CFR, Part 402.14(i)(3)].

1. Amount of Extent of Take Anticipated

Based on survey data from the Service and IDFG, juvenile and/or sub-adult Kootenai sturgeon are expected to be present in the action area during project implementation. The work window for the project is well after the spawning period for Kootenai sturgeon, thus adult Kootenai sturgeon are not expected to be in the action area during project implementation.

The Service anticipates that project activities may result in incidental take of Kootenai sturgeon in the form of harm, harassment, or mortality related to the expected short-term impacts associated with bank stabilization and streambank vegetation activities on the mainstem

Kootenai River. Construction of bank stabilization and streambank vegetation projects will cause some Kootenai sturgeon to evacuate the area of their own volition while others will remain and could be injured or killed.

The amount of take of Kootenai sturgeon that may result from implementation of bank stabilization and streambank vegetation projects on the mainstem Kootenai River is difficult to quantify for the following reasons:

- The number of juvenile and/or sub-adult Kootenai sturgeon varies greatly between reaches of the Kootenai River.

- The precise location of bank stabilization and streambank vegetation projects that will occur over the duration of this SLOPES is unknown.

- Measures proposed by the Corps to minimize impacts to Kootenai sturgeon habitat will likely be effective to varying degrees depending upon site-specific conditions.

For these reasons, the Service concludes that the actual amount or extent of the anticipated incidental take is difficult to determine, as is detection of incidental take. In these cases, we use surrogates to measure the amount or extent of incidental take, and determine when the amount of take anticipated has been exceeded.

Incidental take of 5 bank stabilization and/or streambank revegetation projects per year, and a maximum of 25 bank stabilization and/or streambank revegetation projects over 5 years is authorized for Corps activities permitted under the SLOPES protocol occurring in the meander reach of the Kootenai River. Only those projects which occur in the meander reach of the mainstem Kootenai River or in a tributary less than one stream-mile upstream from the meander reach of the Kootenai River are expected to have adverse effects to Kootenai sturgeon. Bank stabilization and streambank revegetation projects which occur in: 1) unoccupied streams more than one stream-mile from the confluence with an occupied stream, 2) lakes or reservoirs, and 3) the straight, braided, and canyon reaches of the Kootenai River are deemed not likely to adversely affect Kootenai sturgeon and their habitat, and thus are not tallied against these limits for allowable take.

2. Effect of Take

Through the analysis in this biological opinion, the Service has determined that this level of incidental take is not likely to jeopardize the continued existence of Kootenai River white sturgeon.

3. Reasonable and Prudent Measures

Biological opinions provide "reasonable and prudent measures" that are expected to reduce the amount of incidental take. Reasonable and prudent measures refer to those actions the Director believes are necessary or appropriate to minimize the impacts, i.e., amount or extent, of incidental take resulting from proposed actions [50 CFR §402.02]. Reasonable and prudent measures are nondiscretionary and must be implemented by the action agency in order for the exemption in section 7(o)(2) to apply.

No reasonable and prudent measures are necessary. The Program will be implemented as described in the BA, including all conservation measures and best management practices.

4. Terms and Conditions

Because no reasonable and prudent measures are provided, with the exception of the reporting requirements below, no terms and conditions are necessary.

5. Notification, Reporting and Coordination Requirements

Upon locating dead, injured, or sick Kootenai sturgeon during implementation of the Program, notification must be made within 24 hours to the Service's Division of Law Enforcement Special Agent (address: 1387 S. Vinnell Way, Suite 341 Boise, ID 83709-1657; telephone: 208-378- 5333). Instructions for proper handling and disposition of such specimens will be issued by the Division of Law Enforcement. Care must be taken in handling sick or injured fish to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible state. In conjunction with the care of sick or injured Kootenai sturgeon, or the preservation of biological materials from a dead fish, the action agencies have the responsibility to ensure that information relative to the date, time, and location of the fish when found, and possible cause of injury or death of each fish be recorded and provided to the Service. Dead, injured, or sick Kootenai sturgeon should also be reported to the Service's North Idaho Field Office (telephone: 509-891-6839).

N. CONSERVATION RECOMENDATIONS

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 recommendations that: (1) identify discretionary measures a Federal agency can take to minimize or avoid the adverse effects of a proposed action on listed or proposed species, or designated or proposed critical habitat, (2) identify studies, monitoring, or research to develop new information on listed or proposed species, or designated or proposed critical habitat, and, (3) include suggestions on how an action agency can assist species conservation as part of their action and in furtherance of their authorities under section 7(a)(1) of the Act. The Service provides the following recommendations:

1. The Corps should participate in and encourage the development of large-scale assessment of channel modifications and floodplain impacts, such as the channel migration zone studies or hydrogeomorphic assessments to provide a basis for assessing the cumulative impact of bank stabilization activities on riverine function and habitat development. As such a task is not practicable for one agency acting alone, we recommend collaboration and joint funding with other agencies, tribes, and private entities to prioritize and complete such assessments.

2. The Corps, in conjunction with Service, state, county, and tribal water agencies, conservation districts, and interested non-profits groups, should provide outreach and education regarding conservation measures included in this SLOPES to encourage use of these practices to reduce impacts to riverine habitat for all species.

O. REINITIATION NOTICE

This concludes formal consultation with the Corps regarding the effects of these SLOPES on bull trout, bull trout critical habitat, Kootenai River white sturgeon and Kootenai River white sturgeon critical habitat. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if:

(1) the amount or extent of incidental take is exceeded;

(2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion;

(3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or

(4) a new species is listed or critical habitat designated that may be affected by the action.

In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation. The Service retains the discretion to determine whether the conditions listed in (1) through (4) have been met and reinitiation of formal consultation in required.

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APPENDIX A: STATUS OF THE SPECIES – BULL TROUT

This section provides information about the bull trout's life history, habitat preferences, geographic distribution, population trends, threats, and conservation needs. This includes description of the effects of past human activities and natural events that have led to the current status of the bull trout. This information provides the background for analyses in later sections of the biological opinion. The proposed and final listing rules contain a physical species description (USFWS 1998, 63 FR 31647; USFWS 1999, 64 FR 58910). Additional information can be found at https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=E065.

Listing Status and Current Range

The coterminous United States population of the bull trout (Salvelinus confluentus) was listed as threatened on November 1, 1999 (USFWS 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, p. 2; Brewin and Brewin 1997, p. 215; Cavender 1978, pp. 165-166; Leary and Allendorf 1997, pp. 716-719; USFWS 1998, 63 FR 31647; USFWS 1999, 64 FR 58910; USFWS 2010, 75 FR 2269; USFWS 2015, pg. 1).

The final listing rule for the United States coterminous population of the bull trout discusses the consolidation of five DPSs into one listed taxon and the application of the jeopardy standard in accordance with the requirements of section 7 of the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 et seq.), relative to this species, and established five interim recovery units for each of these DPSs for the purposes of Consultation and Recovery (USFWS 1999, 64 FR 58930).

Six draft recovery units were identified based on new information (USFWS 2010, 75 FR 63898) that confirmed they were needed to ensure a resilient, redundant, and representative distribution of bull trout populations throughout the range of the listed entity. The final Recovery Plan for the Coterminous Bull Trout Population (bull trout recovery plan) formalized these six recovery units (USFWS 2015, pg. 36-43) (see Figure 1). The final recovery units replace the previous five interim recovery units and will be used in the application of the jeopardy standard for Section 7 consultation proceedures.

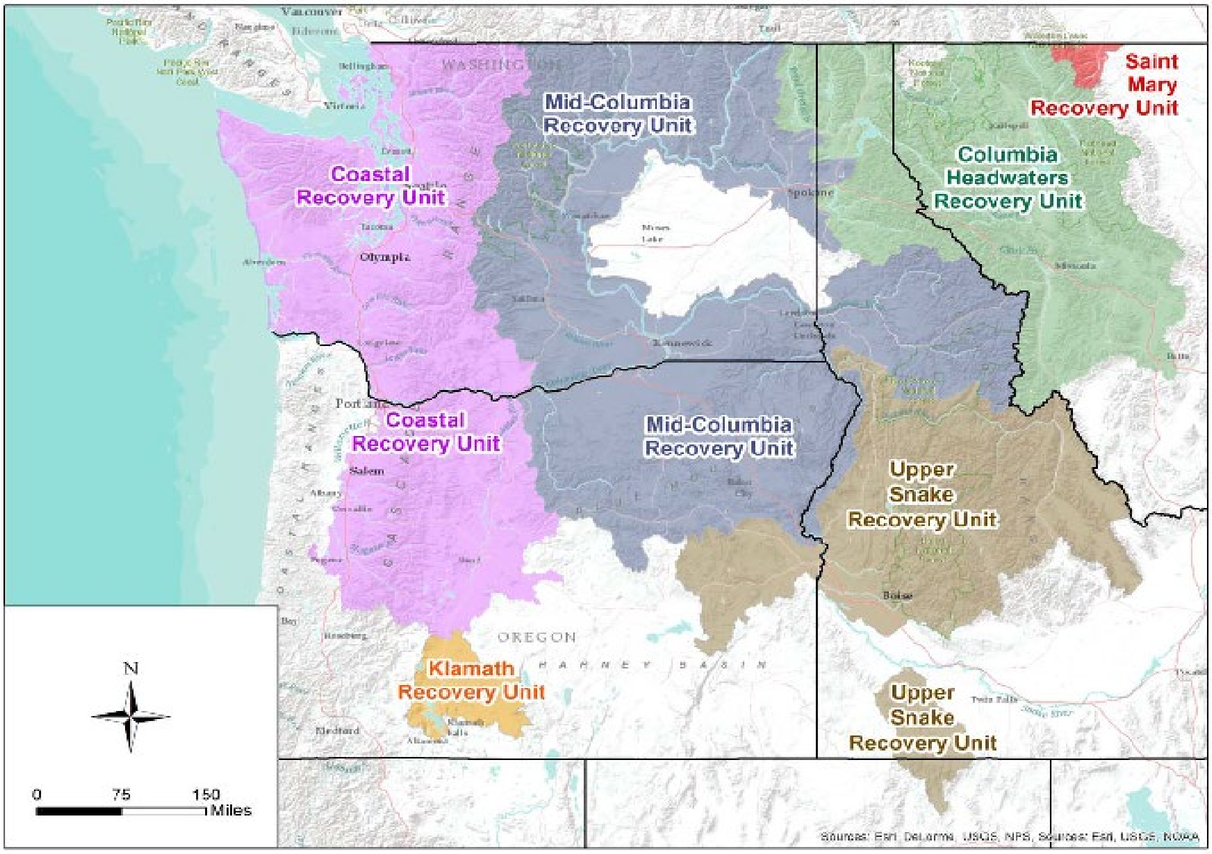

Figure 1. Locations of the six bull trout recovery units in the coterminous United States.

Reasons for Listing, Rangewide Trends and Threats

Throughout its range, the bull trout is threatened by the combined effects of habitat degradation, fragmentation, and alterations associated with dewatering, road construction and maintenance, mining, grazing, the blockage of migratory corridors by dams or other diversion structures, poor water quality; incidental angler harvest; entrainment (a process by which aquatic organisms are pulled through a diversion or other device) into diversion channels; and introduced non-native species (USFWS 1998, 63 FR 31647; USFWS 1999, 64 FR 58910). Poaching and incidental mortality of bull trout during other targeted fisheries are identified described in the bull trout recovery plan (see Threat Factors B and D) as additional threats (USFWS 2015, p. 150). Since the time of coterminous listing the species (USFWS 1999, 64 FR 58910) and designation of its critical habitat (USFWS 2004, 69 FR 59996; USFWS 2005b, 70 FR 56212; 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, entire), the bull trout core areas templates (USFWS 2005a, entire; USFWS 2009, entire), Conservation Status Assessment (USFWS 2005), and 5-year Reviews (USFWS 2008, entire; USFWS 2015g, entire) have provided additional information about threats and status. The final recovery plan lists other documents and meetings that compiled information about the status of bull trout (USFWS 2015, p. 3). As well, 2015 5-year review maintained the listing status as threatened based on the information compiled in the final bull trout recovery plan (USFWS 2015g, p.3) and the recovery unit implementation plans (RUIPs) (USFWS 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 (USFWS 2002, entire; USFWS 2004, entire; USFWS 2004a, entire) included detailed information on threats at the recovery unit scale (i.e. similar to subbasin or regional watersheds), thus incorporating the metapopulation concept with core areas and local populations. In the 2008, 5-year Review, the Service established threats categories (i.e. dams, forest management, grazing, agricultural practices, transportation networks, mining, development and urbanization, fisheries management, small populations, limited habitat, and wild fire.) (USFWS 2008, entire). In the final recovery plan, threats and recovery actions are described for 109 core areas, forage/migration and overwintering areas, historical core areas, and research needs areas in each of the six recovery units (USFWS 2015, p 10-11). Primary threats are described in three broad categories: Habitat, Demographic, and Nonnative Fish for all recovery areas described in the listed range of the species. The 2015 5-year status review (USFWS 2015g, entire) references the final recovery plan and the recovery unit implementation plans and incorporates by reference the threats described therein. Although significant recovery actions have been implemented since the time of listing, the 5-year review concluded that bull trout still meets the definition of a "threatened" species (USFWS 2015g, entire).

New or Emerging Threats

The final Recovery Plan for the Coterminous Bull Trout Population (USFWS 2015, pg. 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 (USFWS 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 (USFWS 2015, p. 48). The recovery plan further states that use of best available information will ensure future conservation efforts that offer the greatest long-term benefit to sustain bull trout and their required coldwater habitats (USFWS 2015, p. vii, and pp. 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, entire; Koopman et al. 2009, entire; PRBO Conservation Science 2011, entire). Lower flows as a result of smaller snowpack could reduce habitat, which might adversely affect bull trout reproduction and survival. Warmer water temperatures could lead to physiological stress and could also benefit nonnative fishes that prey on or compete with bull trout. Increases in the number and size of forest fires could also result from climate change (Westerling et al. 2006) and could adversely affect watershed function by resulting in faster runoff, lower base flows during the summer and fall, and increased sedimentation rates. Lower flows also may result in increased groundwater withdrawal for agricultural purposes and resultant reduced water availability in certain stream reaches occupied by bull trout (USFWS 2015b, p. B-10). Although all salmonids are likely to be affected by climate change, bull trout are especially vulnerable given that spawning and rearing are constrained by their location in upper watersheds and the requirement for cold water temperatures (Battin et al. 2007, pp. 6672-6673; Rieman et al. 2007, p. 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).

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, pp. 165-166; Bond 1992, p. 2). To the west, the bull trout's range includes Puget Sound, various coastal rivers of British Columbia, Canada, and southeast Alaska (Bond 1992, p. 2). Bull trout occur in portions of the Columbia River and tributaries within the basin, including its headwaters in Montana and Canada. Bull trout also occur in the Klamath River basin of south-central Oregon. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta and Montana and in the MacKenzie River system in Alberta and British Columbia, Canada (Cavender 1978, pp. 165-166; Brewin and Brewin 1997, entire).

Reproductive Biology

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

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, p. 30; Pratt 1985, pp. 28-34). The largest verified bull trout is a 32-pound specimen caught in Lake Pend Oreille, Idaho, in 1949 (Simpson and Wallace 1982, p. 95).

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

16; Pratt 1992, pp. 6-7; Rieman and McIntyre 1996, p. 133). Depending on water temperature, incubation is normally 100 to 145 days (Pratt 1992, p. 1). After hatching, fry remain in the substrate, and time from egg deposition to emergence may surpass 220 days. Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows (Pratt 1992, p. 1; Ratliff and Howell 1992, p. 10).

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

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

Population Structure

Bull trout exhibit both resident and migratory life history strategies. Both resident and migratory forms may be found together, and either form may produce offspring exhibiting either resident or migratory behavior (Rieman and McIntyre 1993, p. 2). Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. The resident form tends to be smaller than the migratory form at maturity and also produces fewer eggs (Goetz 1989, p. 15). Migratory bull trout spawn in tributary streams where juvenile fish rear 1 to 4 years before migrating to either a lake (adfluvial form), river (fluvial form) (Fraley and Shepard 1989, p. 138; Goetz 1989, p. 24), or saltwater (anadromous form) to rear as subadults and to live as adults (Brenkman and Corbett 2005, entire; McPhail and Baxter 1996, p. i; WDFW et al. 1997, p. 16). Bull trout normally reach sexual maturity in 4 to 7 years and may live longer than 12 years. They are iteroparous (they spawn more than once in a lifetime). Repeat- and alternate-year spawning has been reported, although repeat-spawning frequency and post-spawning mortality are not well documented (Fraley and Shepard 1989, p. 135; Leathe and Graham 1982, p. 95; Pratt 1992, p. 8; Rieman and McIntyre 1996, p. 133).

Bull trout are naturally migratory, which allows them to capitalize on temporally abundant food resources and larger downstream, and resident forms may develop where barriers (either natural or manmade) occur or where foraging, migrating, or overwintering habitats for migratory fish are minimized (Swanberg, 1997, entire; Brenkman and Corbett 2005, pp. 1075-1076; Goetz et al. 2004, p. 105, Starcevich et al 2012, entire; USFWS 2016, p. 170). For example, multiple life history forms (e.g., resident and fluvial) and multiple migration patterns have been noted in the Grande Ronde River (Baxter 2002, pp. 96, 98-106). Some river systems have retained habitat conditions that allow free movement between spawning and rearing areas and the mainstem Rivers. In these areas with connectivity bull trout can migrate between large rivers lakes, and spawning tributaries. Other migrations in Central Washington have shown that fluvial and adfluvial life forms travel long distances, migrate between core areas, and mix together in many locations where there is connectivity (Ringel et al 2014; Nelson and Nelle 2008). Such multiple life history strategies help to maintain the stability and persistence of bull trout populations to environmental changes. Benefits of connected habitat for migratory bull trout include greater growth in the more productive waters of larger streams, lakes, and marine waters; greater fecundity resulting in increased reproductive potential; and dispersing the population across space and time so that spawning streams may be recolonized should local populations suffer a catastrophic loss (Frissell 1999, pp. 861-863; MBTSG 1998, p. 13; Rieman and McIntyre 1993, pp. 2-3). In the absence of the migratory bull trout life form, isolated populations cannot be replenished when disturbances make local habitats temporarily unsuitable. Therefore, the range of the species is diminished, and the potential for a greater reproductive contribution from larger size fish with higher fecundity is lost (Rieman and McIntyre 1993, p. 2).

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

i. "Coastal", including the Deschutes River and all of the Columbia River drainage downstream, as well as most coastal streams in Washington, Oregon, and British Columbia. A compelling case also exists that the Klamath Basin represents a unique evolutionary lineage within the coastal group.
ii. "Snake River", which also included the John Day, Umatilla, and Walla Walla rivers. Despite close proximity of the John Day and Deschutes Rivers, a striking level of divergence between bull trout in these two systems was observed.
iii. "Upper Columbia River" which includes the entire basin in Montana and northern Idaho. A tentative assignment was made by Spruell et al. (2003, p. 25) of the Saskatchewan River drainage populations (east of the continental divide), grouping them with the upper Columbia River group.

Spruell et al. (2003, p. 17) noted that within the major assemblages, populations were further subdivided, primarily at the level of major river basins. Taylor et al. (1999, entire) surveyed bull trout populations, primarily from Canada, and found a major divergence between inland and coastal populations. Costello et al. (2003, p. 328) suggested the patterns reflected the existence of two glacial refugia, consistent with the conclusions of Taylor and Costello (2006, pg. 1165-1170), Spruell et al. (2003, p. 26) and the biogeographic analysis of Haas and McPhail (2001, entire). Both Taylor et al. (1999, p. 1166) and Spruell et al. (2003, p. 21) concluded that the Deschutes River represented the most upstream limit of the coastal lineage in the Columbia River Basin.

More recently, the USFWS identified additional genetic units within the coastal and interior lineages (Ardren et al. 2011, p. 18). Based on a recommendation in the USFWS's 5-year review of the species' status (USFWS 2008, p. 45), the USFWS reanalyzed the 27 recovery units identified in the 2002 draft bull trout recovery plan (USFWS 2002, p. 48) by utilizing, in part, information from previous genetic studies and new information from additional analysis (Ardren et al. 2011, entire). In this examination, the USFWS applied relevant factors from the joint USFWS and NMFS Distinct Population Segment (DPS) policy (USFWS 1996, entire) 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 (USFWS 2010, p. 63898). These six recovery units, adopted in the final bull trout recovery plan (USFWS 2015) and described further in the RUIPs (USFWS 2015a-f) include: Coastal, Klamath, Mid-Columbia, Columbia Headwaters, Saint Mary, and Upper Snake. A number of additional genetic analyses within core areas have been completed to understand uniqueness of local populations (Hawkins and Van Barren 2006, 2007; Small et al. 2009; DeHann and Neibauer 2012).

Population Dynamics

Although bull trout are widely distributed over a large geographic area, they exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993, p. 4). Increased habitat fragmentation reduces the amount of available habitat and increases isolation from other populations of the same species (Saunders et al. 1991, entire). Burkey (1989, entire) concluded that when species are isolated by fragmented habitats, low rates of population growth are typical in local populations and their probability of extinction is directly related to the degree of isolation and fragmentation. Without sufficient immigration, growth for local populations may be low and probability of extinction high (Burkey 1989, entire; Burkey 1995, entire).

Metapopulation concepts of conservation biology theory have been suggested relative to the distribution and characteristics of bull trout, although empirical evidence is relatively scant (Rieman and McIntyre 1993, p. 15; Dunham and Rieman 1999, entire; Rieman and Dunham 2000, entire). A metapopulation is an interacting network of local populations with varying frequencies of migration and gene flow among them (Meffe and Carroll 1994, pp. 189-190). For inland bull trout, metapopulation theory is likely most applicable at the watershed scale where habitat consists of discrete patches or collections of habitat capable of supporting local populations; local populations are for the most part independent and represent discrete reproductive units; and long-term, low-rate dispersal patterns among component populations influences the persistence of at least some of the local populations (Rieman and Dunham 2000, entire). Ideally, multiple local populations distributed throughout a watershed provide a mechanism for spreading risk because the simultaneous loss of all local populations is unlikely. However, habitat alteration, primarily through the construction of impoundments, dams, and water diversions has fragmented habitats, eliminated migratory corridors, and in many cases isolated bull trout in the headwaters of tributaries (Rieman and Clayton 1997, pp. 10-12; Dunham and Rieman 1999, p. 645; Spruell et al. 1999, pp. 118-120; Rieman and Dunham 2000, p. 55).

Human-induced factors as well as natural factors affecting bull trout distribution have likely limited the expression of the metapopulation concept for bull trout to patches of habitat within the overall distribution of the species (Dunham and Rieman 1999, entire). However, despite the theoretical fit, the relatively recent and brief time period during which bull trout investigations have taken place does not provide certainty as to whether a metapopulation dynamic is occurring (e.g., a balance between local extirpations and recolonizations) across the range of the bull trout or whether the persistence of bull trout in large or closely interconnected habitat patches (Dunham and Rieman 1999, entire) is simply reflective of a general deterministic trend towards extinction of the species where the larger or interconnected patches are relics of historically wider distribution (Rieman and Dunham 2000, pp. 56-57). Research does, however, provide genetic evidence for the presence of a metapopulation process for bull trout, at least in the Boise River Basin of Idaho (Whiteley et al. 2003, entire), while Whitesel et al. identifies that bull trout fit the metapopulation theory in several ways (Whitesel et al, 2004, p. 18-21).

Habitat Characteristics

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

Bull trout have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993, p. 4). Habitat components that influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrate, and migratory corridors (Fraley and Shepard 1989, entire; Goetz 1989, pp. 23, 25; Hoelscher and Bjornn 1989, pp. 19, 25; Howell and Buchanan 1992, pp. 30, 32; Pratt 1992, entire; Rich 1996, p. 17; Rieman and McIntyre 1993, pp. 4-6; Rieman and McIntyre 1995, entire; Sedell and Everest 1991, entire; Watson and Hillman 1997, entire). Watson and Hillman (1997, pp. 247-250) concluded that watersheds must have specific physical characteristics to provide the habitat requirements necessary for bull trout to successfully spawn and rear and that these specific characteristics are not necessarily present throughout these watersheds. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993, pp. 4-6), bull trout should not be expected to simultaneously occupy all available habitats.

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

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

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

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

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

Diet

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy. Fish growth depends on the quantity and quality of food that is eaten, and as fish grow their foraging strategy changes as their food changes, in quantity, size, or other characteristics (Quinn 2005, pp. 195-200). Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, and small fish (Boag 1987, p. 58; Donald and Alger 1993, pp. 242-243; Goetz 1989, pp. 33-34). Subadult and adult migratory bull trout generally feed on various fish species (Donald and Alger 1993, pp. 241-243; Fraley and Shepard 1989, pp. 135, 138; Leathe and Graham 1982, pp. 13, 50-56). Bull trout of all sizes other than fry have been found to eat fish half their length (Beauchamp and VanTassell 2001, p. 204). In nearshore marine areas of western Washington, bull trout feed on Pacific herring (*Clupea pallasi*), Pacific sand lance (*Ammodytes hexapterus*), and surf smelt (*Hypomesus pretiosus*) (Goetz et al. 2004, p. 105; WDFW et al. 1997, p. 23).

Bull trout migration and life history strategies are closely related to their feeding and foraging strategies and their environment. Migration allows bull trout to access optimal foraging areas and exploit a wider variety of prey resources both within and between core areas. Connectivity between the spawning, rearing, overwintering, and forage areas maintains this diversity. There have been recent studies documenting movement patterns in the Columbia River basin that document long distance migrations (Borrows et al 2016, entire; Schaller et al 2014, entire; USFWS 2016, entire). For example, a data report documented a juvenile bull trout from the Entiat made over a 200-mile migration between spawning grounds in the Entiat River to foraging and overwintering areas in Columbia and Yakima River near Prosser Dam (PTAGIS 2015, Tag Code 3D9.1C2CCD42DD). As well, 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, p. 25). Anadromous bull trout also use marine waters as migration corridors to reach seasonal habitats in non-natal watersheds to forage and possibly overwinter (Brenkman and Corbett 2005, pp. 1078-1079; Goetz et al. 2004, entire).

Conservation Needs

The 2015 recovery plan for bull trout established the primary strategy for recovery of bull trout in the coterminous United States: (1) conserve bull trout so that they are geographically widespread across representative habitats and demographically stable 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 (USFWS 2015, p. 24.) .

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

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

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

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

> 1. Protect, restore, and maintain suitable habitat conditions for bull trout;
>
> 2. Minimize demographic threats to bull trout by restoring connectivity or populations where appropriate to promote diverse life history strategies and conserve genetic diversity;
>
> 3. Prevent and reduce negative effects of nonnative fishes and other nonnative taxa on bull trout;
>
> 4. and result in actively working with partners to conduct research and monitoring to implement and evaluate bull trout recovery activities, consistent with an adaptive management approach using feedback from implemented, site-specific recovery tasks, and considering the effects of climate change (USFWS 2015, p. 50-51).

Bull trout recovery is based on a geographical hierarchical approach. Bull trout are listed as a single DPS within the five-state area of the coterminous United States. The single DPS is subdivided into six biological-based recovery units: (1) Coastal Recovery Unit; (2) Klamath Recovery Unit; (3) Mid-Columbia Recovery Unit; (4) Upper Snake Recovery Unit; (5) Columbia Headwaters Recovery Unit; and (6) Saint Mary Recovery Unit (USFWS 2015, p. 23). A viable recovery unit should demonstrate that the three primary principles of biodiversity have been met: representation (conserving the genetic makeup of the species); resiliency (ensuring that each population is sufficiently large to withstand stochastic events); and redundancy (ensuring a sufficient number of populations to withstand catastrophic events) (USFWS 2015, p. 33).

Each of the six recovery units contain multiple bull trout recovery areas which are non-overlapping watershed-based polygons, and each core area includes one or more local population. Currently there are 109 occupied core areas, which comprise 611 local populations (USFWS 2015, p. 3, Appendix F). There are also six core areas where bull trout historically occurred but are now extirpated, and one research needs area where bull trout were known to occur historically, but their current presence and use of the area are uncertain (USFWS 2015, p. 3, Appendix F). Core areas can be further described as complex or simple (USFWS 2015, p. 3-4). Complex core areas contain multiple local bull trout populations, are found in large watersheds, have multiple life history forms, and have migratory connectivity between spawning and rearing habitat and foraging, migration, and overwintering habitats (FMO). Simple core areas are those that contain one bull trout local population. Simple core areas are small in scope, isolated from other core areas by natural barriers, and may contain unique genetic or life history adaptations.

A core area is a combination of core habitat (i.e., habitat that could supply all elements for the long-term security of bull trout) and a core population (a group of one or more local bull trout populations that exist within core habitat) and constitutes the basic unit on which to gauge recovery within a recovery unit. Core areas require both habitat and bull trout to function, and the number (replication) and characteristics of local populations inhabiting a core area provide a relative indication of the core area's likelihood to persist. A core area represents the closest approximation of a biologically functioning unit for bull trout. Core areas are presumed to reflect the metapopulation structure of bull trout.

A local population is a group of bull trout that spawn within a particular stream or portion of a stream system (USFWS 2015, p. 73). A local population is considered to be the smallest group of fish that is known to represent an interacting reproductive unit. For most waters where specific information is lacking, a local population may be represented by a single headwater tributary or complex of headwater tributaries. Gene flow may occur between local populations (*e.g.*, those within a core population), but is assumed to be infrequent compared with that among individuals within a local population.

Population Units

The final recovery plan (USFWS 2015) designates six bull trout recovery units as described above. These units replace the 5 interim recovery units previously identified (USFWS 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 (USFWS 2015), 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 (RUIPs)(USFWS 2015a-f), which identify recovery actions and conservation 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 numbers and distribution, as well as its genetic and phenotypic diversity, all of which are important to ensure the species' resilience to changing environmental conditions. For more details on Federal, State, and tribal conservation actions in this unit see the actions since listing, contemporaneous actions, and environmental baseline discussions below.

Coastal Recovery Unit

The Coastal RUIP describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015a, entire). The Coastal Recovery Unit is divided into three Geographic 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. This recovery unit also has four historically occupied core areas that could be re-established (USFWS 2015, p. 47; USFWS 2015a, p. A-2).

Although population strongholds do exist across the three regions, populations in the Puget Sound region generally have better demographic status while the Lower Columbia River region exhibits the least robust demography (USFWS 2015a, p. A-6). 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 allow for the continued natural population dynamics in which the core areas have evolved (USFWS 2015a, p. A-5). 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 (USFWS

2015, p.79; USFWS 2015a, p. A-3). These are the most stable and abundant bull trout populations in the recovery unit. The Puget Sound region supports at least two core areas containing a natural adfluvial life history.

The demographic status of the Puget Sound populations is better in northern areas. Barriers to migration in the Puget Sound region are few, and significant amounts of headwater habitat occur in protected areas (USFWS 2015a, p. A-7). 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 nearshore marine habitats, development and related impacts (e.g., flood control, floodplain disconnection, bank armoring, channel straightening, loss of instream habitat complexity), agriculture (e.g., diking, water control structures, draining of wetlands, channelization, and the removal of riparian vegetation, livestock grazing), fish passage (e.g., dams, culverts, instream flows) residential development, urbanization, forest management practices (e.g., timber harvest and associated road building activities), connectivity impairment, mining, and the introduction of non-native species (USFWS 2015a, p. A-1 – A-25). Conservation measures or recovery actions implemented or ongoing include relicensing of major hydropower facilities that have provided upstream and downstream fish passage or complete removal of dams, land acquisition to conserve bull trout habitat, floodplain restoration, culvert removal, riparian revegetation, levee setbacks, road removal, and projects to protect and restore important nearshore marine habitats (USFWS 2015a, p. A-33 – A-34).

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 (USFWS 2015b, entire). 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 (USFWS 2015, p. 39). This recovery unit currently contains three core areas and eight local populations (USFWS 2015, p. 47; USFWS 2015b, p. B-1). Nine historic local populations of bull trout have become extirpated (USFWS 2015b, p. B-1). All three core areas have been isolated from other bull trout populations for the past 10,000 years (USFWS 2015b, p. B-3). 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 (UFWS 2015b, p. B-13 – B-14). Conservation measures or recovery actions implemented or ongoing 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, culver replacement, and habitat restoration (USFWS 2015b, p. B-10 – B-11).

Mid-Columbia Recovery Unit

The Mid-Columbia RUIP describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015c, entire). 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, two historically occupied core areas, one research needs area, and seven FMO habitats (USFWS 2015, p. 47; USFWS 2015c, p. C-1 – C-4). 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 (USFWS 2015c, p. C-9 – C-34). Conservation measures or recovery actions implemented or ongoing include road removal, channel restoration, mine reclamation, improved grazing management, removal of fish barriers, and instream flow requirements (USFWS 2015c, C-37 – C-40).

Columbia Headwaters Recovery Unit

The Columbia headwaters RUIP describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015d). 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 (USFWS 2015d, p. D-2 – D-4). 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 (USFWS 2015d, p. D-1). Fish passage improvements within the recovery unit have reconnected some previously fragmented habitats (USFWS 2015d, p. D-42), while others remain fragmented. Unlike other recovery units in Washington, Idaho and Oregon, the Columbia Headwaters Recovery Unit does not have any anadromous fish overlap (USFWS 2015d, p. D-42). Therefore, bull trout within the Columbia Headwaters Recovery Unit do not benefit from the recovery actions for salmon (USFWS 2015d, p. D-42). The current condition of the bull trout in this recovery unit is attributed to the adverse effects of climate change, mostly historical mining and contamination by heavy metals, expanding populations of nonnative fish predators and competitors, modified instream flows, migratory barriers (e.g., dams), habitat fragmentation, forest practices (e.g., logging, roads), agriculture practices (e.g. irrigation, livestock grazing), and residential development (USFWS 2015d, p. D-10 – D-25). Conservation measures or recovery actions implemented or ongoing include habitat improvement, fish passage, and removal of nonnative species (USFWS 2015d, p. D-42 – D-43).

Upper Snake Recovery Unit

The Upper Snake RUIP describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015e, entire). 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, with over 70 percent being present in the Salmon River Region (USFWS 2015, p. 47; USFWS 2015e, p. E-1 – E-2). 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) (USFWS 2015e, p. E-15 – E-18). Conservation measures or recovery actions implemented or ongoing include instream habitat restoration, instream flow requirements, screening of irrigation diversions, and riparian restoration (USFWS 2015e, p. E-19 – E-20).

St. Mary Recovery Unit

The St. Mary RUIP describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015f). 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 (USFWS 2015f, p. F-1) 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 (USFWS 2015f, p. F-7 – F-8). The primary issue precluding bull trout recovery in this recovery unit relates to impacts of water diversions, specifically at the Bureau of Reclamations Milk River Project (USFWS 2015f, p. F-5). Conservation measures or recovery actions implemented or ongoing are not identified in the St. Mary RUIP; however, the USFWS is conducting interagency and tribal coordination to accomplish conservation goals for the bull trout (USFWS 2015f, p. F-9)

Federal, State and Tribal Actions Since Listing

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

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

At sites that are vulnerable to development, protection of land through fee title acquisition or conservation easements is important to prevent adverse impacts or allow conservation actions to be implemented. In several bull trout core areas, it is necessary to continue ongoing fisheries management efforts to suppress the effects of non-native fish competition, predation, or hybridization; particularly brown trout, brook trout, lake trout, and northern pike (Fredenberg et al. 2007; DeHaan et al. 2010, entire; DeHaan and Godfrey 2009, entire; Fredericks and Dux

2014; Rosenthal and Fredenberg 2017). A more comprehensive overview of conservation successes from 1999-2013, described for each recovery unit, is found in the Summary of Bull Trout Conservation Successes and Actions since 1999 (Available at: (http://www.fws.gov/pacific/ecoservices/endangered/recovery/documents/USFWS_2013_summary_of_conservation_successes.pdf).

Projects that have undergone ESA section 7 consultation have occurred throughout the range of bull trout. Singly or in aggregate, these projects could affect the species' status. The Service has conducted periodic reviews of prior Federal "consulted-on" actions. A detailed discussion of consulted-on effects in the proposed action area is provided in the environmental baseline section below.

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APPENDIX B: STATUS OF CRITICAL HABITAT – BULL TROUT

Legal Status

Current Designation

The Service published a final critical habitat designation for the coterminous United States population of the bull trout on October 18, 2010 (70 FR 63898); the rule became effective on November 17, 2010. Critical habitat is defined as the specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery. Designated critical CHUs for the bull trout are described in Figure 1. A justification document describes occupancy and the rationale for why these habitat areas are essential for the conservation of bull trout was developed to support the rule and is available on our website (https://www.fws.gov/pacific/bulltrout/crithab/Jusitfication%20Docs.html).

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

Table B-1. Stream/shoreline distance and reservoir/lake area designated as bull trout critical habitat by state.

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

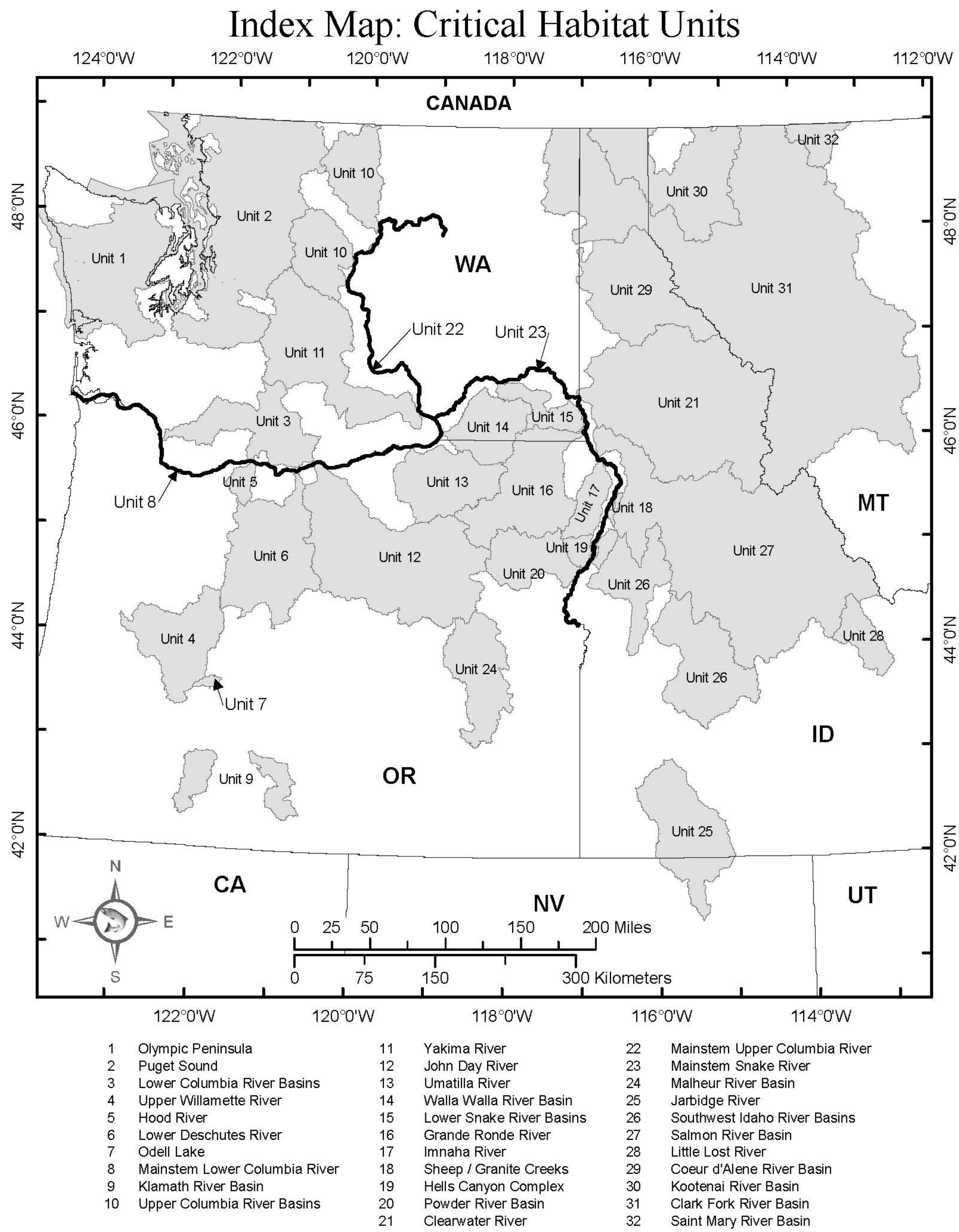

Figure 1. Index map of bull trout designated critical habitat units.

This rule also identifies and designates as critical habitat approximately 1,323.7 km (822.5 miles) of streams/shorelines and 6,758.8 ha (16,701.3 acres) of lakes/reservoirs of unoccupied habitat to address bull trout conservation needs in specific geographic areas in several areas not occupied at the time of listing. 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.

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. Fewer than 2,000 stream miles and 20,000 acres of lake and reservoir surface area were excluded from the designation of critical habitat. It is important to note that the exclusion of waterbodies from designated critical habitat does not negate or diminish their importance for bull trout conservation, nor reduce authorities that protect the species under the ESA. Because exclusions reflect the often complex pattern of land ownership, designated critical habitat is often fragmented and interspersed with excluded stream segments.

Conservation Role and Description of Critical Habitat

The conservation role of bull trout critical habitat is to support viable core area populations (75 FR 63898:63943 [October 18, 2010]). 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 shown in Figure 1, thirty-two CHUs within the geographical area occupied by the species at the time of listing are designated under the final critical habitat 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 biological features associated with Primary Constituent Elements (PCEs) 5 and 6, which relate to breeding habitat.

The primary function of individual CHUs is to maintain and support core areas, which 1) contain bull trout populations with the demographic characteristics needed to ensure their persistence and contain the habitat needed to sustain those characteristics (Rieman and McIntyre 1993, p. 19); 2) provide for persistence of strong local populations, in part, by providing habitat conditions that encourage movement of migratory fish (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 (Hard 1995, pp. 314-315; Healey and Prince 1995, p. 182; 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 (Hard 1995, pp. 321-322; 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, overwintering, and migration.

Primary Constituent Elements for Bull Trout Critical Habitat

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

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

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

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

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

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

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

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

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

9. Sufficiently low levels of occurrence of non-native predatory (e.g., lake trout, 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.

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

Note that only PCEs 2, 3, 4, 5, and 8 apply to marine nearshore waters identified as critical habitat. Also, lakes and reservoirs within the CHUs also contain most of the physical or biological features necessary to support bull trout, with the exception of those associated with PCEs 1 and 6. Additionally, all except PCE 6 apply to FMO habitat designated as critical habitat.
Critical habitat designated within each CHU includes the stream channels within the designated stream reaches and has a lateral extent as defined by the bankfull elevation on one bank to the bankfull elevation on the opposite bank. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain and is reached at a discharge that generally has a recurrence interval of 1 to 2 years on the annual flood series. If bankfull elevation is not evident on either bank, the ordinary high-water line must be used to determine the lateral extent of critical habitat. The lateral extent of designated lakes is defined by the perimeter of the waterbody as mapped on standard 1:24,000 scale topographic maps. The Service assumes in many cases this is the full-pool level of the waterbody. In areas where only one side of the waterbody is designated (where only one side is excluded), the mid-line of the waterbody represents the lateral extent of critical habitat.

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

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

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

Current Critical Habitat Condition Rangewide

The condition of bull trout critical habitat varies across its range from poor to good. Although still relatively widely distributed across its 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 decline of bull trout is primarily due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices, impoundments, dams, water diversions, and the introduction of nonnative species (63 FR 31647, June 10 1998; 64 FR 17112, April 8, 1999).

There is widespread agreement in the scientific literature that many factors related to human activities have impacted bull trout habitat function, 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; and 5) degradation of FMO habitat resulting from reduced prey base, roads, agriculture, development, and dams.

Effects of Climate Change on Bull Trout Critical Habitat

One objective of the final rule was to identify and protect those habitats that provide resiliency for bull trout use in the face of climate change. Over a period of decades, climate change may directly threaten the integrity of the essential 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). For more discussion regarding impacts of climate change, see the status of the species and environmental baseline sections.

Consulted on Effects to Critical Habitat

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

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APPENDIX C: STATUS OF THE SPECIES AND CRITCAL HABITAT – KOOTENAI RIVER WHITE STURGEON

Kootenai River White Sturgeon

Listing Status

On June 11, 1992, the Service received a petition from the Idaho Conservation League, North Idaho Audubon, and the Boundary Backpackers to list the Kootenai sturgeon as threatened or endangered under the Act. The petition cited lack of natural flows affecting juvenile recruitment as the primary threat to the continued existence of the wild Kootenai River white sturgeon (Kootenai sturgeon) population. Pursuant to section 4(b)(A) of the Act, the Service determined that the petition presented substantial information indicating that the requested action may be warranted, and published this finding in the Federal Register on April 14, 1993 (58 FR 19401).

A proposed rule to list the Kootenai sturgeon as endangered was published on July 7, 1993 (58 FR 36379), with a final rule following on September 6, 1994 (59 FR 45989).

Reasons for Listing

The Kootenai sturgeon is threatened by habitat modifications in the form of a significantly altered annual hydrograph. Significant levels of natural recruitment ceased after 1974, which coincides with commencement of Libby Dam operations. Other potential threats to the Kootenai sturgeon include removal of side-channel habitats; changes in water chemistry, including elevated heavy metal concentration; and a loss of nutrient inputs from flooding. Paragamian (2002) reported that "Reduced productivity because of [a] nutrient sink effect in Lake Koocanusa, river regulation, the lack of flushing flows, power peaking and changes in river temperature may have led to changes in fish community structure." Changes in the fish community structure may have favored an increase in fish species that prey on Kootenai sturgeon eggs and free-embryos. Changes in the hydrograph, particularly from Libby Dam and the Corra Linn Dam (in Canada), have altered Kootenai sturgeon spawning, egg incubation, and rearing habitats, and reduced overall biological productivity of the Kootenai River. These indirect factors may be adversely affecting the free-swimming life stages of the Kootenai sturgeon.

Species Description

Kootenai sturgeon are included in the family Acipenseridae, which consists of 4 genera and 24 species of sturgeon. Eight species of sturgeon occur in North America with Kootenai sturgeon being one of the five species in the genus *Acipenser*. Kootenai sturgeon are a member of the species *Acipenser transmontanus*.

White sturgeon were first described by Richardson in 1863 from a single specimen collected in the Columbia River near Fort Vancouver, Washington (Scott and Crossman 1973, as cited in NWPCC, 2005). White sturgeon are distinguished from other Acipenser by the specific arrangement and number of scutes (bony plates) along the body (NWPCC, 2005). The largest white sturgeon on record, weighing approximately 1,500 pounds was taken from the Snake River near Weiser, Idaho in 1898 (Simpson and Wallace 1982). The largest white sturgeon reported among Kootenai sturgeon was a 159 kilogram (350-pound) individual, estimated at 85 to 90 years of age, captured in Kootenay Lake during September 1995 (RL&L 1999). White sturgeon are generally long-lived, with females living from 34 to 70 years (PSMFC 1992).

Life History

As noted in the Kootenai Sturgeon Recovery Plan (Service 1999), Kootenai sturgeon are considered opportunistic feeders. Partridge (1983) found Kootenai sturgeon more than 70 centimeters (28 inches) in length feeding on a variety of prey items including clams, snails, aquatic insects, and fish. Andrusak (pers. comm., 1993) noted that kokanee (*Oncorhynchus nerka*) in Kootenay Lake, prior to a dramatic population crash beginning in the mid-1970's, were once considered an important prey item for adult Kootenai sturgeon.

In the spring, reproductively active Kootenai sturgeon respond to increasing river depth and flows by ascending the Kootenai River. Historically (prior to Libby Dam construction and operation), spawning areas for Kootenai sturgeon were reported to be in the roughly one mile stretch of the Kootenai River below Kootenai Falls (RM 309.7) (Corps 1971; MFWP 1974). However, Kootenai sturgeon monitoring programs conducted from 1990 through 1995 revealed that during that five year period, sturgeon spawned within an 11.2 RM reach of the Kootenai River, from Bonners Ferry downstream to below Shorty's Island (RM 143.0). Through 2018, most spawning continues to occur downstream of Bonners Ferry over sandy substrates. As river flow and stage increase, Kootenai sturgeon spawning tends to occur further upstream, near the gravel substrates which now occur at and upstream of Bonners Ferry (Paragamian et al. 1997). Although about a third of Kootenai sturgeon in spawning condition migrate upstream to the Bonners Ferry area annually, few remain there to spawn (Paragamian et al. 1997; Rust and Wakkinen 2013). Kootenai sturgeon have spawned in water ranging in temperature from 37.3 to 55.4° F. However, most Kootenai sturgeon spawn when the water temperature is near 50° F (Paragamian et al. 1997).

The size or age at first maturity for Kootenai sturgeon in the wild is quite variable (PSMFC 1992). In the Kootenai River system, females have been estimated (based upon age-length relationships) to mature at age 30 and males at age 28 (Paragamian et al. 2005). Only a portion of Kootenai sturgeon are reproductive or spawn each year, with the spawning frequency for females estimated at 4 to 6 years (Paragamian et al. 2005). Spawning occurs when the physical environment permits egg development and cues ovulation. Kootenai sturgeon spawn during the period of historical peak flows, from May through July (Apperson and Anders 1991; Marcuson 1994). Spawning at near peak flows with high water velocities disperses and prevents clumping of the adhesive, demersal (sinking) eggs.

Following fertilization, eggs adhere to the rocky riverbed substrate and hatch after a relatively brief incubation period of 8 to 15 days, depending on water temperature (Brannon et al. 1985). Here they are afforded cover from predation by high near-substrate water velocities and ambient water turbidity, which preclude efficient foraging by potential predators.

Upon hatching the embryos become “free-embryos” (that life stage after hatching through active foraging larvae with continued dependence upon yolk materials for energy). Free-embryos initially undergo limited downstream redistribution(s) by swimming up into the water column and are then passively redistributed downstream by the current. This redistribution phase may last from one to six days depending on water velocity (Brannon et al. 1985; Kynard and Parker 2005). The inter-gravel spaces in the substrate provide shelter and cover during the free-embryo "hiding phase".

As the yolk sac is depleted, free-embryos begin to increase feeding, and ultimately become free-swimming larvae, entirely dependent upon forage for food and energy. Because the larvae are free-swimming, they are less dependent upon rocky substrate or high water velocity for survival (Brannon et al. 1985; Kynard and Parker, 2005). The timing of these developmental events is dependent upon water temperature. With water temperatures typical of the Kootenai River, free-embryo Kootenai sturgeon may require more than seven days post-hatching to develop a mouth and be able to ingest forage. At 11 or more days, Kootenai sturgeon free-embryos would be expected to have consumed much of the energy from yolk materials, and they become increasingly dependent upon active foraging.

The duration of the passive redistribution of post-hatching free-embryos, and consequently the linear extent of redistribution, depends upon near substrate water velocity, where free-embryos enter the hiding phase earlier when river currents are higher (Brannon et al. 1985). This adaptive behavior prevents prolonged exposure of free-embryos to potential predators (Brannon et al. 1985). Working with Kootenai sturgeon, Kynard and Parker (2005) found that under some circumstances this dispersal phase may last for up to 6 days. A prolonged dispersal phase among free-embryos would increase the risk of predation on the embryo and diminish energy reserves, whereas entering the hiding phase earlier would reduce these risks. Multiple years of field sampling of juveniles and adults indicates that juvenile and adult Kootenai sturgeon primarily rear in the lower Kootenai River and in Kootenay Lake (Flory 2011).

Population Dynamics and Viability

Paragamian et al. (2005) indicated that the wild population of Kootenai sturgeon consists of an aging cohort of large, old fish. In 2019, an Interim Progress Report from IDFG estimated that the wild adult Kootenai sturgeon population abundance had declined from approximately 2,072 individuals in 2011 to 1,744 individuals (confidence interval 1,232-2,182) in 2017 (Hardy and McDonnell unpublished report 2019). Annual survival rates (estimated by mark-recapture analysis) are estimated to be approximately 96 percent. These latest estimates are the most current information available and constitute the best available science on the abundance and survival of wild adult Kootenai sturgeon.

Beamesderfer et al. (2014) found that "very low levels of natural recruitment continue to be documented based on low sample numbers of juvenile fish". The same analysis also showed that applying capture probabilities (from capture of hatchery fish) indicates that approximately 13 wild juveniles are recruited into the population annually. This suggests that high levels of mortality are now occurring in habitats used for egg incubation and free-embryo development, which are unlikely to sustain a wild population of the Kootenai sturgeon. Natural reproduction at this level cannot be expected to provide any population level benefits (Anders 2017), nor would reproduction at this level have been adequate to sustain the population of 6,000 to 8,000 sturgeon estimated to exist in 1980 (Anders 2017). The last year of significant natural recruitment was 1974.

Distribution

The Kootenai sturgeon is one of 18 landlocked populations of white sturgeon known to occur in western North America (Service 1999). Kootenai sturgeon occur in Idaho, Montana, and British Columbia and are restricted to approximately 167.7 RM of the Kootenai River extending from Kootenai Falls, Montana (31 RM below Libby Dam, Montana), downstream through Kootenay Lake to Corra Linn Dam, which was built on Bonnington Falls at the outflow from Kootenay Lake in British Columbia (RM 16.3). Approximately 45 percent of the species' range is located within British Columbia.

Bonnington Falls in British Columbia, a natural barrier downstream from Kootenay Lake, has isolated the Kootenai sturgeon since the last glacial advance roughly 10,000 years ago (Apperson 1992). Apperson and Anders (1990; 1991) found that at least 36 percent (7 of 19) of the Kootenai sturgeon tracked during 1989 overwintered in Kootenay Lake. Adult Kootenai sturgeon forage in and migrate freely throughout the Kootenai River downstream of Kootenai Falls at RM 193.9. Juvenile Kootenai sturgeon also forage in and migrate freely throughout the lower Kootenai River downstream of Kootenai Falls and within Kootenay Lake. Apperson and Anders (1990; 1991) observed that Kootenai sturgeon no longer commonly occur upstream of Bonners Ferry, Idaho. However, there are no structural barriers preventing Kootenai sturgeon from ascending the Kootenai River up to Kootenai Falls, and this portion of the range remains occupied as documented by Ireland (2005), Stephens et al. (2010), and Stephens and Sylvester (2011).

Conservation Needs

Based on the best scientific information currently available, the habitat needs for successful spawning and recruitment of Kootenai sturgeon are described below.

Water Velocity
High "localized" water velocity is one of the common factors of known sites where white sturgeon spawn and successfully recruit in the Columbia River Basin. Mean water velocities exceeding 3.3 feet/second (f/s) are important to spawning site selection. These water velocities provide: cover from predation; normal free-embryo behavior and redistribution; and shelter (living space) for eggs and free-embryos through the duration of the incubation period.

Water Depth
The best information currently available indicates that water depth is a factor affecting both migratory behavior and spawning site selection among Kootenai sturgeon.

Rocky Substrate
Rocky substrate and associated inter-gravel spaces provide both structural shelter and cover for egg attachment, embryo incubation, and normal free-embryo incubation and behavior involving downstream redistribution by the current.

Water Temperature/Quality
Suitable water and substrate quality are necessary for the viability of early life stages of Kootenai sturgeon, including both incubating eggs and free-embryos, and for normal breeding behavior.

Lower than normal water temperatures in the spawning reach may affect spawning behavior, location, and timing. Preferred spawning temperature for the Kootenai sturgeon is near 50 °F, and sudden drops of 3.5 to 5.5 °F cause males to become reproductively inactive, at least temporarily. Water temperatures also affect the duration of incubation of both embryos (eggs) and free-embryos.

Kootenai River White Sturgeon Critical Habitat

On September 6, 2001, the Service issued a final rule designating critical habitat for the Kootenai sturgeon (66 FR 46548). The critical habitat designation extends from ordinary high water line to ordinary high water line on the right and left banks, respectively, along approximately 11.2 miles of the mainstem Kootenai River from RM 141.4 to RM 152.6 in Boundary County, Idaho, Unit 2, Figure 1. On February 10, 2006, the Service issued an interim rule designating the braided reach (RM 152.6 to RM 159.7) as critical habitat (71 FR 6383), Unit 2, Figure 1. On June 9, 2008, the Service issued a final rule designating the braided reach as critical habitat (73 FR 39506). Both the meander and the braided reach are located entirely within Boundary County, Idaho, respectively downstream and upstream of Bonners Ferry. A total of 18.3 RM is designated as critical habitat for Kootenai sturgeon.

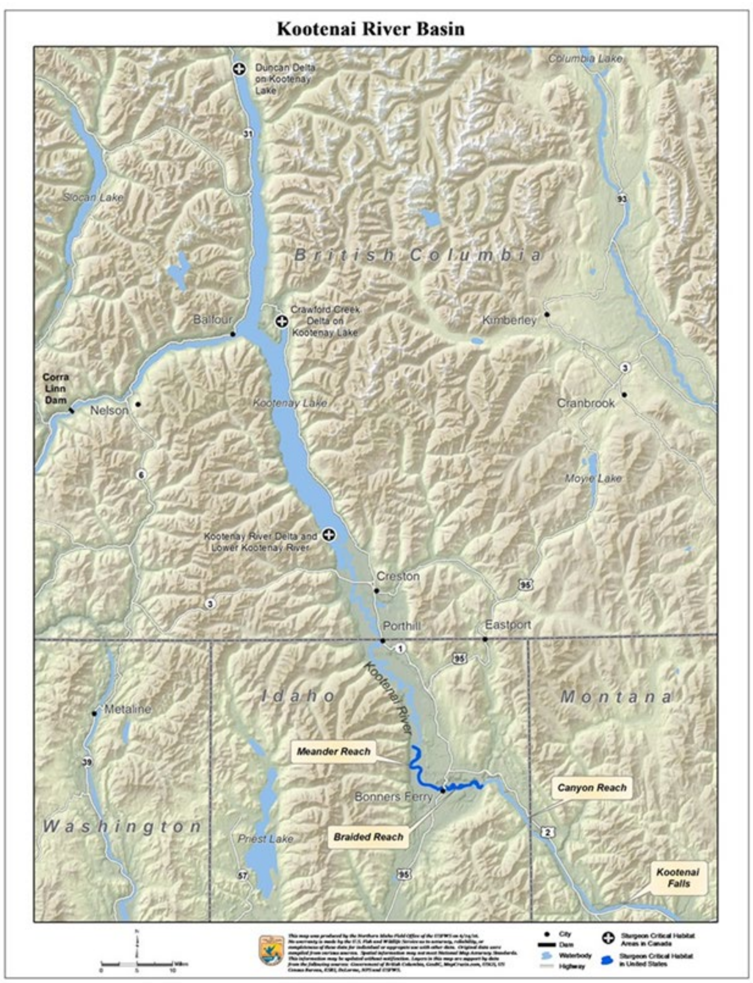

Figure 1. Geographic reaches within Kootenai sturgeon critical habitat

Primary Constituent Elements

Four PCEs are defined for Kootenai sturgeon critical habitat (73 FR 39506). These PCEs are specifically focused on adult migration, spawning site selection, and survival of embryos and free-embryos, the latter two of which are the life stages now identified as limiting the reproduction and numbers of the Kootenai sturgeon. The PCEs are defined as follows:

1. A flow regime, during the spawning season of May through June, that approximates natural variable conditions and is capable of producing depths of 23 feet (ft) (7 meters (m)) or greater when natural conditions (for example, weather patterns, water year) allow. The depths must occur at multiple sites throughout, but not uniformly within, the Kootenai River designated critical habitat.

2. A flow regime, during the spawning season of May through June, that approximates natural variable conditions and is capable of producing mean water column velocities of 3.3 feet/second (ft/s) (1.0 meters/second) or greater when natural conditions (for example, weather patterns, water year) allow. The velocities must occur at multiple sites throughout, but not uniformly within, the Kootenai River designated critical habitat.

3. During the spawning season of May through June, water temperatures between 47.3 and 53.6 °F (8.5 and 12 °C), with no more than a 3.6 °F (2.1 °C) fluctuation in temperature within a 24-hour period, as measured at Bonners Ferry.

4. Submerged rocky substrates in approximately 5 continuous river miles (8 river kilometers) to provide for natural free embryo redistribution behavior and downstream movement.

5. A flow regime that limits sediment deposition and maintains appropriate rocky substrate and inter-gravel spaces for sturgeon egg adhesion, incubation, escape cover, and free embryo development. Note: the flow regime described above under PCEs 1 and 2 should be sufficient to achieve these conditions.

Current Condition of Critical Habitat

Meander Reach

The meander reach is characterized by sandy substrate, a low water-surface gradient, a series of deep holes, and water velocities which rarely reach 3.3 ft/s. The morphology of the meander reach has changed relatively little over time (Barton 2004). Significant changes to this reach caused by the construction and operation of Libby Dam include: 1) a decrease in suspended sediment; 2) the initiation of cyclical aggradation and degradation of the sand riverbed in the center of the channel; 3) a reduction in water velocities (Barton 2004); and 4) reductions in floodplain interactions and riparian function, which negatively affect primary and secondary productivity in the river.

The upstream-most segment of the meander reach (approximately 0.6 RM in length) has rocky substrate and water velocities in excess of 3.3 ft/s under present river operations (Berenbrock 2005a). However, due to a reduction of average peak flows by over 50 percent caused by flood control operations of Libby Dam and the reduction of the average elevation of Kootenay Lake by approximately 7.2 ft (and the resultant backwater effect), the PCE for water depth is infrequently achieved in this reach of the Kootenai River (Berenbrock 2005a). A deep hole (49.9 ft) that is frequented by sturgeon in spawning condition exists near Ambush Rock at approximately RM 151.9 (Barton et al. 2005).

In 2014, as part of the Kootenai River Habitat Restoration Project, small patches (approximately 0.5 to 1.0 acre each) of rocky substrates were placed in documented spawning areas in the Shorty's Island (RM 143.6) and Myrtle Creek (RM 145.5) areas. Rocky substrates were also placed in the straight reach (RM 152) in 2016. These substrate enhancement projects were implemented as pilot projects to test whether the substrates would persist (i.e., remain clear of sand and silt) and whether Kootenai sturgeon would continue to spawn at those specific sites. Current monitoring of both the substrates and spawning sturgeon indicate that the pilot projects have been successful in those specific regards (KTOI 2016).

Braided Reach

The braided reach of the Kootenai River was selected for designation because it contains: 1) sites with seasonal availability of adequate water velocity in excess of 3.3 ft/s; and 2) rocky substrate necessary for normal spawning, embryo attachment and incubation, and normal free embryo dispersal, incubation and development. Within this reach, the valley broadens, and the river forms an intermediate-gradient braided reach as it courses through multiple shallow channels over gravel and cobbles (Barton 2004).

Similar to the 0.6 RM upstream-most segment of the meander reach, the lower end of the braided reach has also become shallower during the sturgeon reproductive period for the same reasons discussed above. Additionally, a loss of energy and bed load accumulation has resulted in a large portion of the middle of the braided reach becoming wider and shallower (Barton et al. 2005).

The net result of the changes described above may adversely affect Kootenai sturgeon in the following ways: 1) Kootenai sturgeon may generally avoid spawning in areas upstream of Bonners Ferry that have suitable rocky substrates; 2) Kootenai sturgeon may instead spawn at sites that have unsuitable substrates and low water velocity (i.e., the meander reach); 3) the loss of floodplain interaction and riparian function may negatively affect primary and secondary productivity in the river, thereby reducing available food sources during sturgeon early life stages. While suitable water depth is still achieved under current operations at the downstream end of the braided reach, significant special management is needed to adequately address the PCEs for substrate and water velocity in this area.

Beginning in 2011, multiple habitat restoration projects have been implemented in the braided reach, as part of the Kootenai River Habitat Restoration Program. Projects implemented to date include side channel restoration, bank stabilization, island construction, pool construction, construction of pool-forming structures, riparian restoration and enhancement, and floodplain reconnection and enhancement.

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APPENDIX D: Effects Screen for Projects Meeting SLOPES Requirements

Effects to Bull Trout

1. Project is outside of a bull trout HUC6, based on IPaC or list.
   a. Project stream is not directly connected to an occupied stream…………....**NO EFFECT**
   b. Project stream is directly connected to an occupied stream…..…........…**MAY AFFECT**

2. Project is within a bull trout HUC6, based on IPaC or list………………………....... **MAY AFFECT**
   a. Project is in an occupied lake…………………………………………...…………………………**NLAA**
   b. Project is in an unoccupied stream and directly connected to an occupied stream
      1. Project location is one mile or more from occupied stream…………..…**NLAA**
      2. Project location is less than one mile from occupied stream…………...…**LAA**
   c. Project is in an occupied stream……………………………………..……………………...…**LAA**

Effects to Bull Trout Critical Habitat

3. Project is not in designated critical habitat, based on critical habitat maps.
   a. Project stream is not directly connected to critical habitat…………………..….....**NO EFFECT**
   b. Project stream is directly connected to critical habitat………..…............…**MAY AFFECT**
      i. Project location is one mile or more from critical habitat…...…………..…..……….**NLAA**
      ii. Project location is less than one mile from critical habitat...……………..……...…**LAA**

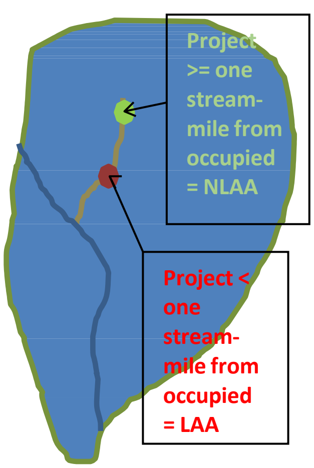
Effects Screen Illustration

No Effect: Project occurs outside of bull trout watersheds (based on IPaC or list) and project stream does not directly empty into an occupied stream (i.e., is not a primary tributary to an occupied stream, but may have a higher order connection).

NLAA: Project occurs in lake, reservoir or lake-like setting or in an unoccupied stream with direct downstream connectivity to an occupied stream and one stream-mile or more from the confluence with the occupied stream.

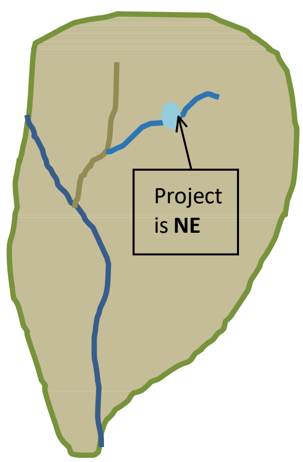
LAA: Project occurs in an occupied stream OR in an unoccupied stream with direct downstream connectivity to an occupied stream and less than one stream-mile from the confluence with the occupied stream.

HUC6 with bull trout present



Unoccupied streams with connectivity to occupied

HUC6 with NO bull trout present



Unoccupied stream with NO direct direct connectivity to occupied

APPENDIX E: Conservation Measures

1. 2017 Nationwide Permit Conditions
    a. Permit Specific Conditions - All actions covered under this SLOPES shall comply with all applicable Nationwide Permit specific conditions and limitations.
    b. General Conditions – All actions covered under this SLOPES shall comply with all applicable Nationwide Permit General Conditions.
    c. Regional Conditions – All actions covered under this SLOPES shall comply with all Regional Conditions applicable to the state where the action will occur and the NWP being used to authorize the project. The Regional Conditions for each state can be found at the links as listed below.
        i. Montana –NWO Regional Conditions for Montana
        ii. Idaho – NWW Regional Conditions
        iii. Washington – NWS Regional Conditions
2. Project Design
    a. All stream crossings (new and replacement of existing structures) will be designed to allow unimpeded natural stream flow and movement of existing streambed material.
    b. Utility stream crossings shall be perpendicular to the watercourse, or nearly so, and designed in the following priority: (1) directional drilling, boring and jacking; and (2) dry trenching or plowing.
    c. If trenching or plowing are used, all work shall be completed in the dry and backfilled with native material and any large wood displaced by trenching or plowing will be returned to its original position wherever feasible.
    d. All construction impacts must be confined to the minimum area necessary to complete the project and boundaries of clearing limits associated with site access and construction will be clearly marked to avoid or minimize disturbance of riparian vegetation, wetlands and other sensitive sites.
    e. The design of any proposed stream bank stabilization must incorporate woody vegetation unless the stream experiences altered hydrology from an impoundment.
    f. Maximum barb length will not exceed 1/4 of the bankfull channel width.
    g. Riprap/rock material must be keyed into the toe of the bank.
    h. Existing channel form and dimension must be maintained to the maximum extent possible.
    i. Rock riprap shall be individually placed without end dumping.
    j. If the bank stabilization structure has been destroyed or damaged beyond repair, replacement of the structure shall utilize bioengineering principals and methods, and will incorporate native vegetation.
    k. Bank stabilization activities shall not exceed the limits of Nationwide Permit 13 unless a variance is approved.
    l. Placement of riprap/rock for any structure shall not exceed top of bank elevation.

m. Any proposals to add spawning gravel must first be reviewed and approved by the local state fisheries biologist. Spawning gravel must be inspected by either a state fisheries biologist or a qualified fisheries biologist familiar with the site's characteristics and requirements.
n. Any intake structure (pump or raw water intake), shall meet the most recent NOAA screening criteria. https://www.westcoast.fisheries.noaa.gov/publications/hydropower/southwest_region_1997_fish_screen_design_criteria.pdf
o. Clean natural angular rock or stone may be used to anchor or stabilize large wood, fill scour holes, prevent scouring or undercutting of an existing structure, or to construct a barb, weir or other properly designed and approved in-water structure.

3. In-water Work Timing

   a. The Corps will check with appropriate sources to determine whether or not listed fish are present or likely to be present during any proposed in-water work. The following work timeframes will be adhered to minimize adverse impacts to listed fish:
      i. Bull trout: In rivers and streams, foraging, migrating, and overwintering habitat in-channel disturbance is limited to the period between July 1 and September 30, except for projects incorporating dormant woody vegetation where species presence has been adequately evaluated; Spawning and rearing habitat in-channel disturbance is limited to the period between May 1 and August 31.

      ii. In lake or lake influenced settings, such as Lake Pend Oreille or Flathead Lake, work may be conducted in the dry during the lake draw down period.

4. Work Area Isolation
   a. All work should be performed in the dry when possible. Any work in rivers (excluding the Pend Oreille River) and streams must be completed by working from the top of the bank or the work areas must be isolated from flowing or open water using cofferdams, silt curtains, sandbags or other approved means to keep suspended sediment from entering flowing or open water, unless not isolating the area and working in the channel would result in less habitat disturbance.

5. Erosion Control Measures
   a. Minimize Site Preparation Impacts
      i. Site clearing, staging areas, access routes, and stockpile areas shall be in a manner that minimizes overall disturbance, minimizes disturbance to riparian vegetation, and that precludes erosion into stream channels.

        ii. Sediment barriers will be placed around potentially disturbed sites to prevent sediment from entering a stream directly or indirectly, including by way of roads and ditches.
        iii. A supply of erosion control materials (e.g. silt fence and straw bales) will be kept on hand to respond to sediment emergencies. Sterile straw or certified "weed free" straw will be used to prevent introduction of noxious weeds.
    b. Minimize Earthmoving-Related Erosion
        i. Work will be confined to the minimum area necessary to complete the project.
        ii. Project operations must cease under high flow conditions that may result in inundation of the project area, except for efforts to avoid or minimize resource damage.

6. Pollution and Invasive Species Control Measures
    a. Equipment Use
        i. All equipment fueling, maintenance, and staging areas will be located in non-wetland areas landward of the ordinary high water mark of the waterbody unless no other option is available. When no option is available, these activities shall occur at the greatest distance possible perpendicular from any water body to adequately avoid and minimize potential impacts.
        ii. All equipment used for in-channel work will be cleaned of external oil, grease, dirt, mud, plant material or other debris, which may harbor invasive plants or animals; and leaks repaired; prior to arriving at the project site. All equipment will be inspected before unloading at site. Any leaks or accumulations of grease will be corrected before entering streams or areas that drain directly into streams or wetlands.
    b. General
        i. All projects must comply with the conditions of the applicable state, EPA, or tribal 401 Water Quality Certification for the appropriate NWP.
        ii. Structural fills with materials such as concrete shall be placed into tightly sealed forms or cells that do not contact the waterway until fully cured.
        iii. Road crossing and bridge structures shall be designed to direct surface drainage into areas or features to prevent erosion of soil and entry of other pollutants directly into waterways or wetlands (such as biofiltration swales or other treatment facilities).

7. Site Restoration
    a. For projects in Washington and Idaho, site revegetation must comply with the applicable Regional Conditions.
    b. For projects in Montana, site revegetation must comply with the following conditions.

i. All areas of vegetation disturbance or removal will be revegetated with native species appropriate for the project location. A revegetation plan must be submitted with the application specifying species, planting or seeding rates and maintenance measures to ensure 80% cover (ground or canopy) after three years.

ii. Within the first planting season post-construction, the stabilized bank shall be revegetated with native species.

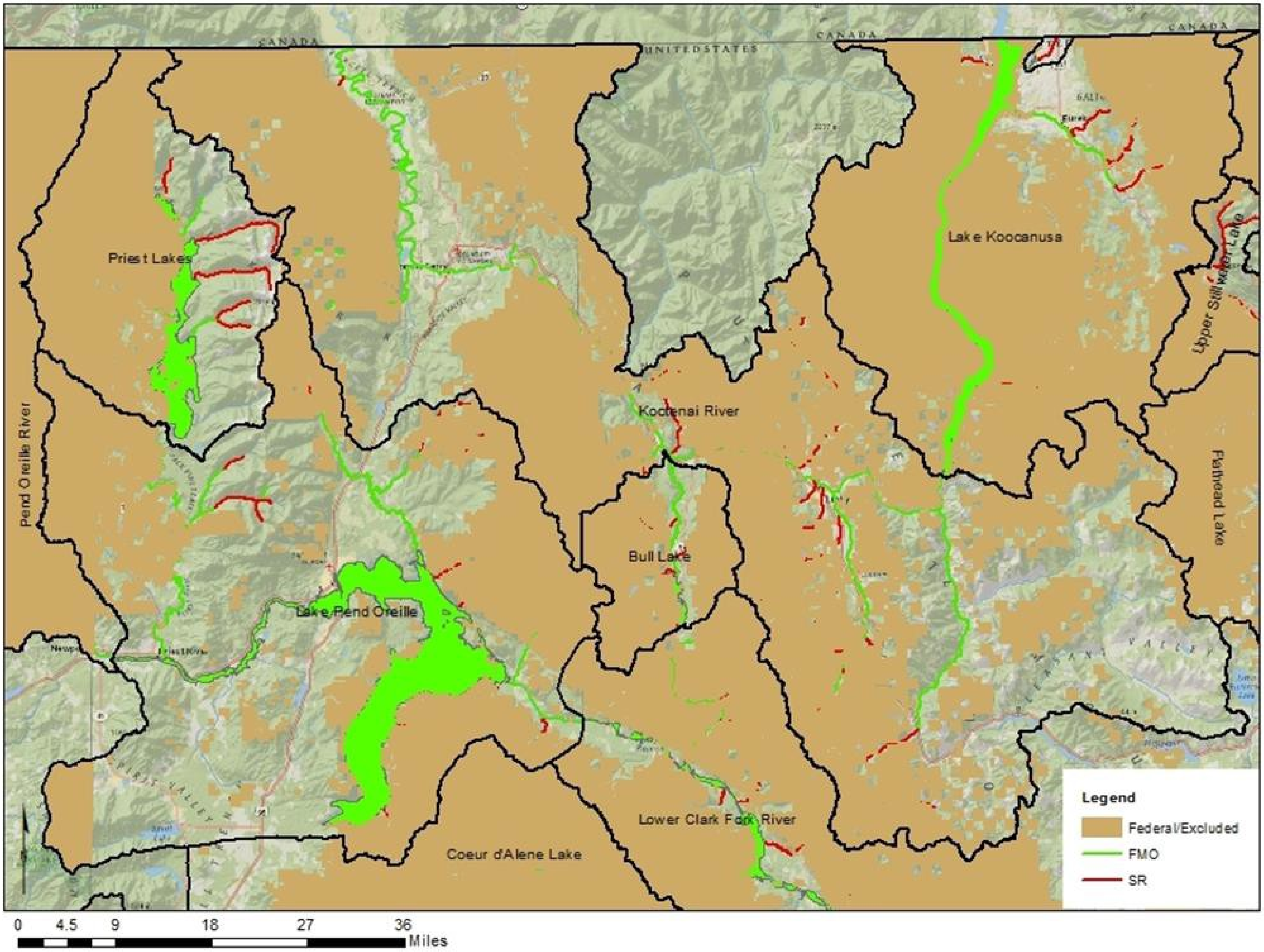
APPENDIX F: Excluded Activities

- Oil and gas exploration or production, construction or upgrading of a gas, sewer or water line to support a new or expanded service area, and foundations for transmission towers.
- Outfalls and intakes where none previously existed
- Unscreened intakes
- Any in-stream structure that could become a barrier to fish movement during low flows.
- Temporary bypass channels in excess of 300 linear feet
- Dewatering that places a stream into a pipe more than 300 feet long or for more than 30 days.
- New sea walls, retaining walls or bulkheads, where none previously existed.
- Any streambank stabilization project utilizing concrete.
- Stream or wetland impacts for new road construction within 300 feet of occupied bull trout or Kootenai River white sturgeon streams.
- Bridge abutments below ordinary high water of occupied streams where none previously existed.
- A replacement bridge constructed adjacent to an existing bridge without full removal of the existing bridge, support structures and approach fill.
- Pond construction or expansion in streams or jurisdictional wetlands.
- Large dam removal projects (>10' head difference).
- Projects that involve relocating more than 300 feet of channel (cumulative total for the entire project).
- Use of concrete logs, cable (wire rope) or chains to permanently anchor any structure.

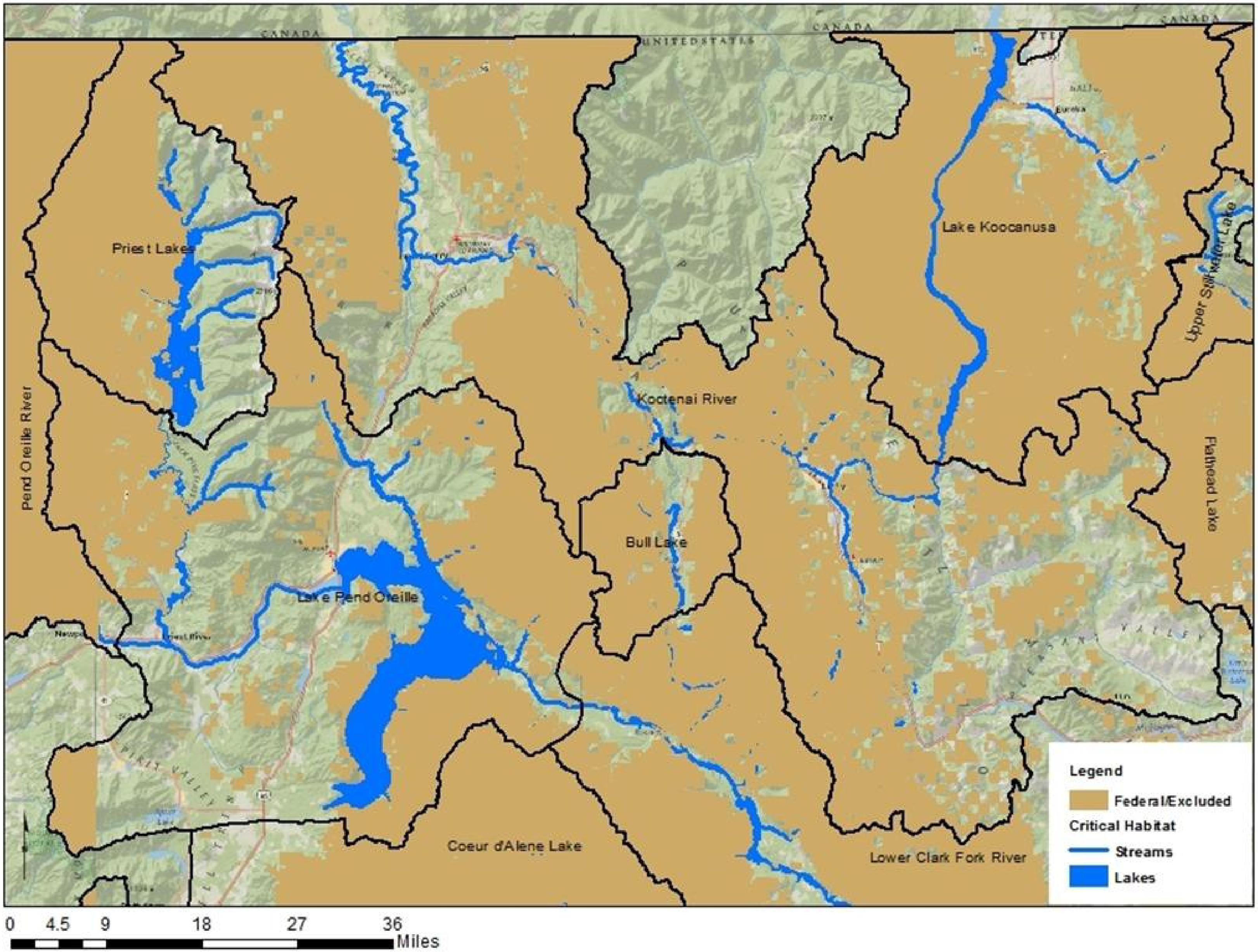
Appendix G: Action Area Maps for Bull Trout Occupied Waters and Designated Critical Habitat

The following maps show streams and lakes which are known or suspected to be occupied by bull trout, categorized as foraging-migrating-overwintering (FMO) and spawning-rearing (SR), within the action area for each bull trout core area. Federal lands are blocked out. Where possible, multiple core areas within a geographic region are shown. Map scales range from 1:500,000 to 1:850,000, so as to allow the largest core areas to be displayed on one page (except for Flathead Lake) with adequate detail. Geographic sections are ordered generally west to east and north to south. Map titles include only core areas that may be affected by the action. Occupied water bodies and designated critical habitat are shown separately. Lakes within federal ownership are visible because they are not part of the land ownership database, and adjacent lands indicate whether the shoreline is within the action area.

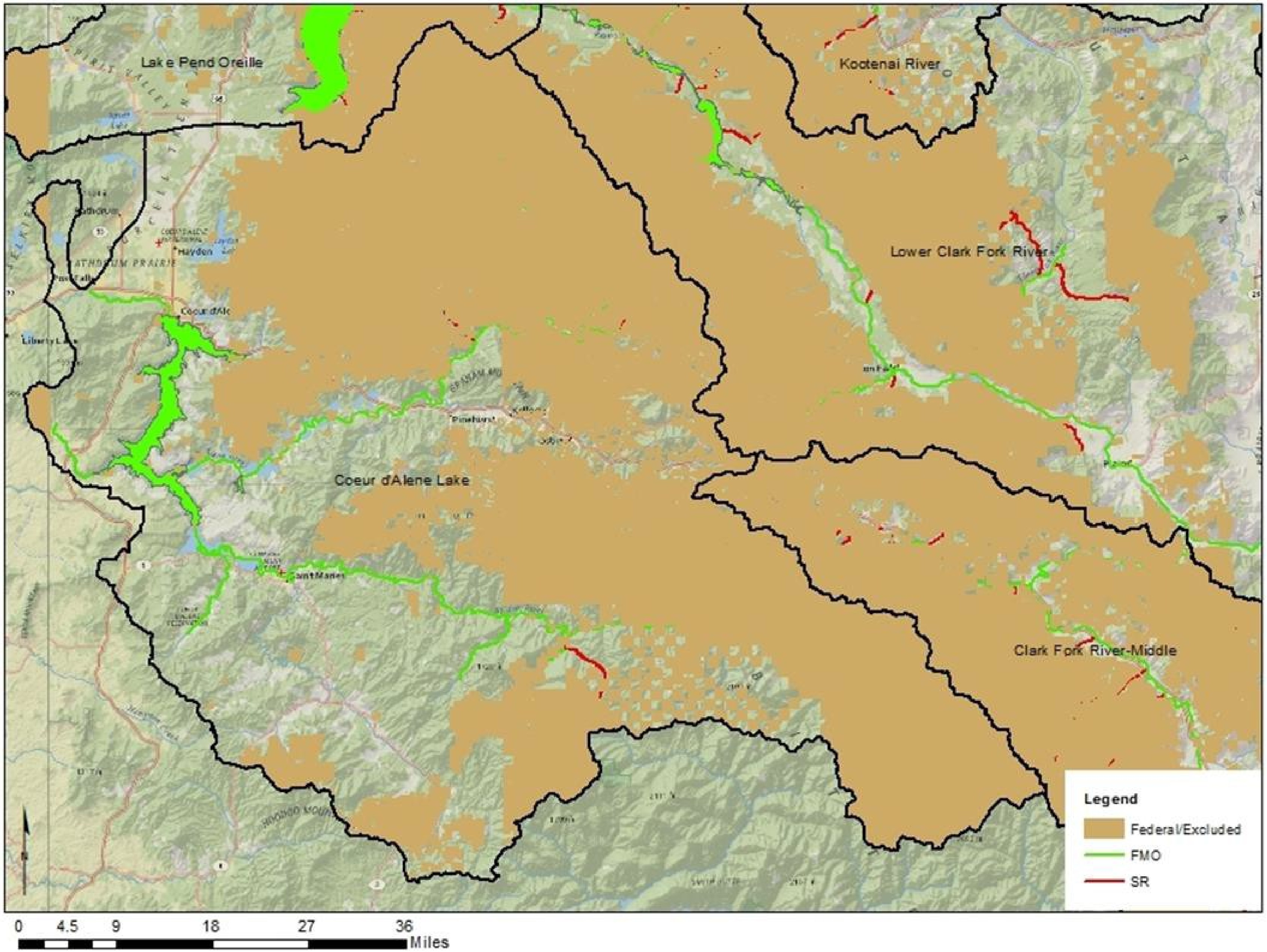
Map 1a: *Bull trout occupied waters and action area (unshaded) in Priest Lakes, Lake Pend Oreille, Kootenai River, Bull Lake, and Lake Koocanusa Core Areas.*



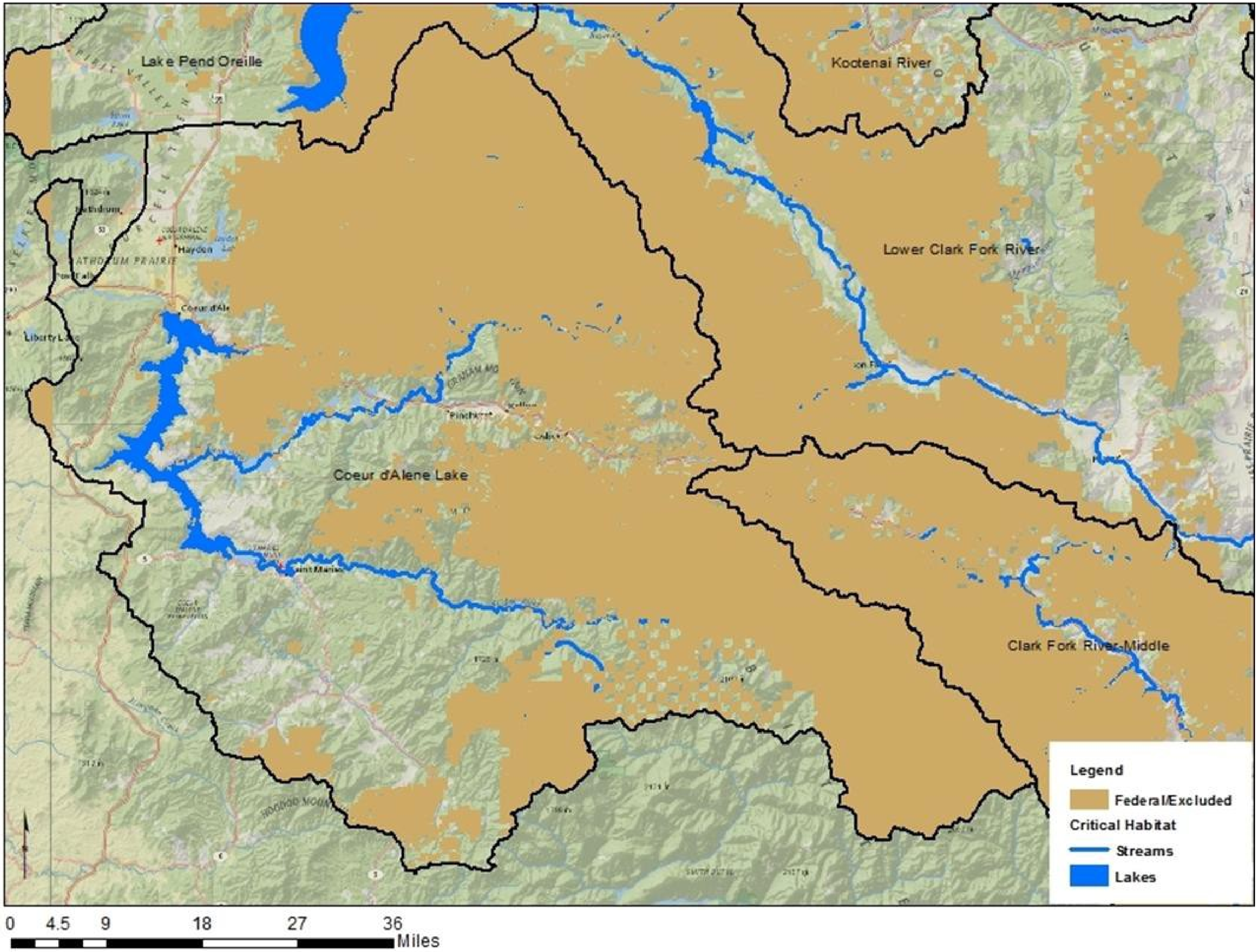
Map 1b: *Designated critical habitat and action area (unshaded) in the Priest Lakes, Lake Pend Oreille, Kootenai River, Bull Lake, and Lake Koocanusa Core Areas.*



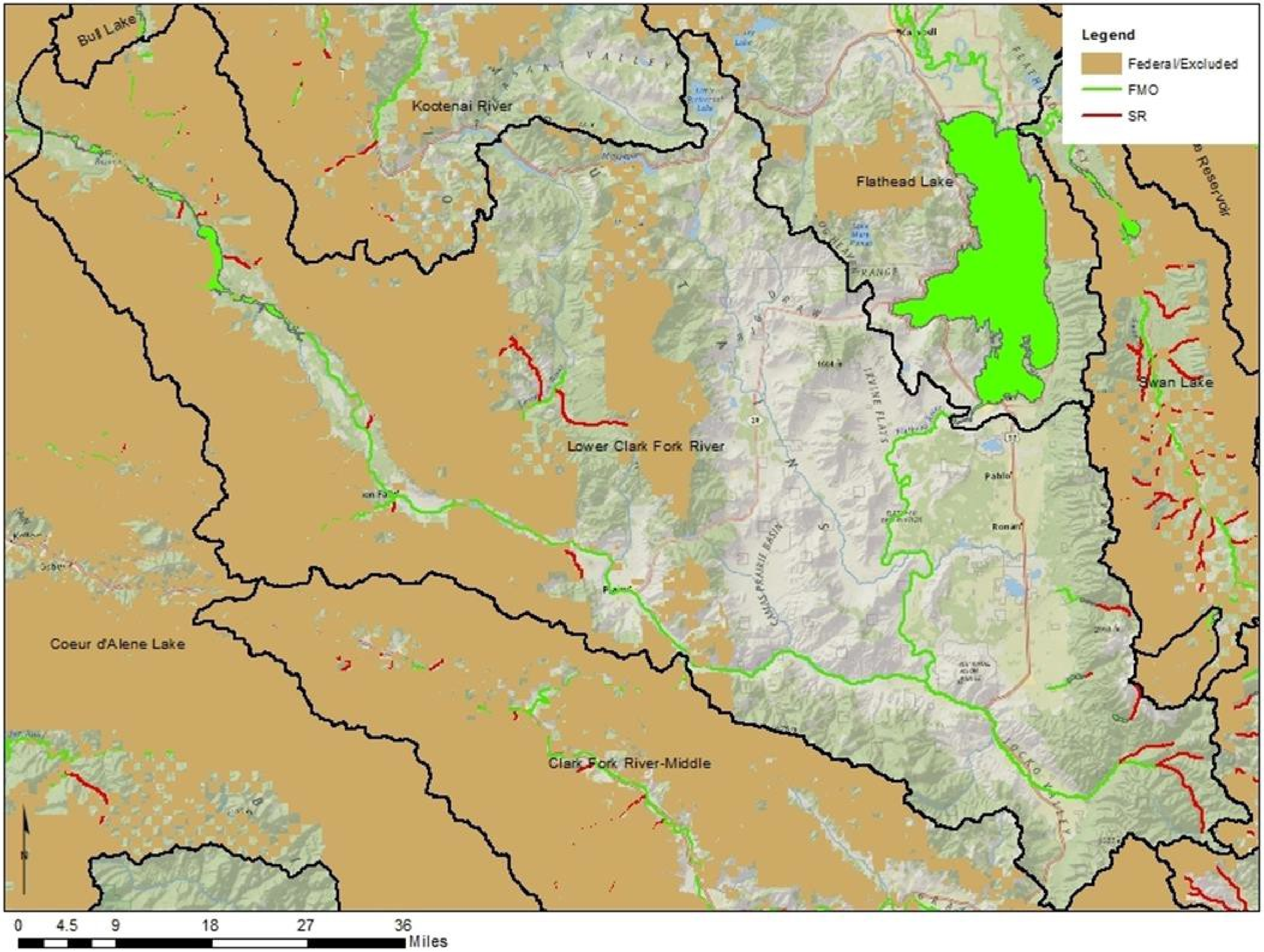
Map 2a: *Bull trout occupied waters and action area (unshaded) in Coeur d'Alene Lake Core Area.*



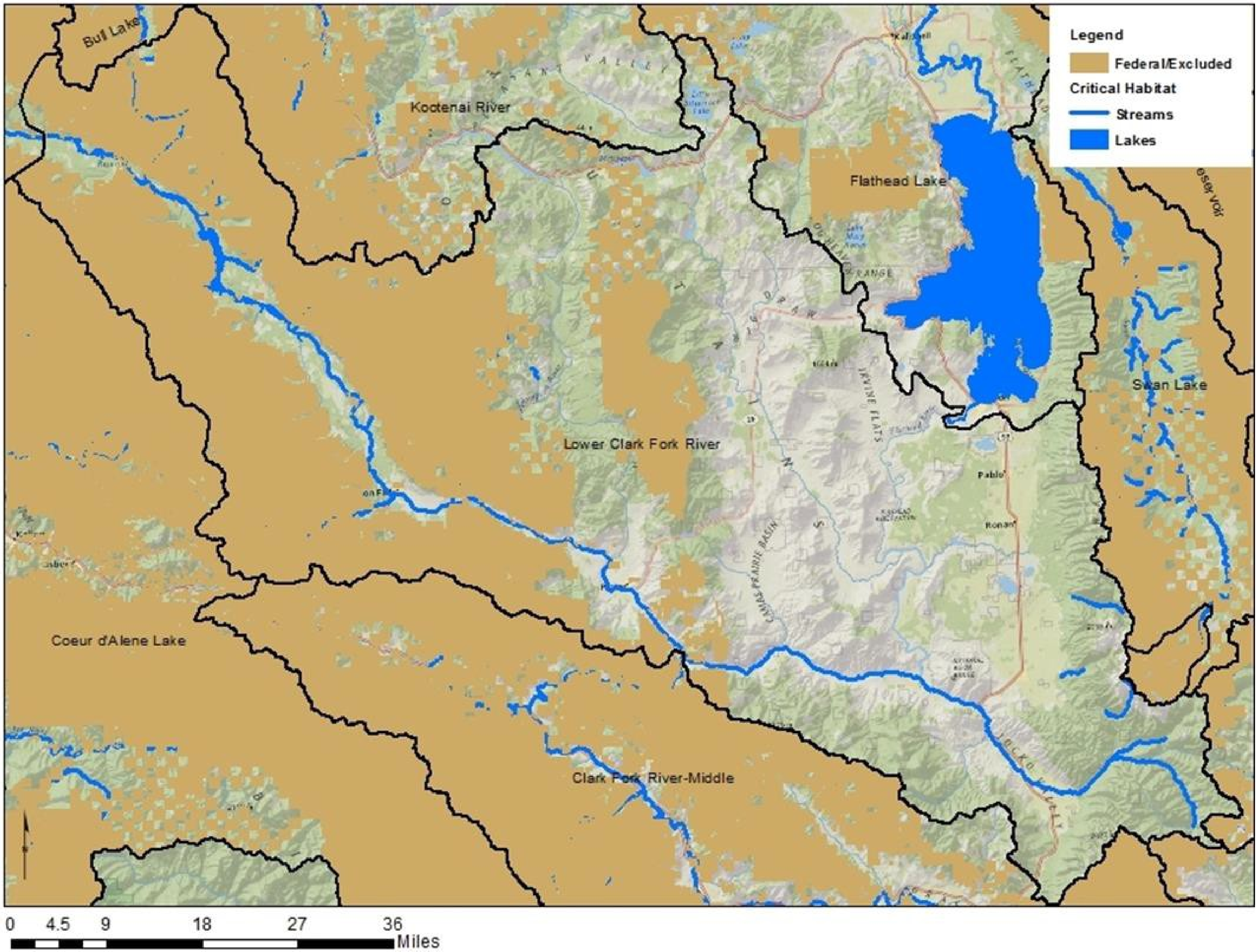
Map 2a: *Designated critical habitat and action area (unshaded) in Coeur d'Alene Lake Core Area.*



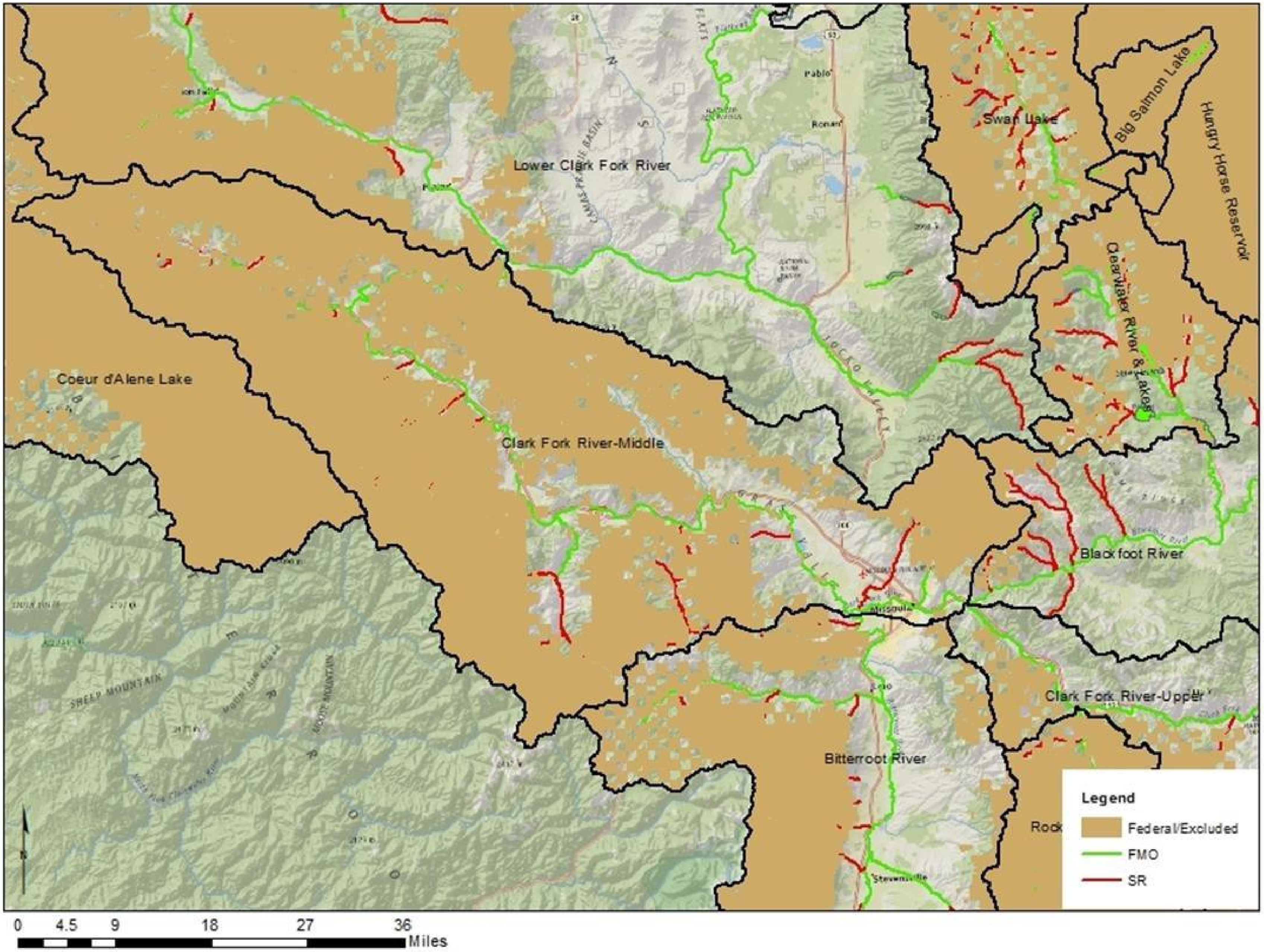
Map 3a: *Bull trout occupied waters and action area (unshaded) in portions of the Lake Pend Oreille and Flathead Lake Core Area.*



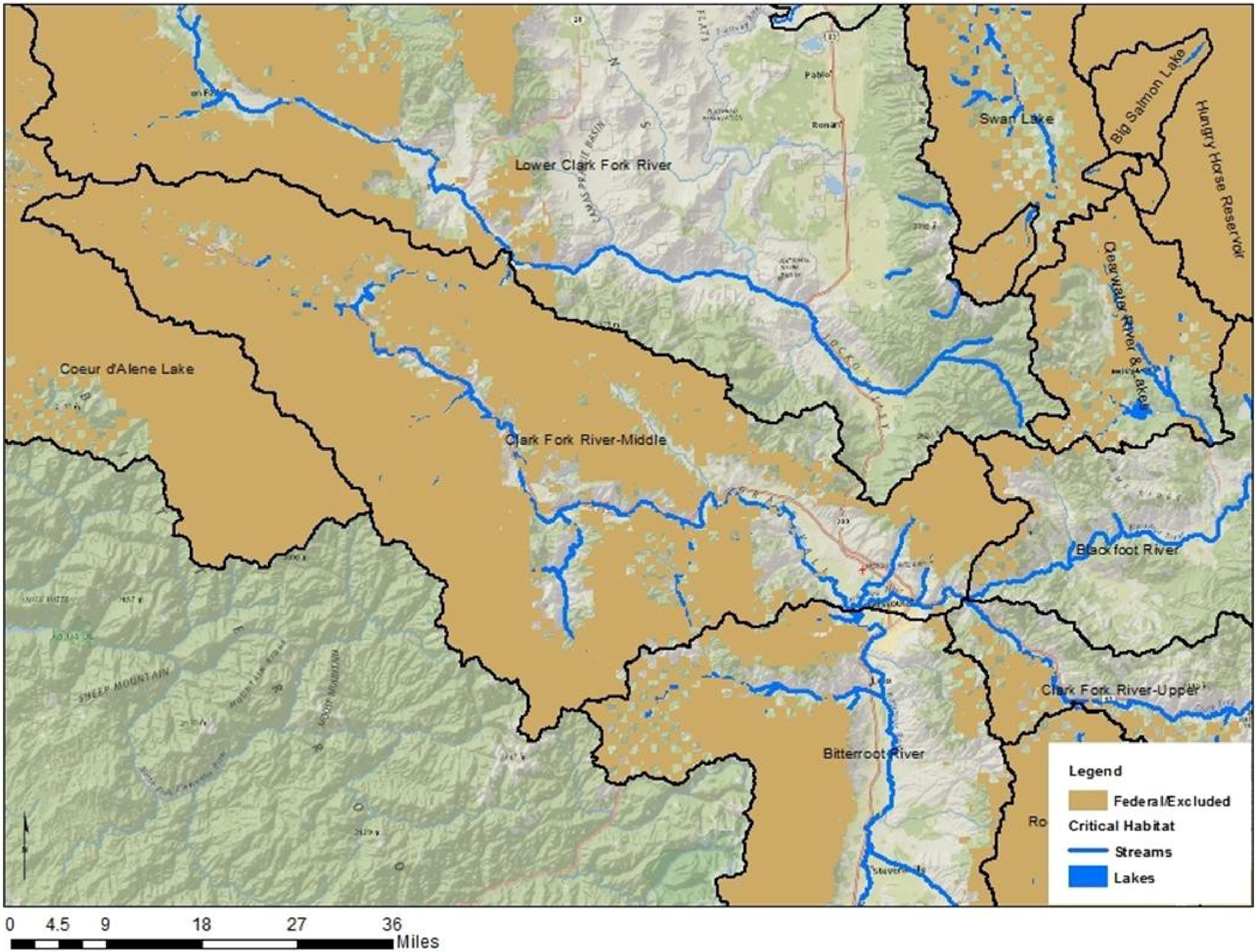
Map 3b: *Designated critical habitat and action area (unshaded) in Lake Pend Oreille, Flathead Lake and Swan Lake Core Areas.*



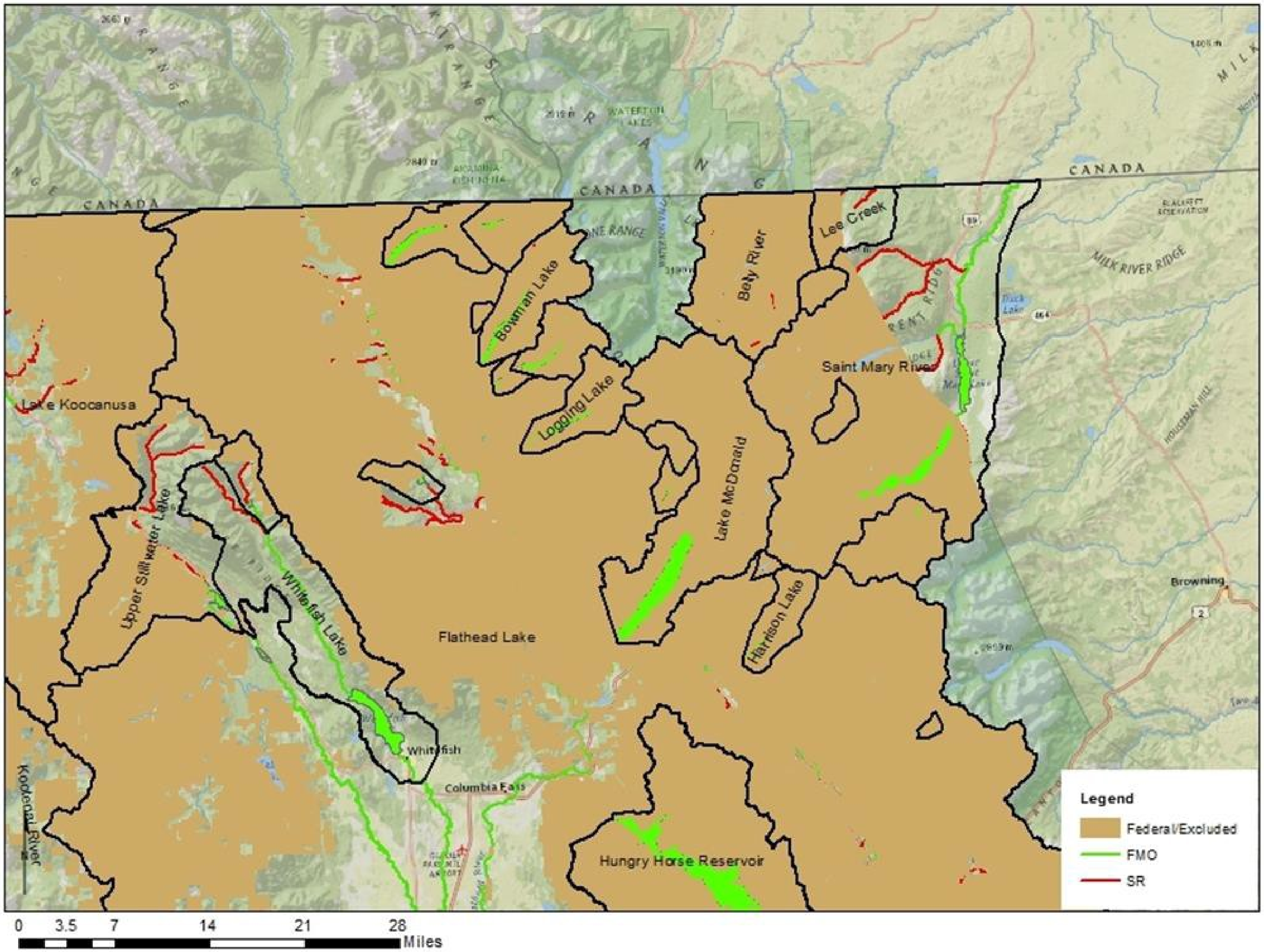
Map 4a: *Bull trout occupied waters and action area (unshaded) in Middle Clark Fork River Core Area.*



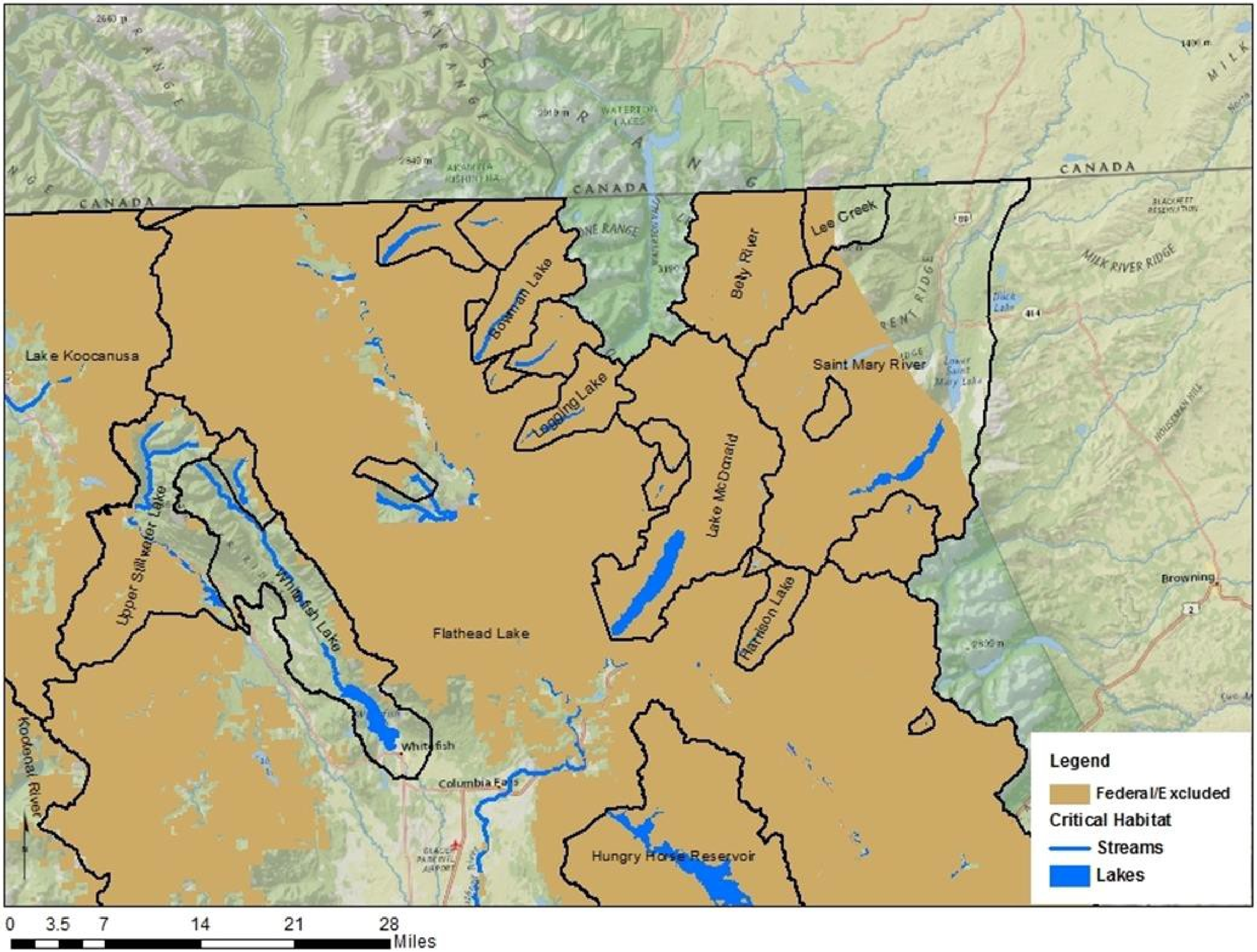
Map 4b: Designated critical habitat and action area (unshaded) in Middle Clark Fork River Core Area.



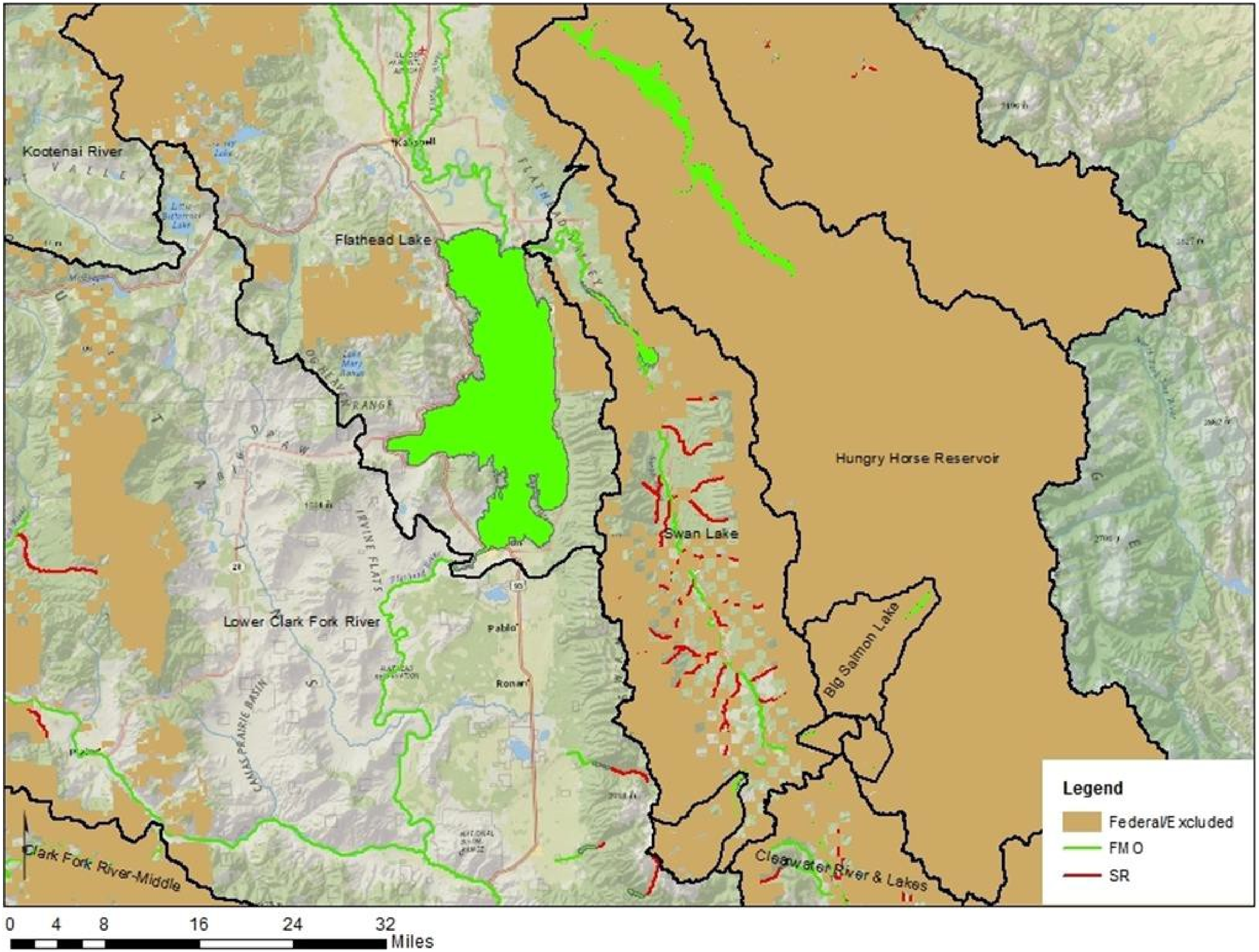
Map 5a: *Bull trout occupied waters and action area (unshaded) in Flathead Lake (north portion), Whitefish Lake, and St. Mary River Core Areas.*



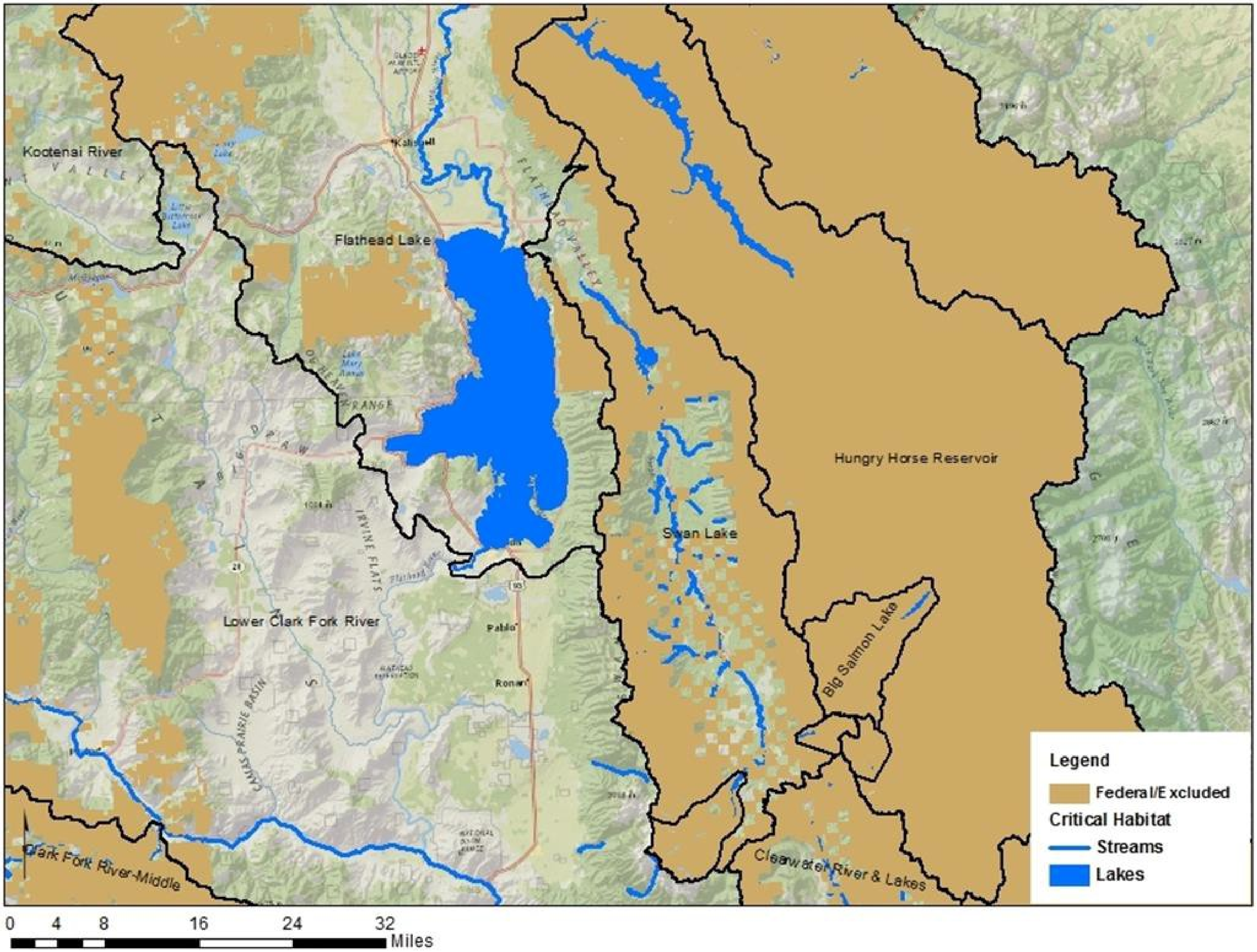
Map 5b: *Designated critical habitat and action area (unshaded) in Flathead Lake (north portion), Whitefish Lake and St. Mary River Core Areas.*



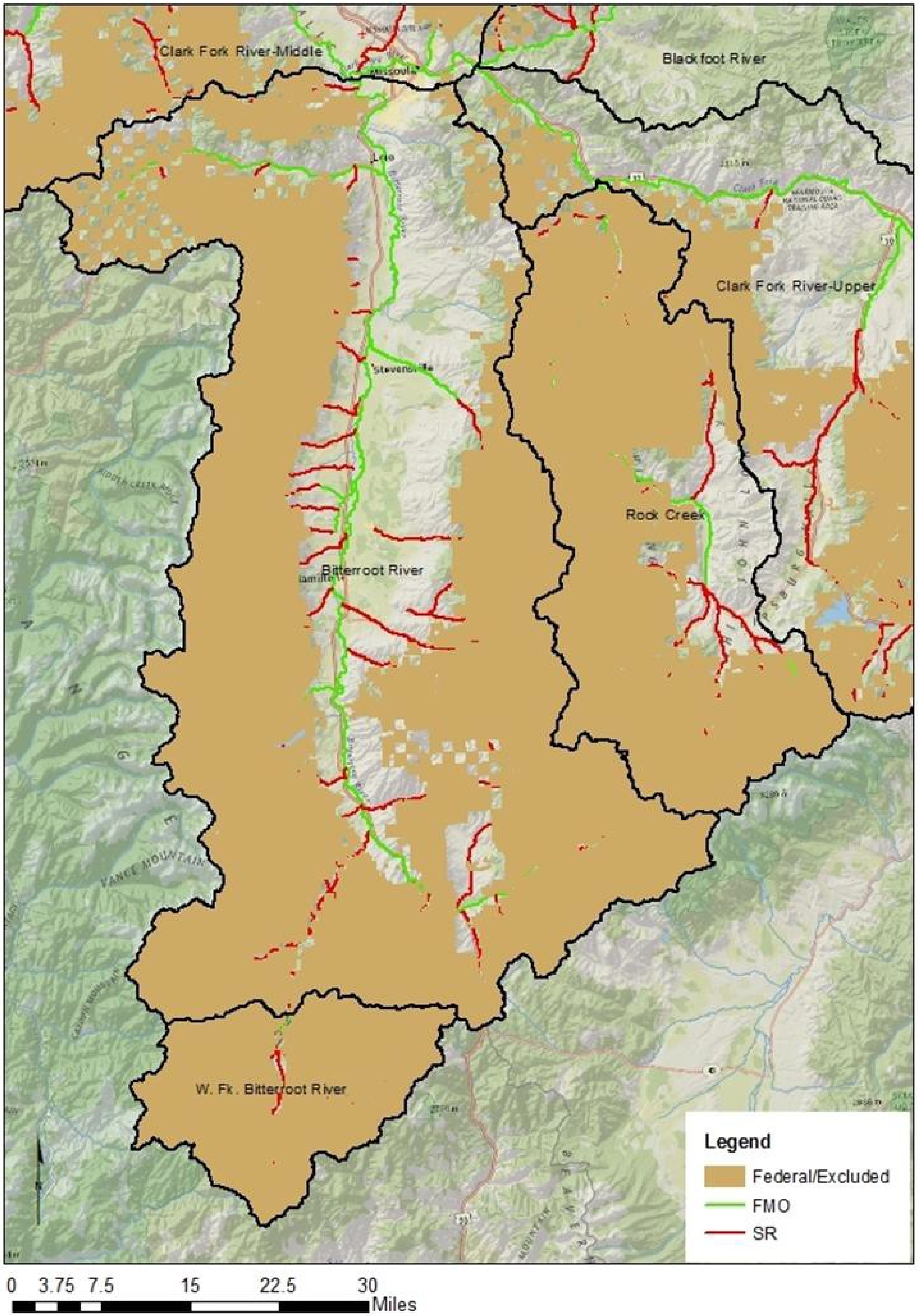
Map 6a: *Bull trout occupied waters and action area (unshaded) in Flathead Lake (south portion), Swan Lake, and Lindbergh Lake Core Areas.*



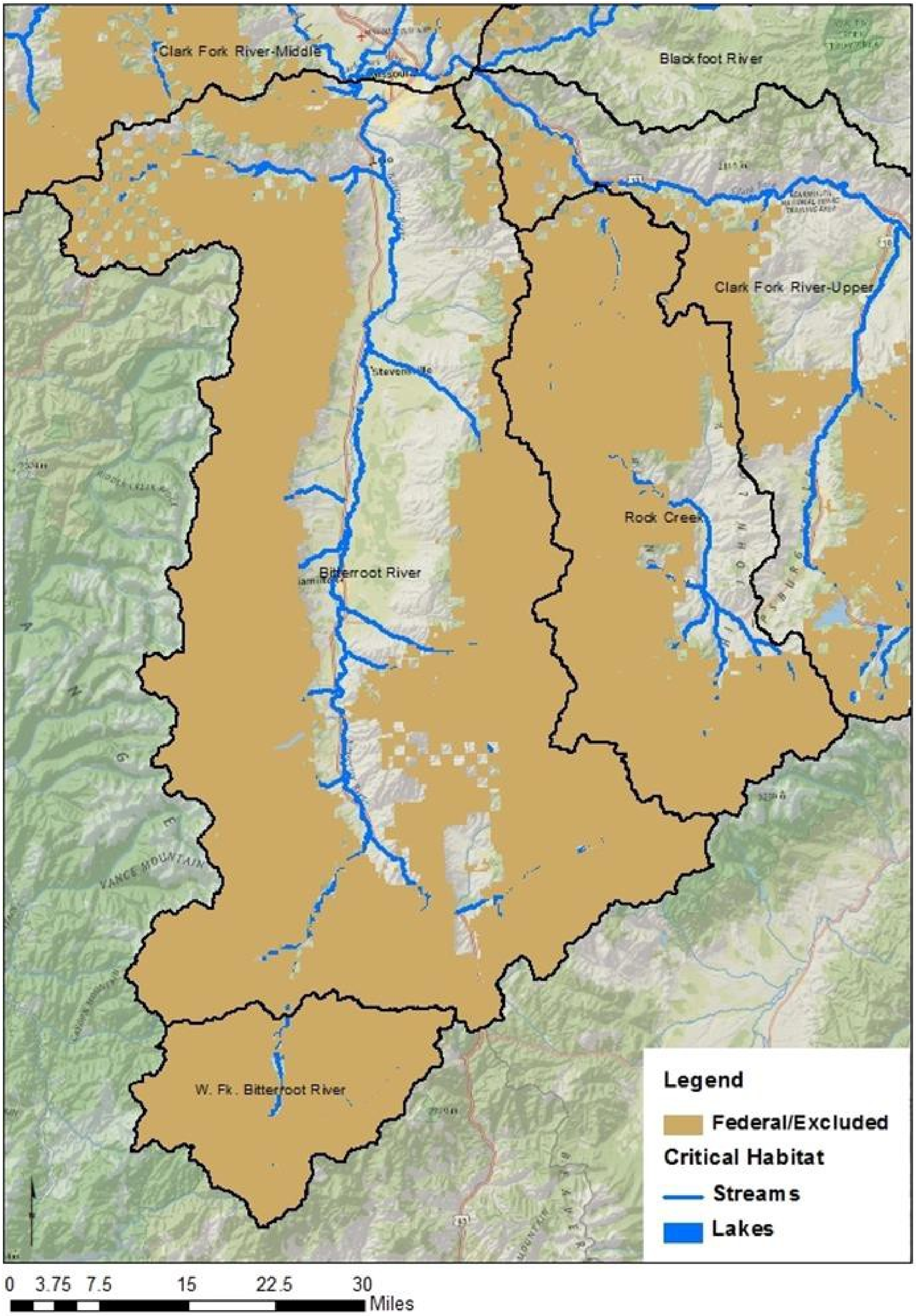
Map 6b: *Designated critical habitat and action area (unshaded) in Flathead Lake (south portion), Swan Lake, and Lindbergh Lake Core Areas.*



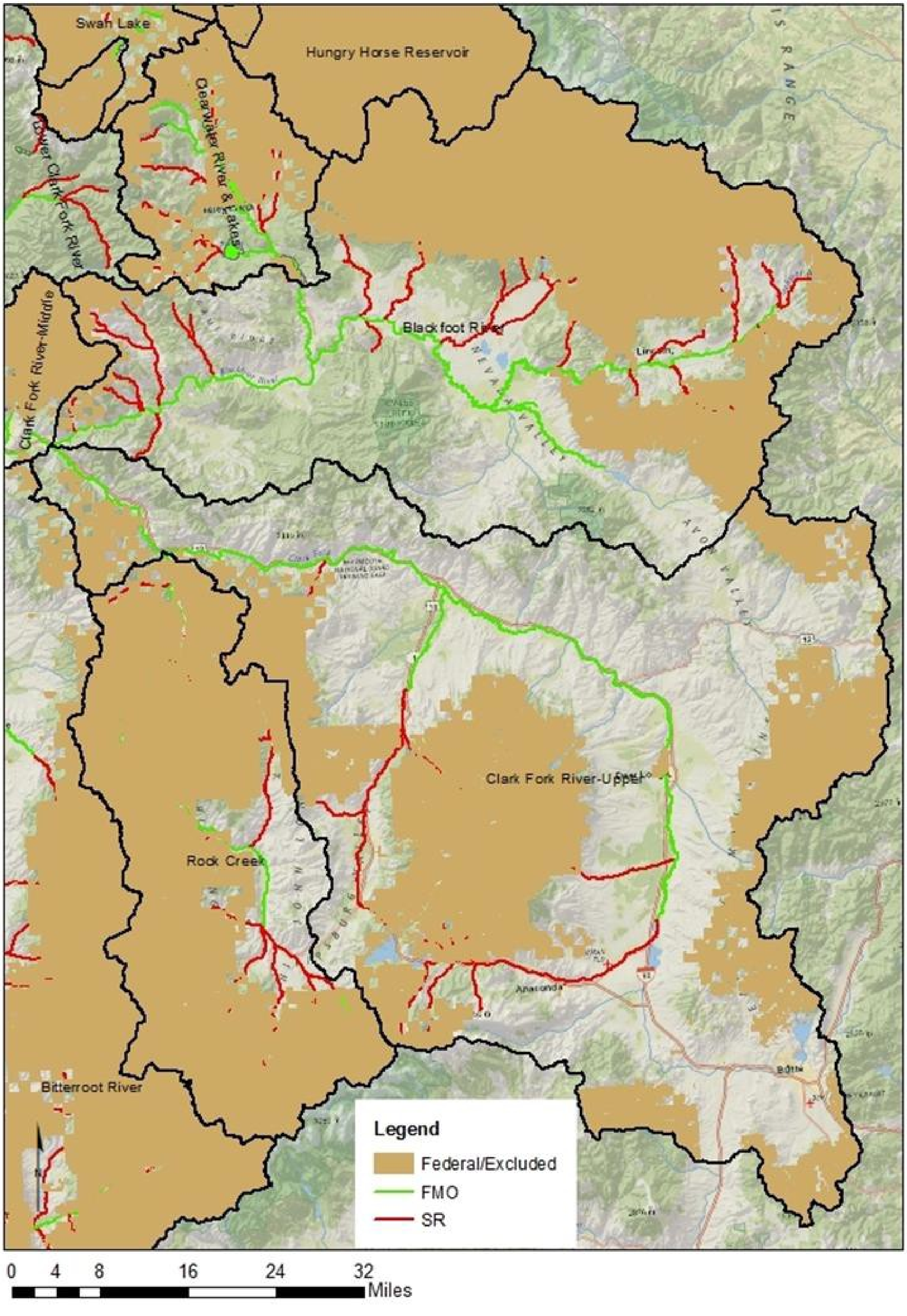
__Map 7a:__ Bull trout occupied waters and action area (unshaded) in Bitterroot River, West Fork Bitterroot River, and Rock Creek Core Areas.



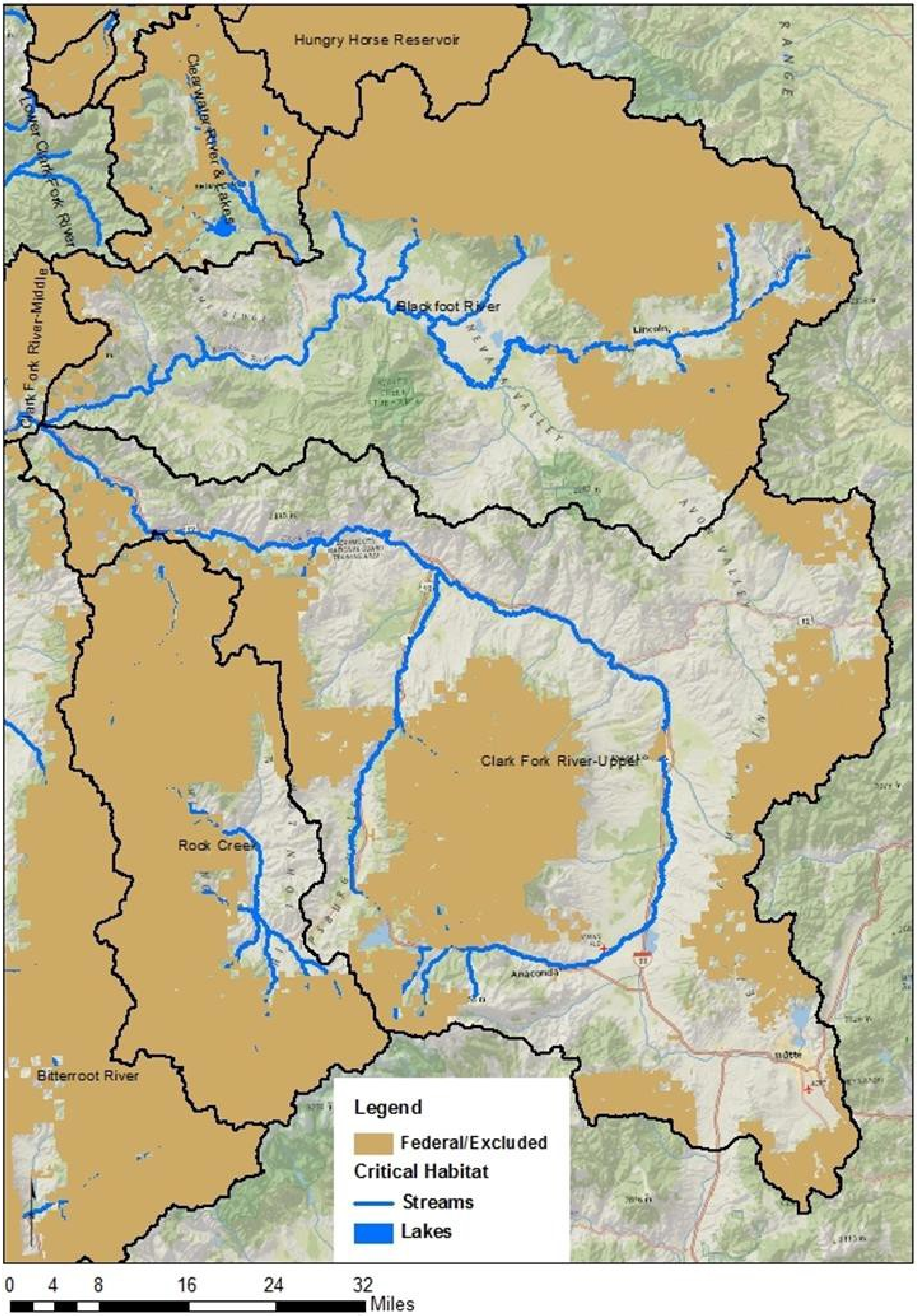
Map 7b: *Designated critical habitat and action area (unshaded) in Bitterroot River, West Fork Bitterroot River, and Rock Creek Core Areas.*



Map 8a: *Bull trout occupied waters and action area (unshaded) in Blackfoot River and Upper Clark Fork River Core Areas.*



Map 8b: *Designated critical habitat and action area (unshaded) in Blackfoot River and Upper Clark Fork River Core Areas.*



APPENDIX A: STATUS OF THE SPECIES – BULL TROUT

This section provides information about the bull trout's life history, habitat preferences, geographic distribution, population trends, threats, and conservation needs. This includes description of the effects of past human activities and natural events that have led to the current status of the bull trout. This information provides the background for analyses in later sections of the biological opinion. The proposed and final listing rules contain a physical species description (USFWS 1998, 63 FR 31647; USFWS 1999, 64 FR 58910). Additional information can be found at https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=E065.

Listing Status and Current Range

The coterminous United States population of the bull trout (*Salvelinus confluentus*) was listed as threatened on November 1, 1999 (USFWS 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, p. 2; Brewin and Brewin 1997, p. 215; Cavender 1978, pp. 165-166; Leary and Allendorf 1997, pp. 716-719; USFWS 1998, 63 FR 31647; USFWS 1999, 64 FR 58910; USFWS 2010, 75 FR 2269; USFWS 2015, pg. 1).

The final listing rule for the United States coterminous population of the bull trout discusses the consolidation of five DPSs into one listed taxon and the application of the jeopardy standard in accordance with the requirements of section 7 of the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 et seq.), relative to this species, and established five interim recovery units for each of these DPSs for the purposes of Consultation and Recovery (USFWS 1999, 64 FR 58930).

Six draft recovery units were identified based on new information (USFWS 2010, 75 FR 63898) that confirmed they were needed to ensure a resilient, redundant, and representative distribution of bull trout populations throughout the range of the listed entity. The final Recovery Plan for the Coterminous Bull Trout Population (bull trout recovery plan) formalized these six recovery units (USFWS 2015, pg. 36-43) (see Figure 1). The final recovery units replace the previous five interim recovery units and will be used in the application of the jeopardy standard for Section 7 consultation proceedures.

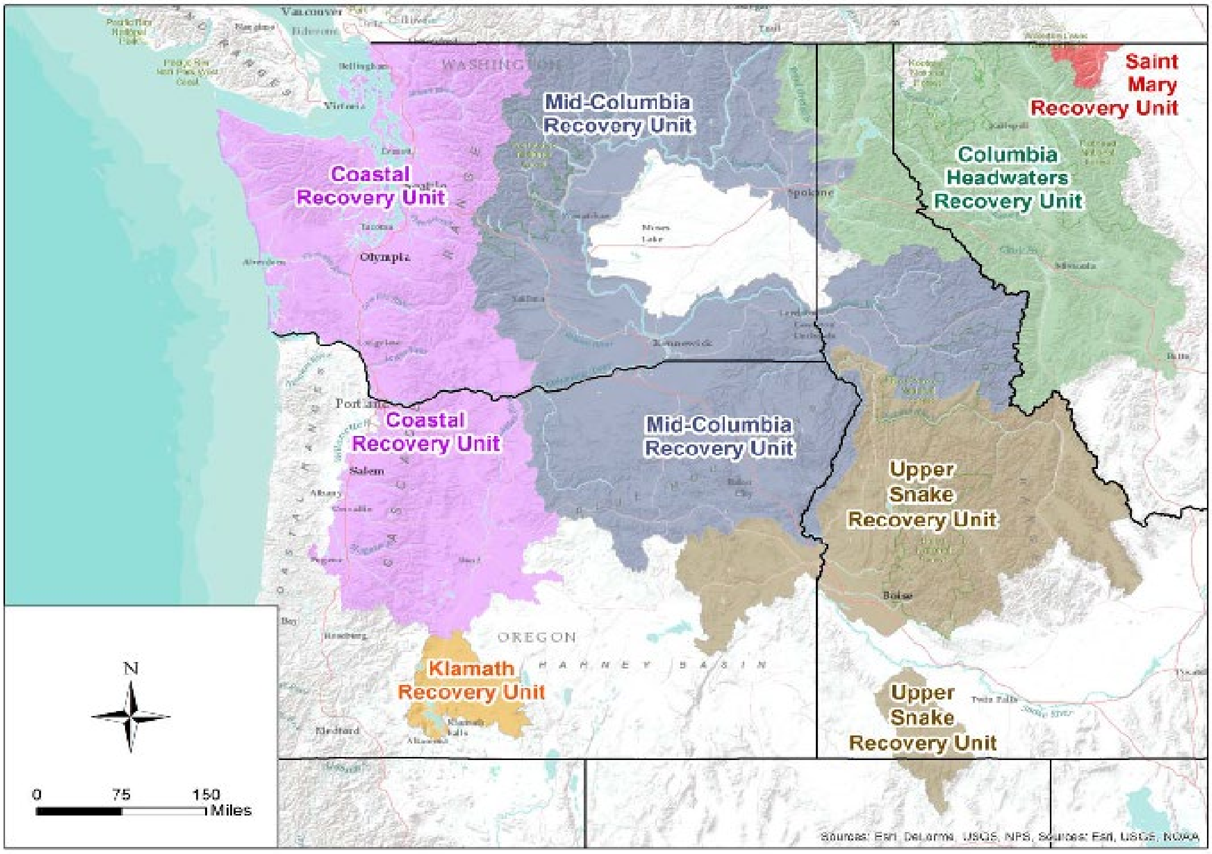


Figure 1. Locations of the six bull trout recovery units in the coterminous United States.

Reasons for Listing, Rangewide Trends and Threats

Throughout its range, the bull trout is threatened by the combined effects of habitat degradation, fragmentation, and alterations associated with dewatering, road construction and maintenance, mining, grazing, the blockage of migratory corridors by dams or other diversion structures, poor water quality; incidental angler harvest; entrainment (a process by which aquatic organisms are pulled through a diversion or other device) into diversion channels; and introduced non-native species (USFWS 1998, 63 FR 31647; USFWS 1999, 64 FR 58910). Poaching and incidental mortality of bull trout during other targeted fisheries are identified described in the bull trout recovery plan (see Threat Factors B and D) as additional threats (USFWS 2015, p. 150). Since the time of coterminous listing the species (USFWS 1999, 64 FR 58910) and designation of its critical habitat (USFWS 2004, 69 FR 59996; USFWS 2005b, 70 FR 56212; 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, entire), the bull trout core areas templates (USFWS 2005a, entire; USFWS 2009, entire), Conservation Status Assessment (USFWS 2005), and 5-year Reviews (USFWS 2008, entire; USFWS 2015g, entire) have provided additional information about threats and status. The final recovery plan lists other documents and meetings that compiled information about the status of bull trout (USFWS 2015, p. 3). As well, 2015 5-year review maintained the listing status as threatened based on the information compiled in the final bull trout recovery plan (USFWS 2015g, p.3) and the recovery unit implementation plans (RUIPs) (USFWS 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 (USFWS 2002, entire; USFWS 2004, entire; USFWS 2004a, entire) included detailed information on threats at the recovery unit scale (i.e. similar to subbasin or regional watersheds), thus incorporating the metapopulation concept with core areas and local populations. In the 2008, 5-year Review, the Service established threats categories (i.e. dams, forest management, grazing, agricultural practices, transportation networks, mining, development and urbanization, fisheries management, small populations, limited habitat, and wild fire.) (USFWS 2008, entire). In the final recovery plan, threats and recovery actions are described for 109 core areas, forage/migration and overwintering areas, historical core areas, and research needs areas in each of the six recovery units (USFWS 2015, p 10-11). Primary threats are described in three broad categories: Habitat, Demographic, and Nonnative Fish for all recovery areas described in the listed range of the species. The 2015 5-year status review (USFWS 2015g, entire) references the final recovery plan and the recovery unit implementation plans and incorporates by reference the threats described therein. Although significant recovery actions have been implemented since the time of listing, the 5-year review concluded that bull trout still meets the definition of a "threatened" species (USFWS 2015g, entire).

New or Emerging Threats

The final Recovery Plan for the Coterminous Bull Trout Population (USFWS 2015, pg. 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 (USFWS 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 (USFWS 2015, p. 48). The recovery plan further states that use of best available information will ensure future conservation efforts that offer the greatest long-term benefit to sustain bull trout and their required coldwater habitats (USFWS 2015, p. vii, and pp. 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, entire; Koopman et al. 2009, entire; PRBO Conservation Science 2011, entire). Lower flows as a result of smaller snowpack could reduce habitat, which might adversely affect bull trout reproduction and survival. Warmer water temperatures could lead to physiological stress and could also benefit nonnative fishes that prey on or compete with bull trout. Increases in the number and size of forest fires could also result from climate change (Westerling et al. 2006) and could adversely affect watershed function by resulting in faster runoff, lower base flows during the summer and fall, and increased sedimentation rates. Lower flows also may result in increased groundwater withdrawal for agricultural purposes and resultant reduced water availability in certain stream reaches occupied by bull trout (USFWS 2015b, p. B-10). Although all salmonids are likely to be affected by climate change, bull trout are especially vulnerable given that spawning and rearing are constrained by their location in upper watersheds and the requirement for cold water temperatures (Battin et al. 2007, pp. 6672-6673; Rieman et al. 2007, p. 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).

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, pp. 165-166; Bond 1992, p. 2). To the west, the bull trout's range includes Puget Sound, various coastal rivers of British Columbia, Canada, and southeast Alaska (Bond 1992, p. 2). Bull trout occur in portions of the Columbia River and tributaries within the basin, including its headwaters in Montana and Canada. Bull trout also occur in the Klamath River basin of south-central Oregon. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta and Montana and in the MacKenzie River system in Alberta and British Columbia, Canada (Cavender 1978, pp. 165-166; Brewin and Brewin 1997, entire).

Reproductive Biology

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

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, p. 30; Pratt 1985, pp. 28-34). The largest verified bull trout is a 32-pound specimen caught in Lake Pend Oreille, Idaho, in 1949 (Simpson and Wallace 1982, p. 95).

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

16; Pratt 1992, pp. 6-7; Rieman and McIntyre 1996, p. 133). Depending on water temperature, incubation is normally 100 to 145 days (Pratt 1992, p. 1). After hatching, fry remain in the substrate, and time from egg deposition to emergence may surpass 220 days. Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows (Pratt 1992, p. 1; Ratliff and Howell 1992, p. 10).

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

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

Population Structure

Bull trout exhibit both resident and migratory life history strategies. Both resident and migratory forms may be found together, and either form may produce offspring exhibiting either resident or migratory behavior (Rieman and McIntyre 1993, p. 2). Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. The resident form tends to be smaller than the migratory form at maturity and also produces fewer eggs (Goetz 1989, p. 15). Migratory bull trout spawn in tributary streams where juvenile fish rear 1 to 4 years before migrating to either a lake (adfluvial form), river (fluvial form) (Fraley and Shepard 1989, p. 138; Goetz 1989, p. 24), or saltwater (anadromous form) to rear as subadults and to live as adults (Brenkman and Corbett 2005, entire; McPhail and Baxter 1996, p. i; WDFW et al. 1997, p. 16). Bull trout normally reach sexual maturity in 4 to 7 years and may live longer than 12 years. They are iteroparous (they spawn more than once in a lifetime). Repeat- and alternate-year spawning has been reported, although repeat-spawning frequency and post-spawning mortality are not well documented (Fraley and Shepard 1989, p. 135; Leathe and Graham 1982, p. 95; Pratt 1992, p. 8; Rieman and McIntyre 1996, p. 133).

Bull trout are naturally migratory, which allows them to capitalize on temporally abundant food resources and larger downstream, and resident forms may develop where barriers (either natural or manmade) occur or where foraging, migrating, or overwintering habitats for migratory fish are minimized (Swanberg, 1997, entire; Brenkman and Corbett 2005, pp. 1075-1076; Goetz et al. 2004, p. 105, Starcevich et al 2012, entire; USFWS 2016, p. 170). For example, multiple life history forms (e.g., resident and fluvial) and multiple migration patterns have been noted in the Grande Ronde River (Baxter 2002, pp. 96, 98-106). Some river systems have retained habitat conditions that allow free movement between spawning and rearing areas and the mainstem Rivers. In these areas with connectivity bull trout can migrate between large rivers lakes, and spawning tributaries. Other migrations in Central Washington have shown that fluvial and adfluvial life forms travel long distances, migrate between core areas, and mix together in many locations where there is connectivity (Ringel et al 2014; Nelson and Nelle 2008). Such multiple life history strategies help to maintain the stability and persistence of bull trout populations to environmental changes. Benefits of connected habitat for migratory bull trout include greater growth in the more productive waters of larger streams, lakes, and marine waters; greater fecundity resulting in increased reproductive potential; and dispersing the population across space and time so that spawning streams may be recolonized should local populations suffer a catastrophic loss (Frissell 1999, pp. 861-863; MBTSG 1998, p. 13; Rieman and McIntyre 1993, pp. 2-3). In the absence of the migratory bull trout life form, isolated populations cannot be replenished when disturbances make local habitats temporarily unsuitable. Therefore, the range of the species is diminished, and the potential for a greater reproductive contribution from larger size fish with higher fecundity is lost (Rieman and McIntyre 1993, p. 2).

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

i. "Coastal", including the Deschutes River and all of the Columbia River drainage downstream, as well as most coastal streams in Washington, Oregon, and British Columbia. A compelling case also exists that the Klamath Basin represents a unique evolutionary lineage within the coastal group.
ii. "Snake River", which also included the John Day, Umatilla, and Walla Walla rivers. Despite close proximity of the John Day and Deschutes Rivers, a striking level of divergence between bull trout in these two systems was observed.
iii. "Upper Columbia River" which includes the entire basin in Montana and northern Idaho. A tentative assignment was made by Spruell et al. (2003, p. 25) of the Saskatchewan River drainage populations (east of the continental divide), grouping them with the upper Columbia River group.

Spruell et al. (2003, p. 17) noted that within the major assemblages, populations were further subdivided, primarily at the level of major river basins. Taylor et al. (1999, entire) surveyed bull trout populations, primarily from Canada, and found a major divergence between inland and coastal populations. Costello et al. (2003, p. 328) suggested the patterns reflected the existence of two glacial refugia, consistent with the conclusions of Taylor and Costello (2006, pg. 1165-1170), Spruell et al. (2003, p. 26) and the biogeographic analysis of Haas and McPhail (2001, entire). Both Taylor et al. (1999, p. 1166) and Spruell et al. (2003, p. 21) concluded that the Deschutes River represented the most upstream limit of the coastal lineage in the Columbia River Basin.

More recently, the USFWS identified additional genetic units within the coastal and interior lineages (Ardren et al. 2011, p. 18). Based on a recommendation in the USFWS's 5-year review of the species' status (USFWS 2008, p. 45), the USFWS reanalyzed the 27 recovery units identified in the 2002 draft bull trout recovery plan (USFWS 2002, p. 48) by utilizing, in part, information from previous genetic studies and new information from additional analysis (Ardren et al. 2011, entire). In this examination, the USFWS applied relevant factors from the joint USFWS and NMFS Distinct Population Segment (DPS) policy (USFWS 1996, entire) 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 (USFWS 2010, p. 63898). These six recovery units, adopted in the final bull trout recovery plan (USFWS 2015) and described further in the RUIPs (USFWS 2015a-f) include: Coastal, Klamath, Mid-Columbia, Columbia Headwaters, Saint Mary, and Upper Snake. A number of additional genetic analyses within core areas have been completed to understand uniqueness of local populations (Hawkins and Van Barren 2006, 2007; Small et al. 2009; DeHann and Neibauer 2012).

Population Dynamics

Although bull trout are widely distributed over a large geographic area, they exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993, p. 4). Increased habitat fragmentation reduces the amount of available habitat and increases isolation from other populations of the same species (Saunders et al. 1991, entire). Burkey (1989, entire) concluded that when species are isolated by fragmented habitats, low rates of population growth are typical in local populations and their probability of extinction is directly related to the degree of isolation and fragmentation. Without sufficient immigration, growth for local populations may be low and probability of extinction high (Burkey 1989, entire; Burkey 1995, entire).

Metapopulation concepts of conservation biology theory have been suggested relative to the distribution and characteristics of bull trout, although empirical evidence is relatively scant (Rieman and McIntyre 1993, p. 15; Dunham and Rieman 1999, entire; Rieman and Dunham 2000, entire). A metapopulation is an interacting network of local populations with varying frequencies of migration and gene flow among them (Meffe and Carroll 1994, pp. 189-190). For inland bull trout, metapopulation theory is likely most applicable at the watershed scale where habitat consists of discrete patches or collections of habitat capable of supporting local populations; local populations are for the most part independent and represent discrete reproductive units; and long-term, low-rate dispersal patterns among component populations influences the persistence of at least some of the local populations (Rieman and Dunham 2000, entire). Ideally, multiple local populations distributed throughout a watershed provide a mechanism for spreading risk because the simultaneous loss of all local populations is unlikely. However, habitat alteration, primarily through the construction of impoundments, dams, and water diversions has fragmented habitats, eliminated migratory corridors, and in many cases isolated bull trout in the headwaters of tributaries (Rieman and Clayton 1997, pp. 10-12; Dunham and Rieman 1999, p. 645; Spruell et al. 1999, pp. 118-120; Rieman and Dunham 2000, p. 55).

Human-induced factors as well as natural factors affecting bull trout distribution have likely limited the expression of the metapopulation concept for bull trout to patches of habitat within the overall distribution of the species (Dunham and Rieman 1999, entire). However, despite the theoretical fit, the relatively recent and brief time period during which bull trout investigations have taken place does not provide certainty as to whether a metapopulation dynamic is occurring (e.g., a balance between local extirpations and recolonizations) across the range of the bull trout or whether the persistence of bull trout in large or closely interconnected habitat patches (Dunham and Rieman 1999, entire) is simply reflective of a general deterministic trend towards extinction of the species where the larger or interconnected patches are relics of historically wider distribution (Rieman and Dunham 2000, pp. 56-57). Research does, however, provide genetic evidence for the presence of a metapopulation process for bull trout, at least in the Boise River Basin of Idaho (Whiteley et al. 2003, entire), while Whitesel et al. identifies that bull trout fit the metapopulation theory in several ways (Whitesel et al, 2004, p. 18-21).

Habitat Characteristics

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

Bull trout have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993, p. 4). Habitat components that influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrate, and migratory corridors (Fraley and Shepard 1989, entire; Goetz 1989, pp. 23, 25; Hoelscher and Bjornn 1989, pp. 19, 25; Howell and Buchanan 1992, pp. 30, 32; Pratt 1992, entire; Rich 1996, p. 17; Rieman and McIntyre 1993, pp. 4-6; Rieman and McIntyre 1995, entire; Sedell and Everest 1991, entire; Watson and Hillman 1997, entire). Watson and Hillman (1997, pp. 247-250) concluded that watersheds must have specific physical characteristics to provide the habitat requirements necessary for bull trout to successfully spawn and rear and that these specific characteristics are not necessarily present throughout these watersheds. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993, pp. 4-6), bull trout should not be expected to simultaneously occupy all available habitats.

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

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

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

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

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

Diet

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy. Fish growth depends on the quantity and quality of food that is eaten, and as fish grow their foraging strategy changes as their food changes, in quantity, size, or other characteristics (Quinn 2005, pp. 195-200). Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, and small fish (Boag 1987, p. 58; Donald and Alger 1993, pp. 242-243; Goetz 1989, pp. 33-34). Subadult and adult migratory bull trout generally feed on various fish species (Donald and Alger 1993, pp. 241-243; Fraley and Shepard 1989, pp. 135, 138; Leathe and Graham 1982, pp. 13, 50-56). Bull trout of all sizes other than fry have been found to eat fish half their length (Beauchamp and VanTassell 2001, p. 204). In nearshore marine areas of western Washington, bull trout feed on Pacific herring (*Clupea pallasi*), Pacific sand lance (*Ammodytes hexapterus*), and surf smelt (*Hypomesus pretiosus*) (Goetz et al. 2004, p. 105; WDFW et al. 1997, p. 23).

Bull trout migration and life history strategies are closely related to their feeding and foraging strategies and their environment. Migration allows bull trout to access optimal foraging areas and exploit a wider variety of prey resources both within and between core areas. Connectivity between the spawning, rearing, overwintering, and forage areas maintains this diversity. There have been recent studies documenting movement patterns in the Columbia River basin that document long distance migrations (Borrows et al 2016, entire; Schaller et al 2014, entire; USFWS 2016, entire). For example, a data report documented a juvenile bull trout from the Entiat made over a 200-mile migration between spawning grounds in the Entiat River to foraging and overwintering areas in Columbia and Yakima River near Prosser Dam (PTAGIS 2015, Tag Code 3D9.1C2CCD42DD). As well, 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, p. 25). Anadromous bull trout also use marine waters as migration corridors to reach seasonal habitats in non-natal watersheds to forage and possibly overwinter (Brenkman and Corbett 2005, pp. 1078-1079; Goetz et al. 2004, entire).

Conservation Needs

The 2015 recovery plan for bull trout established the primary strategy for recovery of bull trout in the coterminous United States: (1) conserve bull trout so that they are geographically widespread across representative habitats and demographically stable 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 (USFWS 2015, p. 24.) .

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

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

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

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

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

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

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

4. and result in actively working with partners to conduct research and monitoring to implement and evaluate bull trout recovery activities, consistent with an adaptive management approach using feedback from implemented, site-specific recovery tasks, and considering the effects of climate change (USFWS 2015, p. 50-51).

Bull trout recovery is based on a geographical hierarchical approach. Bull trout are listed as a single DPS within the five-state area of the coterminous United States. The single DPS is subdivided into six biological-based recovery units: (1) Coastal Recovery Unit; (2) Klamath Recovery Unit; (3) Mid-Columbia Recovery Unit; (4) Upper Snake Recovery Unit; (5) Columbia Headwaters Recovery Unit; and (6) Saint Mary Recovery Unit (USFWS 2015, p. 23). A viable recovery unit should demonstrate that the three primary principles of biodiversity have been met: representation (conserving the genetic makeup of the species); resiliency (ensuring that each population is sufficiently large to withstand stochastic events); and redundancy (ensuring a sufficient number of populations to withstand catastrophic events) (USFWS 2015, p. 33).

Each of the six recovery units contain multiple bull trout recovery areas which are non-overlapping watershed-based polygons, and each core area includes one or more local population. Currently there are 109 occupied core areas, which comprise 611 local populations (USFWS 2015, p. 3, Appendix F). There are also six core areas where bull trout historically occurred but are now extirpated, and one research needs area where bull trout were known to occur historically, but their current presence and use of the area are uncertain (USFWS 2015, p. 3, Appendix F). Core areas can be further described as complex or simple (USFWS 2015, p. 3-4). Complex core areas contain multiple local bull trout populations, are found in large watersheds, have multiple life history forms, and have migratory connectivity between spawning and rearing habitat and foraging, migration, and overwintering habitats (FMO). Simple core areas are those that contain one bull trout local population. Simple core areas are small in scope, isolated from other core areas by natural barriers, and may contain unique genetic or life history adaptations.

A core area is a combination of core habitat (i.e., habitat that could supply all elements for the long-term security of bull trout) and a core population (a group of one or more local bull trout populations that exist within core habitat) and constitutes the basic unit on which to gauge recovery within a recovery unit. Core areas require both habitat and bull trout to function, and the number (replication) and characteristics of local populations inhabiting a core area provide a relative indication of the core area's likelihood to persist. A core area represents the closest approximation of a biologically functioning unit for bull trout. Core areas are presumed to reflect the metapopulation structure of bull trout.

A local population is a group of bull trout that spawn within a particular stream or portion of a stream system (USFWS 2015, p. 73). A local population is considered to be the smallest group of fish that is known to represent an interacting reproductive unit. For most waters where specific information is lacking, a local population may be represented by a single headwater tributary or complex of headwater tributaries. Gene flow may occur between local populations (*e.g.*, those within a core population), but is assumed to be infrequent compared with that among individuals within a local population.

Population Units

The final recovery plan (USFWS 2015) designates six bull trout recovery units as described above. These units replace the 5 interim recovery units previously identified (USFWS 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 (USFWS 2015), 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 (RUIPs)(USFWS 2015a-f), which identify recovery actions and conservation 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 numbers and distribution, as well as its genetic and phenotypic diversity, all of which are important to ensure the species' resilience to changing environmental conditions. For more details on Federal, State, and tribal conservation actions in this unit see the actions since listing, contemporaneous actions, and environmental baseline discussions below.

Coastal Recovery Unit

The Coastal RUIP describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015a, entire). The Coastal Recovery Unit is divided into three Geographic 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. This recovery unit also has four historically occupied core areas that could be re-established (USFWS 2015, p. 47; USFWS 2015a, p. A-2).

Although population strongholds do exist across the three regions, populations in the Puget Sound region generally have better demographic status while the Lower Columbia River region exhibits the least robust demography (USFWS 2015a, p. A-6). 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 allow for the continued natural population dynamics in which the core areas have evolved (USFWS 2015a, p. A-5). 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 (USFWS

2015, p.79; USFWS 2015a, p. A-3). These are the most stable and abundant bull trout populations in the recovery unit. The Puget Sound region supports at least two core areas containing a natural adfluvial life history.

The demographic status of the Puget Sound populations is better in northern areas. Barriers to migration in the Puget Sound region are few, and significant amounts of headwater habitat occur in protected areas (USFWS 2015a, p. A-7). 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 nearshore marine habitats, development and related impacts (e.g., flood control, floodplain disconnection, bank armoring, channel straightening, loss of instream habitat complexity), agriculture (e.g., diking, water control structures, draining of wetlands, channelization, and the removal of riparian vegetation, livestock grazing), fish passage (e.g., dams, culverts, instream flows) residential development, urbanization, forest management practices (e.g., timber harvest and associated road building activities), connectivity impairment, mining, and the introduction of non-native species (USFWS 2015a, p. A-1 – A-25). Conservation measures or recovery actions implemented or ongoing include relicensing of major hydropower facilities that have provided upstream and downstream fish passage or complete removal of dams, land acquisition to conserve bull trout habitat, floodplain restoration, culvert removal, riparian revegetation, levee setbacks, road removal, and projects to protect and restore important nearshore marine habitats (USFWS 2015a, p. A-33 – A-34).

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 (USFWS 2015b, entire). 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 (USFWS 2015, p. 39). This recovery unit currently contains three core areas and eight local populations (USFWS 2015, p. 47; USFWS 2015b, p. B-1). Nine historic local populations of bull trout have become extirpated (USFWS 2015b, p. B-1). All three core areas have been isolated from other bull trout populations for the past 10,000 years (USFWS 2015b, p. B-3). 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 (UFWS 2015b, p. B-13 – B-14). Conservation measures or recovery actions implemented or ongoing 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, culver replacement, and habitat restoration (USFWS 2015b, p. B-10 – B-11).

Mid-Columbia Recovery Unit

The Mid-Columbia RUIP describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015c, entire). 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, two historically occupied core areas, one research needs area, and seven FMO habitats (USFWS 2015, p. 47; USFWS 2015c, p. C-1 – C-4). 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 (USFWS 2015c, p. C-9 – C-34). Conservation measures or recovery actions implemented or ongoing include road removal, channel restoration, mine reclamation, improved grazing management, removal of fish barriers, and instream flow requirements (USFWS 2015c, C-37 – C-40).

Columbia Headwaters Recovery Unit

The Columbia headwaters RUIP describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015d). 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 (USFWS 2015d, p. D-2 – D-4). 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 (USFWS 2015d, p. D-1). Fish passage improvements within the recovery unit have reconnected some previously fragmented habitats (USFWS 2015d, p. D-42), while others remain fragmented. Unlike other recovery units in Washington, Idaho and Oregon, the Columbia Headwaters Recovery Unit does not have any anadromous fish overlap (USFWS 2015d, p. D-42). Therefore, bull trout within the Columbia Headwaters Recovery Unit do not benefit from the recovery actions for salmon (USFWS 2015d, p. D-42). The current condition of the bull trout in this recovery unit is attributed to the adverse effects of climate change, mostly historical mining and contamination by heavy metals, expanding populations of nonnative fish predators and competitors, modified instream flows, migratory barriers (e.g., dams), habitat fragmentation, forest practices (e.g., logging, roads), agriculture practices (e.g. irrigation, livestock grazing), and residential development (USFWS 2015d, p. D-10 – D-25). Conservation measures or recovery actions implemented or ongoing include habitat improvement, fish passage, and removal of nonnative species (USFWS 2015d, p. D-42 – D-43).

Upper Snake Recovery Unit

The Upper Snake RUIP describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015e, entire). 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, with over 70 percent being present in the Salmon River Region (USFWS 2015, p. 47; USFWS 2015e, p. E-1 – E-2). 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) (USFWS 2015e, p. E-15 – E-18). Conservation measures or recovery actions implemented or ongoing include instream habitat restoration, instream flow requirements, screening of irrigation diversions, and riparian restoration (USFWS 2015e, p. E-19 – E-20).

St. Mary Recovery Unit

The St. Mary RUIP describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015f). 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 (USFWS 2015f, p. F-1) 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 (USFWS 2015f, p. F-7 – F-8). The primary issue precluding bull trout recovery in this recovery unit relates to impacts of water diversions, specifically at the Bureau of Reclamations Milk River Project (USFWS 2015f, p. F-5). Conservation measures or recovery actions implemented or ongoing are not identified in the St. Mary RUIP; however, the USFWS is conducting interagency and tribal coordination to accomplish conservation goals for the bull trout (USFWS 2015f, p. F-9)

Federal, State and Tribal Actions Since Listing

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

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

At sites that are vulnerable to development, protection of land through fee title acquisition or conservation easements is important to prevent adverse impacts or allow conservation actions to be implemented. In several bull trout core areas, it is necessary to continue ongoing fisheries management efforts to suppress the effects of non-native fish competition, predation, or hybridization; particularly brown trout, brook trout, lake trout, and northern pike (Fredenberg et al. 2007; DeHaan et al. 2010, entire; DeHaan and Godfrey 2009, entire; Fredericks and Dux

2014; Rosenthal and Fredenberg 2017). A more comprehensive overview of conservation successes from 1999-2013, described for each recovery unit, is found in the Summary of Bull Trout Conservation Successes and Actions since 1999 (Available at: (http://www.fws.gov/pacific/ecoservices/endangered/recovery/documents/USFWS_2013_summary_of_conservation_successes.pdf).

Projects that have undergone ESA section 7 consultation have occurred throughout the range of bull trout. Singly or in aggregate, these projects could affect the species' status. The Service has conducted periodic reviews of prior Federal "consulted-on" actions. A detailed discussion of consulted-on effects in the proposed action area is provided in the environmental baseline section below.

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APPENDIX B: STATUS OF CRITICAL HABITAT – BULL TROUT

Legal Status

Current Designation

The Service published a final critical habitat designation for the coterminous United States population of the bull trout on October 18, 2010 (70 FR 63898); the rule became effective on November 17, 2010. Critical habitat is defined as the specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery. Designated critical CHUs for the bull trout are described in Figure 1. A justification document describes occupancy and the rationale for why these habitat areas are essential for the conservation of bull trout was developed to support the rule and is available on our website (https://www.fws.gov/pacific/bulltrout/crithab/Jusitfication%20Docs.html).

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

Table B-1. Stream/shoreline distance and reservoir/lake area designated as bull trout critical habitat by state.

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

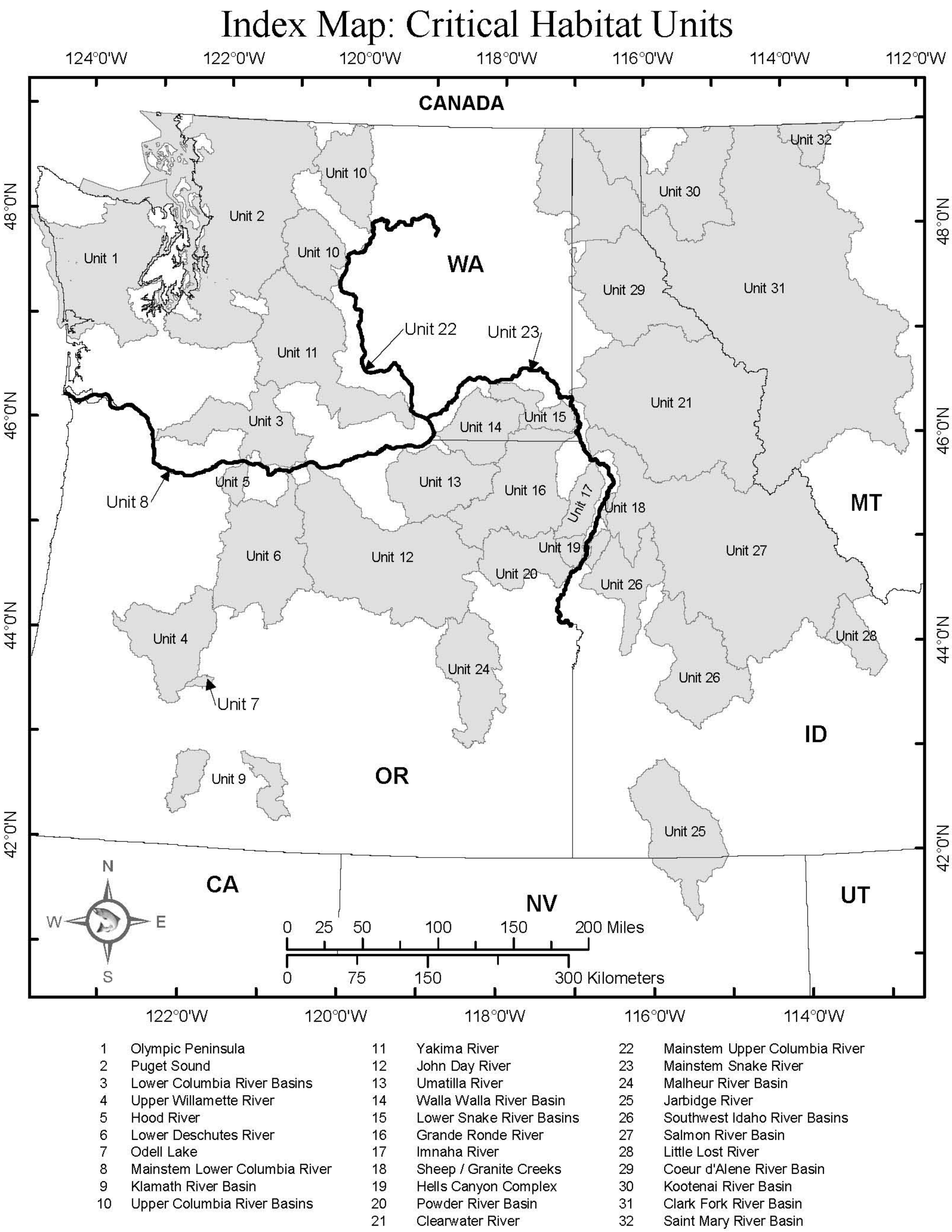

Figure 1. Index map of bull trout designated critical habitat units.

This rule also identifies and designates as critical habitat approximately 1,323.7 km (822.5 miles) of streams/shorelines and 6,758.8 ha (16,701.3 acres) of lakes/reservoirs of unoccupied habitat to address bull trout conservation needs in specific geographic areas in several areas not occupied at the time of listing. 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.

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. Fewer than 2,000 stream miles and 20,000 acres of lake and reservoir surface area were excluded from the designation of critical habitat. It is important to note that the exclusion of waterbodies from designated critical habitat does not negate or diminish their importance for bull trout conservation, nor reduce authorities that protect the species under the ESA. Because exclusions reflect the often complex pattern of land ownership, designated critical habitat is often fragmented and interspersed with excluded stream segments.

Conservation Role and Description of Critical Habitat

The conservation role of bull trout critical habitat is to support viable core area populations (75 FR 63898:63943 [October 18, 2010]). 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 shown in Figure 1, thirty-two CHUs within the geographical area occupied by the species at the time of listing are designated under the final critical habitat 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 biological features associated with Primary Constituent Elements (PCEs) 5 and 6, which relate to breeding habitat.

The primary function of individual CHUs is to maintain and support core areas, which 1) contain bull trout populations with the demographic characteristics needed to ensure their persistence and contain the habitat needed to sustain those characteristics (Rieman and McIntyre 1993, p. 19); 2) provide for persistence of strong local populations, in part, by providing habitat conditions that encourage movement of migratory fish (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 (Hard 1995, pp. 314-315; Healey and Prince 1995, p. 182; 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 (Hard 1995, pp. 321-322; 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, overwintering, and migration.

Primary Constituent Elements for Bull Trout Critical Habitat

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

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

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

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

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

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

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

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

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

9. Sufficiently low levels of occurrence of non-native predatory (e.g., lake trout, 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.

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

Note that only PCEs 2, 3, 4, 5, and 8 apply to marine nearshore waters identified as critical habitat. Also, lakes and reservoirs within the CHUs also contain most of the physical or biological features necessary to support bull trout, with the exception of those associated with PCEs 1 and 6. Additionally, all except PCE 6 apply to FMO habitat designated as critical habitat.
Critical habitat designated within each CHU includes the stream channels within the designated stream reaches and has a lateral extent as defined by the bankfull elevation on one bank to the bankfull elevation on the opposite bank. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain and is reached at a discharge that generally has a recurrence interval of 1 to 2 years on the annual flood series. If bankfull elevation is not evident on either bank, the ordinary high-water line must be used to determine the lateral extent of critical habitat. The lateral extent of designated lakes is defined by the perimeter of the waterbody as mapped on standard 1:24,000 scale topographic maps. The Service assumes in many cases this is the full-pool level of the waterbody. In areas where only one side of the waterbody is designated (where only one side is excluded), the mid-line of the waterbody represents the lateral extent of critical habitat.

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

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

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

Current Critical Habitat Condition Rangewide

The condition of bull trout critical habitat varies across its range from poor to good. Although still relatively widely distributed across its 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 decline of bull trout is primarily due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices, impoundments, dams, water diversions, and the introduction of nonnative species (63 FR 31647, June 10 1998; 64 FR 17112, April 8, 1999).

There is widespread agreement in the scientific literature that many factors related to human activities have impacted bull trout habitat function, 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; and 5) degradation of FMO habitat resulting from reduced prey base, roads, agriculture, development, and dams.

Effects of Climate Change on Bull Trout Critical Habitat

One objective of the final rule was to identify and protect those habitats that provide resiliency for bull trout use in the face of climate change. Over a period of decades, climate change may directly threaten the integrity of the essential 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). For more discussion regarding impacts of climate change, see the status of the species and environmental baseline sections.

Consulted on Effects to Critical Habitat

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

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APPENDIX C: STATUS OF THE SPECIES AND CRITCAL HABITAT – KOOTENAI RIVER WHITE STURGEON

Kootenai River White Sturgeon

Listing Status

On June 11, 1992, the Service received a petition from the Idaho Conservation League, North Idaho Audubon, and the Boundary Backpackers to list the Kootenai sturgeon as threatened or endangered under the Act. The petition cited lack of natural flows affecting juvenile recruitment as the primary threat to the continued existence of the wild Kootenai River white sturgeon (Kootenai sturgeon) population. Pursuant to section 4(b)(A) of the Act, the Service determined that the petition presented substantial information indicating that the requested action may be warranted, and published this finding in the Federal Register on April 14, 1993 (58 FR 19401).

A proposed rule to list the Kootenai sturgeon as endangered was published on July 7, 1993 (58 FR 36379), with a final rule following on September 6, 1994 (59 FR 45989).

Reasons for Listing

The Kootenai sturgeon is threatened by habitat modifications in the form of a significantly altered annual hydrograph. Significant levels of natural recruitment ceased after 1974, which coincides with commencement of Libby Dam operations. Other potential threats to the Kootenai sturgeon include removal of side-channel habitats; changes in water chemistry, including elevated heavy metal concentration; and a loss of nutrient inputs from flooding. Paragamian (2002) reported that "Reduced productivity because of [a] nutrient sink effect in Lake Koocanusa, river regulation, the lack of flushing flows, power peaking and changes in river temperature may have led to changes in fish community structure." Changes in the fish community structure may have favored an increase in fish species that prey on Kootenai sturgeon eggs and free-embryos. Changes in the hydrograph, particularly from Libby Dam and the Corra Linn Dam (in Canada), have altered Kootenai sturgeon spawning, egg incubation, and rearing habitats, and reduced overall biological productivity of the Kootenai River. These indirect factors may be adversely affecting the free-swimming life stages of the Kootenai sturgeon.

Species Description

Kootenai sturgeon are included in the family Acipenseridae, which consists of 4 genera and 24 species of sturgeon. Eight species of sturgeon occur in North America with Kootenai sturgeon being one of the five species in the genus *Acipenser*. Kootenai sturgeon are a member of the species *Acipenser transmontanus*.

White sturgeon were first described by Richardson in 1863 from a single specimen collected in the Columbia River near Fort Vancouver, Washington (Scott and Crossman 1973, as cited in NWPCC, 2005). White sturgeon are distinguished from other Acipenser by the specific arrangement and number of scutes (bony plates) along the body (NWPCC, 2005). The largest white sturgeon on record, weighing approximately 1,500 pounds was taken from the Snake River near Weiser, Idaho in 1898 (Simpson and Wallace 1982). The largest white sturgeon reported among Kootenai sturgeon was a 159 kilogram (350-pound) individual, estimated at 85 to 90 years of age, captured in Kootenay Lake during September 1995 (RL&L 1999). White sturgeon are generally long-lived, with females living from 34 to 70 years (PSMFC 1992).

Life History

As noted in the Kootenai Sturgeon Recovery Plan (Service 1999), Kootenai sturgeon are considered opportunistic feeders. Partridge (1983) found Kootenai sturgeon more than 70 centimeters (28 inches) in length feeding on a variety of prey items including clams, snails, aquatic insects, and fish. Andrusak (pers. comm., 1993) noted that kokanee (*Oncorhynchus nerka*) in Kootenay Lake, prior to a dramatic population crash beginning in the mid-1970's, were once considered an important prey item for adult Kootenai sturgeon.

In the spring, reproductively active Kootenai sturgeon respond to increasing river depth and flows by ascending the Kootenai River. Historically (prior to Libby Dam construction and operation), spawning areas for Kootenai sturgeon were reported to be in the roughly one mile stretch of the Kootenai River below Kootenai Falls (RM 309.7) (Corps 1971; MFWP 1974). However, Kootenai sturgeon monitoring programs conducted from 1990 through 1995 revealed that during that five year period, sturgeon spawned within an 11.2 RM reach of the Kootenai River, from Bonners Ferry downstream to below Shorty's Island (RM 143.0). Through 2018, most spawning continues to occur downstream of Bonners Ferry over sandy substrates. As river flow and stage increase, Kootenai sturgeon spawning tends to occur further upstream, near the gravel substrates which now occur at and upstream of Bonners Ferry (Paragamian et al. 1997). Although about a third of Kootenai sturgeon in spawning condition migrate upstream to the Bonners Ferry area annually, few remain there to spawn (Paragamian et al. 1997; Rust and Wakkinen 2013). Kootenai sturgeon have spawned in water ranging in temperature from 37.3 to 55.4° F. However, most Kootenai sturgeon spawn when the water temperature is near 50° F (Paragamian et al. 1997).

The size or age at first maturity for Kootenai sturgeon in the wild is quite variable (PSMFC 1992). In the Kootenai River system, females have been estimated (based upon age-length relationships) to mature at age 30 and males at age 28 (Paragamian et al. 2005). Only a portion of Kootenai sturgeon are reproductive or spawn each year, with the spawning frequency for females estimated at 4 to 6 years (Paragamian et al. 2005). Spawning occurs when the physical environment permits egg development and cues ovulation. Kootenai sturgeon spawn during the period of historical peak flows, from May through July (Apperson and Anders 1991; Marcuson 1994). Spawning at near peak flows with high water velocities disperses and prevents clumping of the adhesive, demersal (sinking) eggs.

Following fertilization, eggs adhere to the rocky riverbed substrate and hatch after a relatively brief incubation period of 8 to 15 days, depending on water temperature (Brannon et al. 1985). Here they are afforded cover from predation by high near-substrate water velocities and ambient water turbidity, which preclude efficient foraging by potential predators.

Upon hatching the embryos become “free-embryos” (that life stage after hatching through active foraging larvae with continued dependence upon yolk materials for energy). Free-embryos initially undergo limited downstream redistribution(s) by swimming up into the water column and are then passively redistributed downstream by the current. This redistribution phase may last from one to six days depending on water velocity (Brannon et al. 1985; Kynard and Parker 2005). The inter-gravel spaces in the substrate provide shelter and cover during the free-embryo "hiding phase".

As the yolk sac is depleted, free-embryos begin to increase feeding, and ultimately become free-swimming larvae, entirely dependent upon forage for food and energy. Because the larvae are free-swimming, they are less dependent upon rocky substrate or high water velocity for survival (Brannon et al. 1985; Kynard and Parker, 2005). The timing of these developmental events is dependent upon water temperature. With water temperatures typical of the Kootenai River, free-embryo Kootenai sturgeon may require more than seven days post-hatching to develop a mouth and be able to ingest forage. At 11 or more days, Kootenai sturgeon free-embryos would be expected to have consumed much of the energy from yolk materials, and they become increasingly dependent upon active foraging.

The duration of the passive redistribution of post-hatching free-embryos, and consequently the linear extent of redistribution, depends upon near substrate water velocity, where free-embryos enter the hiding phase earlier when river currents are higher (Brannon et al. 1985). This adaptive behavior prevents prolonged exposure of free-embryos to potential predators (Brannon et al. 1985). Working with Kootenai sturgeon, Kynard and Parker (2005) found that under some circumstances this dispersal phase may last for up to 6 days. A prolonged dispersal phase among free-embryos would increase the risk of predation on the embryo and diminish energy reserves, whereas entering the hiding phase earlier would reduce these risks. Multiple years of field sampling of juveniles and adults indicates that juvenile and adult Kootenai sturgeon primarily rear in the lower Kootenai River and in Kootenay Lake (Flory 2011).

Population Dynamics and Viability

Paragamian et al. (2005) indicated that the wild population of Kootenai sturgeon consists of an aging cohort of large, old fish. In 2019, an Interim Progress Report from IDFG estimated that the wild adult Kootenai sturgeon population abundance had declined from approximately 2,072 individuals in 2011 to 1,744 individuals (confidence interval 1,232-2,182) in 2017 (Hardy and McDonnell unpublished report 2019). Annual survival rates (estimated by mark-recapture analysis) are estimated to be approximately 96 percent. These latest estimates are the most current information available and constitute the best available science on the abundance and survival of wild adult Kootenai sturgeon.

Beamesderfer et al. (2014) found that "very low levels of natural recruitment continue to be documented based on low sample numbers of juvenile fish". The same analysis also showed that applying capture probabilities (from capture of hatchery fish) indicates that approximately 13 wild juveniles are recruited into the population annually. This suggests that high levels of mortality are now occurring in habitats used for egg incubation and free-embryo development, which are unlikely to sustain a wild population of the Kootenai sturgeon. Natural reproduction at this level cannot be expected to provide any population level benefits (Anders 2017), nor would reproduction at this level have been adequate to sustain the population of 6,000 to 8,000 sturgeon estimated to exist in 1980 (Anders 2017). The last year of significant natural recruitment was 1974.

Distribution

The Kootenai sturgeon is one of 18 landlocked populations of white sturgeon known to occur in western North America (Service 1999). Kootenai sturgeon occur in Idaho, Montana, and British Columbia and are restricted to approximately 167.7 RM of the Kootenai River extending from Kootenai Falls, Montana (31 RM below Libby Dam, Montana), downstream through Kootenay Lake to Corra Linn Dam, which was built on Bonnington Falls at the outflow from Kootenay Lake in British Columbia (RM 16.3). Approximately 45 percent of the species' range is located within British Columbia.

Bonnington Falls in British Columbia, a natural barrier downstream from Kootenay Lake, has isolated the Kootenai sturgeon since the last glacial advance roughly 10,000 years ago (Apperson 1992). Apperson and Anders (1990; 1991) found that at least 36 percent (7 of 19) of the Kootenai sturgeon tracked during 1989 overwintered in Kootenay Lake. Adult Kootenai sturgeon forage in and migrate freely throughout the Kootenai River downstream of Kootenai Falls at RM 193.9. Juvenile Kootenai sturgeon also forage in and migrate freely throughout the lower Kootenai River downstream of Kootenai Falls and within Kootenay Lake. Apperson and Anders (1990; 1991) observed that Kootenai sturgeon no longer commonly occur upstream of Bonners Ferry, Idaho. However, there are no structural barriers preventing Kootenai sturgeon from ascending the Kootenai River up to Kootenai Falls, and this portion of the range remains occupied as documented by Ireland (2005), Stephens et al. (2010), and Stephens and Sylvester (2011).

Conservation Needs

Based on the best scientific information currently available, the habitat needs for successful spawning and recruitment of Kootenai sturgeon are described below.

Water Velocity
High "localized" water velocity is one of the common factors of known sites where white sturgeon spawn and successfully recruit in the Columbia River Basin. Mean water velocities exceeding 3.3 feet/second (f/s) are important to spawning site selection. These water velocities provide: cover from predation; normal free-embryo behavior and redistribution; and shelter (living space) for eggs and free-embryos through the duration of the incubation period.

Water Depth
The best information currently available indicates that water depth is a factor affecting both migratory behavior and spawning site selection among Kootenai sturgeon.

Rocky Substrate
Rocky substrate and associated inter-gravel spaces provide both structural shelter and cover for egg attachment, embryo incubation, and normal free-embryo incubation and behavior involving downstream redistribution by the current.

Water Temperature/Quality
Suitable water and substrate quality are necessary for the viability of early life stages of Kootenai sturgeon, including both incubating eggs and free-embryos, and for normal breeding behavior.

Lower than normal water temperatures in the spawning reach may affect spawning behavior, location, and timing. Preferred spawning temperature for the Kootenai sturgeon is near 50 °F, and sudden drops of 3.5 to 5.5 °F cause males to become reproductively inactive, at least temporarily. Water temperatures also affect the duration of incubation of both embryos (eggs) and free-embryos.

Kootenai River White Sturgeon Critical Habitat

On September 6, 2001, the Service issued a final rule designating critical habitat for the Kootenai sturgeon (66 FR 46548). The critical habitat designation extends from ordinary high water line to ordinary high water line on the right and left banks, respectively, along approximately 11.2 miles of the mainstem Kootenai River from RM 141.4 to RM 152.6 in Boundary County, Idaho, Unit 2, Figure 1. On February 10, 2006, the Service issued an interim rule designating the braided reach (RM 152.6 to RM 159.7) as critical habitat (71 FR 6383), Unit 2, Figure 1. On June 9, 2008, the Service issued a final rule designating the braided reach as critical habitat (73 FR 39506). Both the meander and the braided reach are located entirely within Boundary County, Idaho, respectively downstream and upstream of Bonners Ferry. A total of 18.3 RM is designated as critical habitat for Kootenai sturgeon.

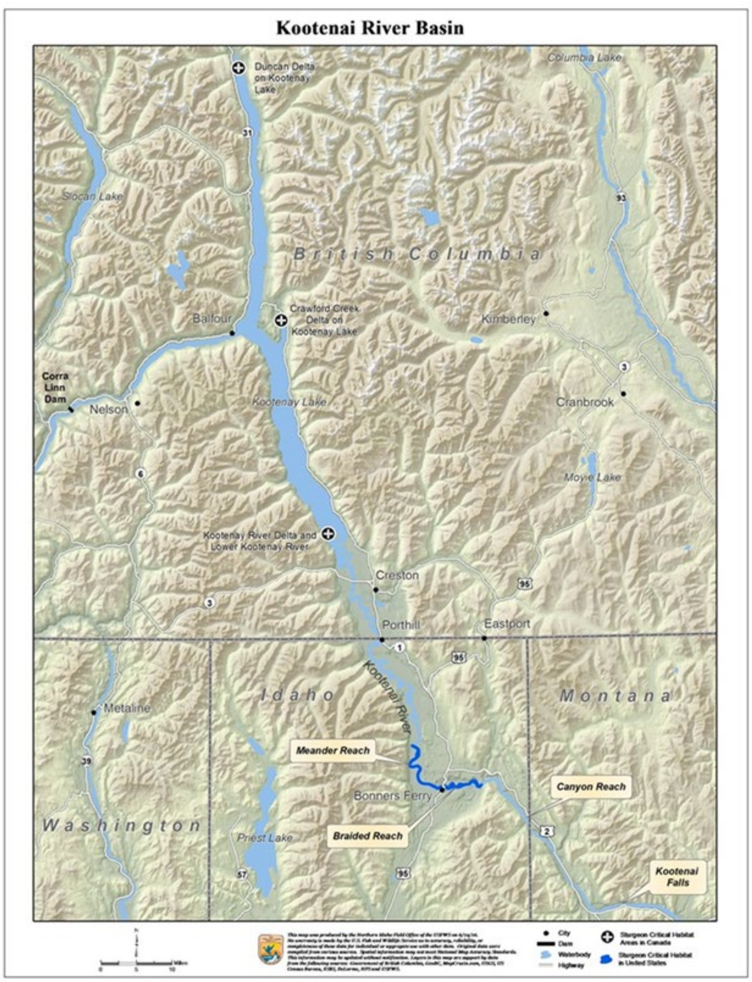

Figure 1. Geographic reaches within Kootenai sturgeon critical habitat

Primary Constituent Elements

Four PCEs are defined for Kootenai sturgeon critical habitat (73 FR 39506). These PCEs are specifically focused on adult migration, spawning site selection, and survival of embryos and free-embryos, the latter two of which are the life stages now identified as limiting the reproduction and numbers of the Kootenai sturgeon. The PCEs are defined as follows:

1. A flow regime, during the spawning season of May through June, that approximates natural variable conditions and is capable of producing depths of 23 feet (ft) (7 meters (m)) or greater when natural conditions (for example, weather patterns, water year) allow. The depths must occur at multiple sites throughout, but not uniformly within, the Kootenai River designated critical habitat.

2. A flow regime, during the spawning season of May through June, that approximates natural variable conditions and is capable of producing mean water column velocities of 3.3 feet/second (ft/s) (1.0 meters/second) or greater when natural conditions (for example, weather patterns, water year) allow. The velocities must occur at multiple sites throughout, but not uniformly within, the Kootenai River designated critical habitat.

3. During the spawning season of May through June, water temperatures between 47.3 and 53.6 °F (8.5 and 12 °C), with no more than a 3.6 °F (2.1 °C) fluctuation in temperature within a 24-hour period, as measured at Bonners Ferry.

4. Submerged rocky substrates in approximately 5 continuous river miles (8 river kilometers) to provide for natural free embryo redistribution behavior and downstream movement.

5. A flow regime that limits sediment deposition and maintains appropriate rocky substrate and inter-gravel spaces for sturgeon egg adhesion, incubation, escape cover, and free embryo development. Note: the flow regime described above under PCEs 1 and 2 should be sufficient to achieve these conditions.

Current Condition of Critical Habitat

Meander Reach

The meander reach is characterized by sandy substrate, a low water-surface gradient, a series of deep holes, and water velocities which rarely reach 3.3 ft/s. The morphology of the meander reach has changed relatively little over time (Barton 2004). Significant changes to this reach caused by the construction and operation of Libby Dam include: 1) a decrease in suspended sediment; 2) the initiation of cyclical aggradation and degradation of the sand riverbed in the center of the channel; 3) a reduction in water velocities (Barton 2004); and 4) reductions in floodplain interactions and riparian function, which negatively affect primary and secondary productivity in the river.

The upstream-most segment of the meander reach (approximately 0.6 RM in length) has rocky substrate and water velocities in excess of 3.3 ft/s under present river operations (Berenbrock 2005a). However, due to a reduction of average peak flows by over 50 percent caused by flood control operations of Libby Dam and the reduction of the average elevation of Kootenay Lake by approximately 7.2 ft (and the resultant backwater effect), the PCE for water depth is infrequently achieved in this reach of the Kootenai River (Berenbrock 2005a). A deep hole (49.9 ft) that is frequented by sturgeon in spawning condition exists near Ambush Rock at approximately RM 151.9 (Barton et al. 2005).

In 2014, as part of the Kootenai River Habitat Restoration Project, small patches (approximately 0.5 to 1.0 acre each) of rocky substrates were placed in documented spawning areas in the Shorty's Island (RM 143.6) and Myrtle Creek (RM 145.5) areas. Rocky substrates were also placed in the straight reach (RM 152) in 2016. These substrate enhancement projects were implemented as pilot projects to test whether the substrates would persist (i.e., remain clear of sand and silt) and whether Kootenai sturgeon would continue to spawn at those specific sites. Current monitoring of both the substrates and spawning sturgeon indicate that the pilot projects have been successful in those specific regards (KTOI 2016).

Braided Reach

The braided reach of the Kootenai River was selected for designation because it contains: 1) sites with seasonal availability of adequate water velocity in excess of 3.3 ft/s; and 2) rocky substrate necessary for normal spawning, embryo attachment and incubation, and normal free embryo dispersal, incubation and development. Within this reach, the valley broadens, and the river forms an intermediate-gradient braided reach as it courses through multiple shallow channels over gravel and cobbles (Barton 2004).

Similar to the 0.6 RM upstream-most segment of the meander reach, the lower end of the braided reach has also become shallower during the sturgeon reproductive period for the same reasons discussed above. Additionally, a loss of energy and bed load accumulation has resulted in a large portion of the middle of the braided reach becoming wider and shallower (Barton et al. 2005).

The net result of the changes described above may adversely affect Kootenai sturgeon in the following ways: 1) Kootenai sturgeon may generally avoid spawning in areas upstream of Bonners Ferry that have suitable rocky substrates; 2) Kootenai sturgeon may instead spawn at sites that have unsuitable substrates and low water velocity (i.e., the meander reach); 3) the loss of floodplain interaction and riparian function may negatively affect primary and secondary productivity in the river, thereby reducing available food sources during sturgeon early life stages. While suitable water depth is still achieved under current operations at the downstream end of the braided reach, significant special management is needed to adequately address the PCEs for substrate and water velocity in this area.

Beginning in 2011, multiple habitat restoration projects have been implemented in the braided reach, as part of the Kootenai River Habitat Restoration Program. Projects implemented to date include side channel restoration, bank stabilization, island construction, pool construction, construction of pool-forming structures, riparian restoration and enhancement, and floodplain reconnection and enhancement.

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APPENDIX D: Effects Screen for Projects Meeting SLOPES Requirements

Effects to Bull Trout

1. Project is outside of a bull trout HUC6, based on IPaC or list.
   a. Project stream is not directly connected to an occupied stream…………....**NO EFFECT**
   b. Project stream is directly connected to an occupied stream…..…........…**MAY AFFECT**

2. Project is within a bull trout HUC6, based on IPaC or list……………………….....… **MAY AFFECT**
   a. Project is in an occupied lake………………………………………...…………………………**NLAA**
   b. Project is in an unoccupied stream and directly connected to an occupied stream
      1. Project location is one mile or more from occupied stream…………..…**NLAA**
      2. Project location is less than one mile from occupied stream…………...…**LAA**
   c. Project is in an occupied stream……………………………………..………………………..…**LAA**

Effects to Bull Trout Critical Habitat

3. Project is not in designated critical habitat, based on critical habitat maps.
   a. Project stream is not directly connected to critical habitat………………..….....**NO EFFECT**
   b. Project stream is directly connected to critical habitat………..….............…**MAY AFFECT**
      i. Project location is one mile or more from critical habitat…...…………..……….**NLAA**
      ii. Project location is less than one mile from critical habitat...……………..……...…**LAA**

Effects Screen Illustration

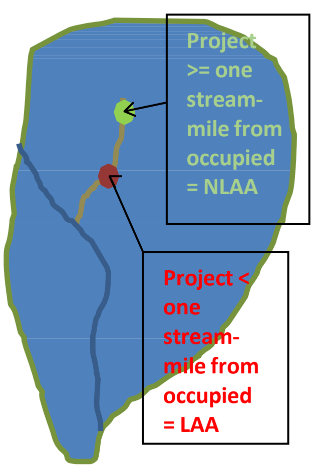
No Effect: Project occurs outside of bull trout watersheds (based on IPaC or list) and project stream does not directly empty into an occupied stream (i.e., is not a primary tributary to an occupied stream, but may have a higher order connection).

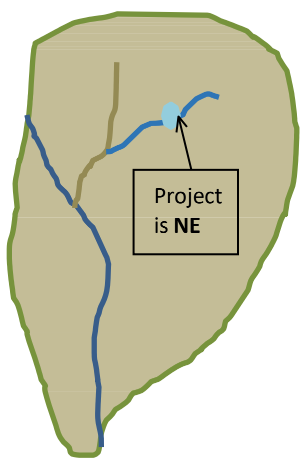
NLAA: Project occurs in lake, reservoir or lake-like setting or in an unoccupied stream with direct downstream connectivity to an occupied stream and one stream-mile or more from the confluence with the occupied stream.

LAA: Project occurs in an occupied stream OR in an unoccupied stream with direct downstream connectivity to an occupied stream and less than one stream-mile from the confluence with the occupied stream.

HUC6 with bull trout present

HUC6 with NO bull trout present





Unoccupied streams with connectivity to occupied

Unoccupied stream with NO direct direct connectivity to occupied

APPENDIX E: Conservation Measures

1. 2017 Nationwide Permit Conditions
   a. Permit Specific Conditions - All actions covered under this SLOPES shall comply with all applicable Nationwide Permit specific conditions and limitations.
   b. General Conditions – All actions covered under this SLOPES shall comply with all applicable Nationwide Permit General Conditions.
   c. Regional Conditions – All actions covered under this SLOPES shall comply with all Regional Conditions applicable to the state where the action will occur and the NWP being used to authorize the project. The Regional Conditions for each state can be found at the links as listed below.
      i. Montana –NWO Regional Conditions for Montana
      ii. Idaho – NWW Regional Conditions
      iii. Washington – NWS Regional Conditions
2. Project Design
   a. All stream crossings (new and replacement of existing structures) will be designed to allow unimpeded natural stream flow and movement of existing streambed material.
   b. Utility stream crossings shall be perpendicular to the watercourse, or nearly so, and designed in the following priority: (1) directional drilling, boring and jacking; and (2) dry trenching or plowing.
   c. If trenching or plowing are used, all work shall be completed in the dry and backfilled with native material and any large wood displaced by trenching or plowing will be returned to its original position wherever feasible.
   d. All construction impacts must be confined to the minimum area necessary to complete the project and boundaries of clearing limits associated with site access and construction will be clearly marked to avoid or minimize disturbance of riparian vegetation, wetlands and other sensitive sites.
   e. The design of any proposed stream bank stabilization must incorporate woody vegetation unless the stream experiences altered hydrology from an impoundment.
   f. Maximum barb length will not exceed 1/4 of the bankfull channel width.
   g. Riprap/rock material must be keyed into the toe of the bank.
   h. Existing channel form and dimension must be maintained to the maximum extent possible.
   i. Rock riprap shall be individually placed without end dumping.
   j. If the bank stabilization structure has been destroyed or damaged beyond repair, replacement of the structure shall utilize bioengineering principals and methods, and will incorporate native vegetation.
   k. Bank stabilization activities shall not exceed the limits of Nationwide Permit 13 unless a variance is approved.
   l. Placement of riprap/rock for any structure shall not exceed top of bank elevation.

m. Any proposals to add spawning gravel must first be reviewed and approved by the local state fisheries biologist. Spawning gravel must be inspected by either a state fisheries biologist or a qualified fisheries biologist familiar with the site's characteristics and requirements.

n. Any intake structure (pump or raw water intake), shall meet the most recent NOAA screening criteria. https://www.westcoast.fisheries.noaa.gov/publications/hydropower/southwest_region_1997_fish_screen_design_criteria.pdf

o. Clean natural angular rock or stone may be used to anchor or stabilize large wood, fill scour holes, prevent scouring or undercutting of an existing structure, or to construct a barb, weir or other properly designed and approved in-water structure.

3. In-water Work Timing

    a. The Corps will check with appropriate sources to determine whether or not listed fish are present or likely to be present during any proposed in-water work. The following work timeframes will be adhered to minimize adverse impacts to listed fish:

        i. Bull trout: In rivers and streams, foraging, migrating, and overwintering habitat in-channel disturbance is limited to the period between July 1 and September 30, except for projects incorporating dormant woody vegetation where species presence has been adequately evaluated; Spawning and rearing habitat in-channel disturbance is limited to the period between May 1 and August 31.

        ii. In lake or lake influenced settings, such as Lake Pend Oreille or Flathead Lake, work may be conducted in the dry during the lake draw down period.

4. Work Area Isolation

    a. All work should be performed in the dry when possible. Any work in rivers (excluding the Pend Oreille River) and streams must be completed by working from the top of the bank or the work areas must be isolated from flowing or open water using cofferdams, silt curtains, sandbags or other approved means to keep suspended sediment from entering flowing or open water, unless not isolating the area and working in the channel would result in less habitat disturbance.

5. Erosion Control Measures

    a. Minimize Site Preparation Impacts

        i. Site clearing, staging areas, access routes, and stockpile areas shall be in a manner that minimizes overall disturbance, minimizes disturbance to riparian vegetation, and that precludes erosion into stream channels.

   ii. Sediment barriers will be placed around potentially disturbed sites to prevent sediment from entering a stream directly or indirectly, including by way of roads and ditches.
   iii. A supply of erosion control materials (e.g. silt fence and straw bales) will be kept on hand to respond to sediment emergencies. Sterile straw or certified “weed free” straw will be used to prevent introduction of noxious weeds.

b. Minimize Earthmoving-Related Erosion
   i. Work will be confined to the minimum area necessary to complete the project.
   ii. Project operations must cease under high flow conditions that may result in inundation of the project area, except for efforts to avoid or minimize resource damage.

6. Pollution and Invasive Species Control Measures
   a. Equipment Use
      i. All equipment fueling, maintenance, and staging areas will be located in non-wetland areas landward of the ordinary high water mark of the waterbody unless no other option is available. When no option is available, these activities shall occur at the greatest distance possible perpendicular from any water body to adequately avoid and minimize potential impacts.
      ii. All equipment used for in-channel work will be cleaned of external oil, grease, dirt, mud, plant material or other debris, which may harbor invasive plants or animals; and leaks repaired; prior to arriving at the project site. All equipment will be inspected before unloading at site. Any leaks or accumulations of grease will be corrected before entering streams or areas that drain directly into streams or wetlands.
   b. General
      i. All projects must comply with the conditions of the applicable state, EPA, or tribal 401 Water Quality Certification for the appropriate NWP.
      ii. Structural fills with materials such as concrete shall be placed into tightly sealed forms or cells that do not contact the waterway until fully cured.
      iii. Road crossing and bridge structures shall be designed to direct surface drainage into areas or features to prevent erosion of soil and entry of other pollutants directly into waterways or wetlands (such as biofiltration swales or other treatment facilities).

7. Site Restoration
   a. For projects in Washington and Idaho, site revegetation must comply with the applicable Regional Conditions.
   b. For projects in Montana, site revegetation must comply with the following conditions.

i. All areas of vegetation disturbance or removal will be revegetated with native species appropriate for the project location. A revegetation plan must be submitted with the application specifying species, planting or seeding rates and maintenance measures to ensure 80% cover (ground or canopy) after three years.
ii. Within the first planting season post-construction, the stabilized bank shall be revegetated with native species.

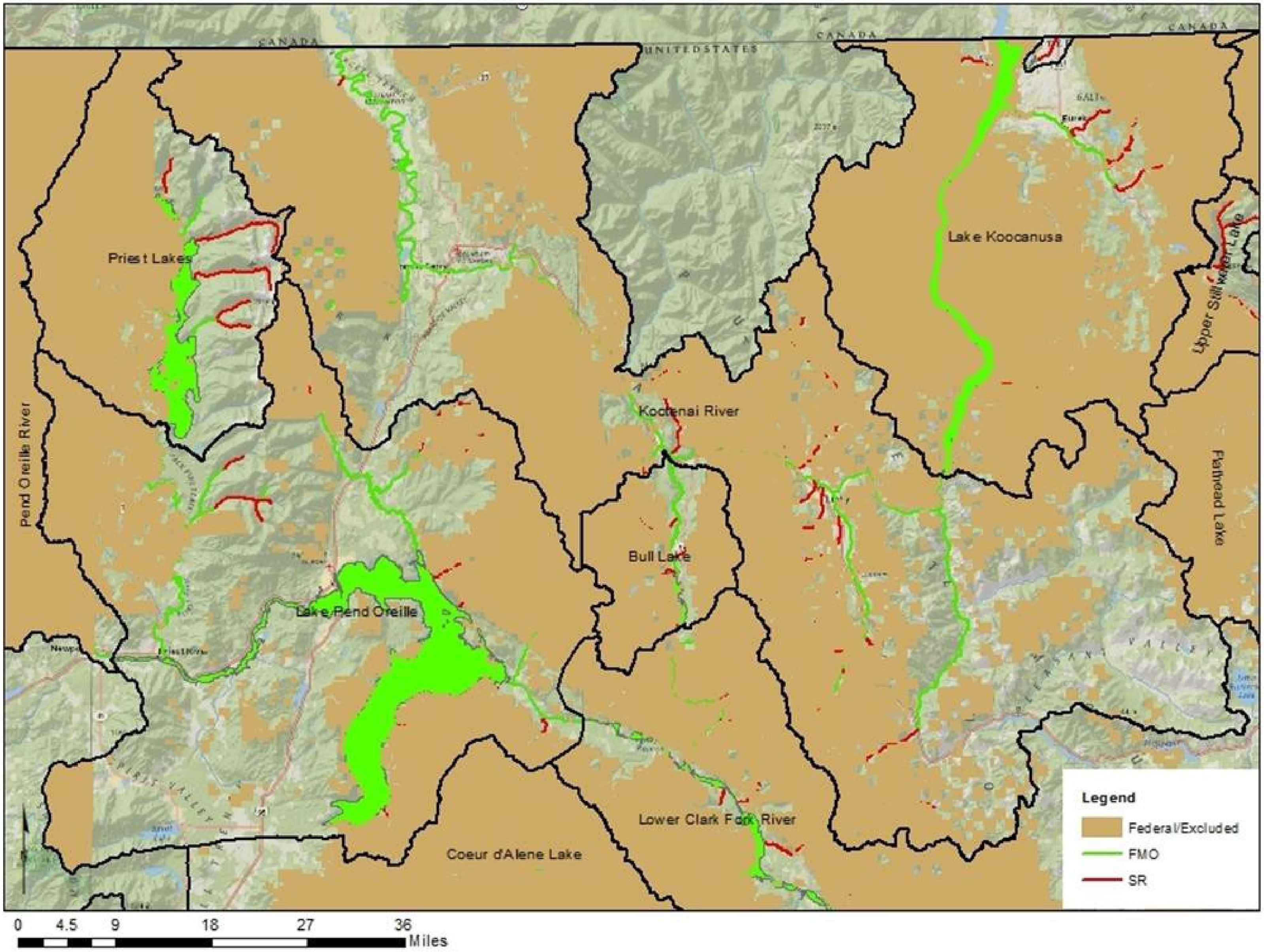
APPENDIX F: Excluded Activities

- Oil and gas exploration or production, construction or upgrading of a gas, sewer or water line to support a new or expanded service area, and foundations for transmission towers.
- Outfalls and intakes where none previously existed
- Unscreened intakes
- Any in-stream structure that could become a barrier to fish movement during low flows.
- Temporary bypass channels in excess of 300 linear feet
- Dewatering that places a stream into a pipe more than 300 feet long or for more than 30 days.
- New sea walls, retaining walls or bulkheads, where none previously existed.
- Any streambank stabilization project utilizing concrete.
- Stream or wetland impacts for new road construction within 300 feet of occupied bull trout or Kootenai River white sturgeon streams.
- Bridge abutments below ordinary high water of occupied streams where none previously existed.
- A replacement bridge constructed adjacent to an existing bridge without full removal of the existing bridge, support structures and approach fill.
- Pond construction or expansion in streams or jurisdictional wetlands.
- Large dam removal projects (>10' head difference).
- Projects that involve relocating more than 300 feet of channel (cumulative total for the entire project).
- Use of concrete logs, cable (wire rope) or chains to permanently anchor any structure.

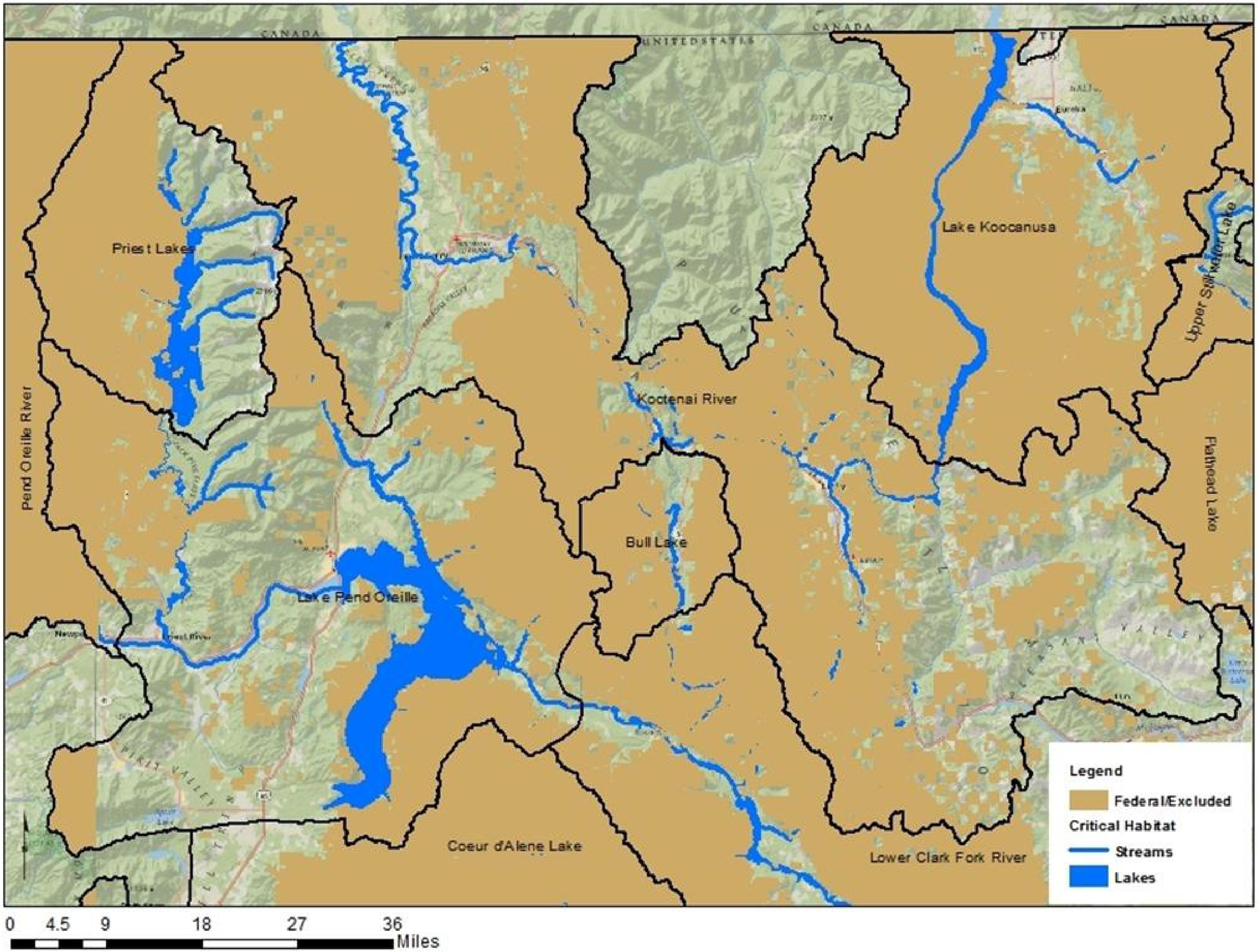
Appendix G: Action Area Maps for Bull Trout Occupied Waters and Designated Critical Habitat

The following maps show streams and lakes which are known or suspected to be occupied by bull trout, categorized as foraging-migrating-overwintering (FMO) and spawning-rearing (SR), within the action area for each bull trout core area. Federal lands are blocked out. Where possible, multiple core areas within a geographic region are shown. Map scales range from 1:500,000 to 1:850,000, so as to allow the largest core areas to be displayed on one page (except for Flathead Lake) with adequate detail. Geographic sections are ordered generally west to east and north to south. Map titles include only core areas that may be affected by the action. Occupied water bodies and designated critical habitat are shown separately. Lakes within federal ownership are visible because they are not part of the land ownership database, and adjacent lands indicate whether the shoreline is within the action area.

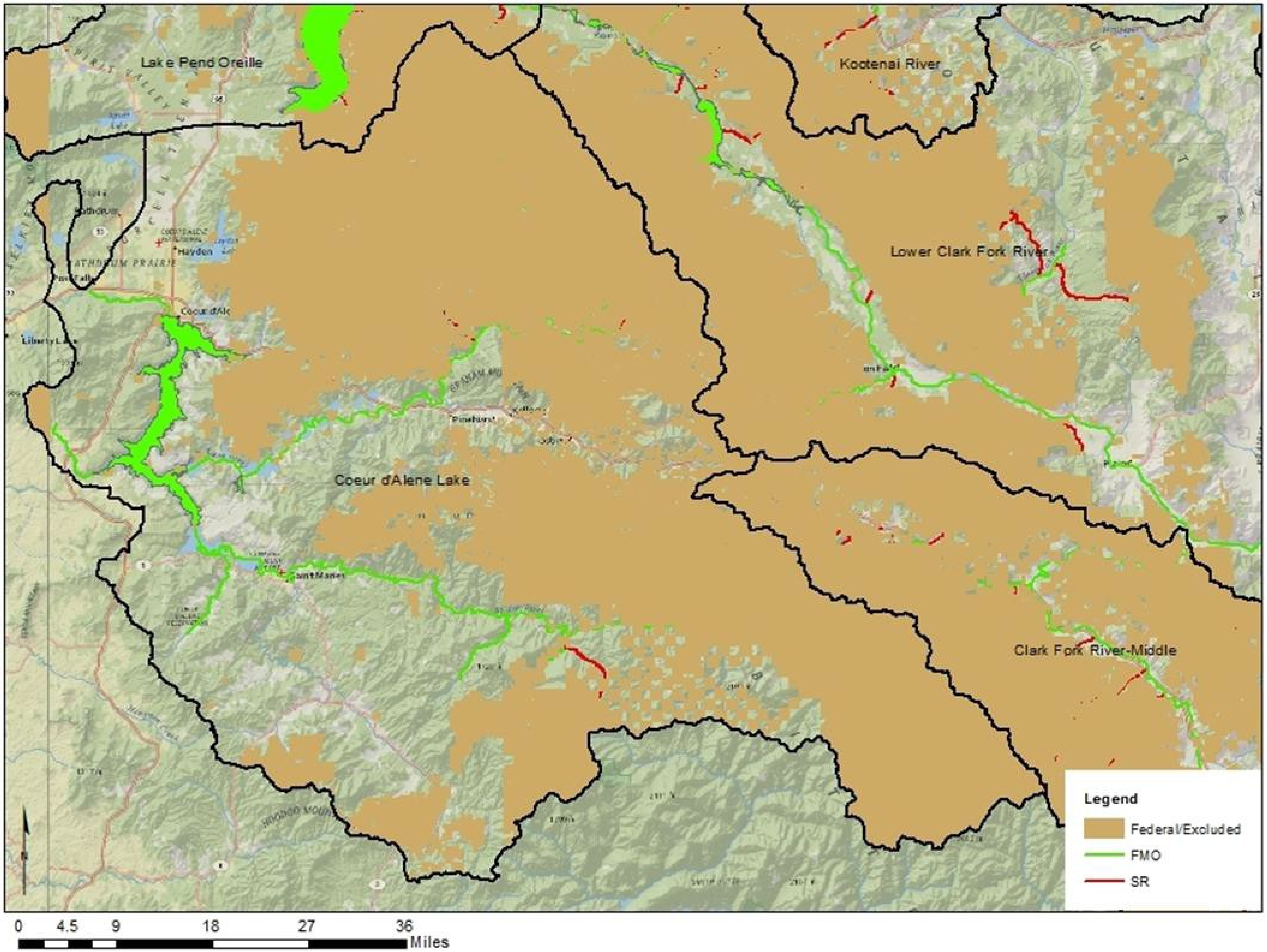
***Map 1a:** Bull trout occupied waters and action area (unshaded) in Priest Lakes, Lake Pend Oreille, Kootenai River, Bull Lake, and Lake Koocanusa Core Areas.*



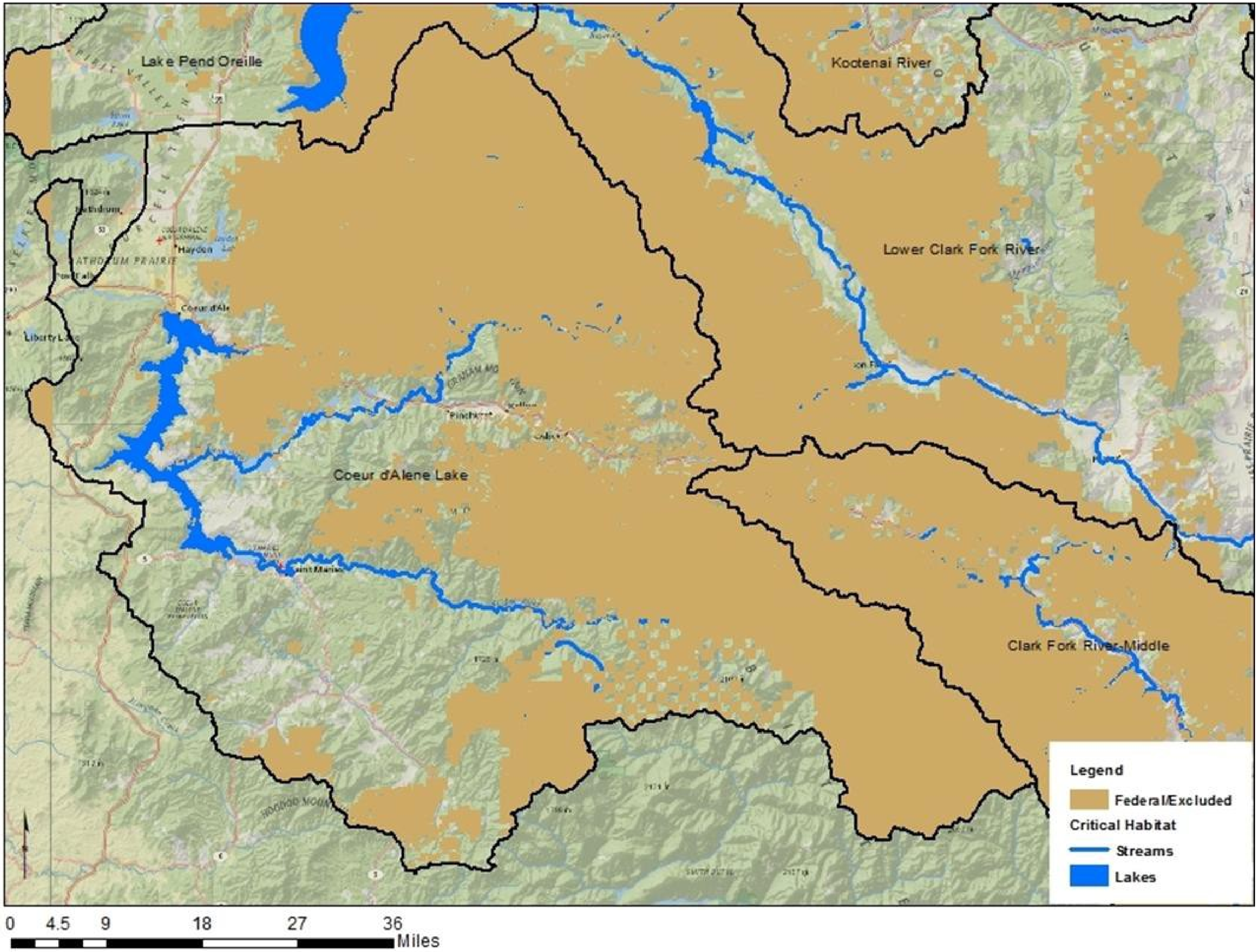
Map 1b: *Designated critical habitat and action area (unshaded) in the Priest Lakes, Lake Pend Oreille, Kootenai River, Bull Lake, and Lake Koocanusa Core Areas.*



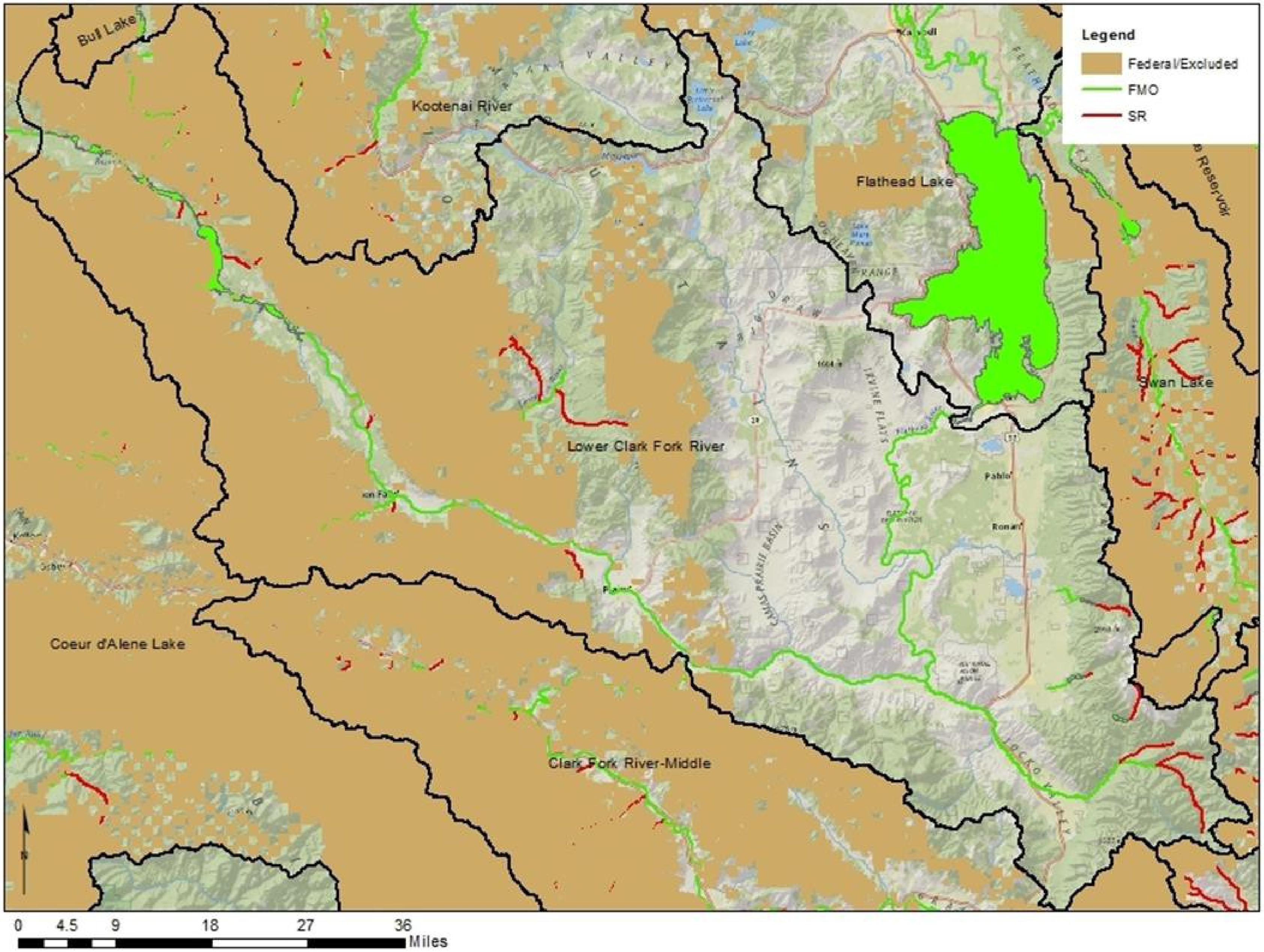
Map 2a: *Bull trout occupied waters and action area (unshaded) in Coeur d'Alene Lake Core Area.*



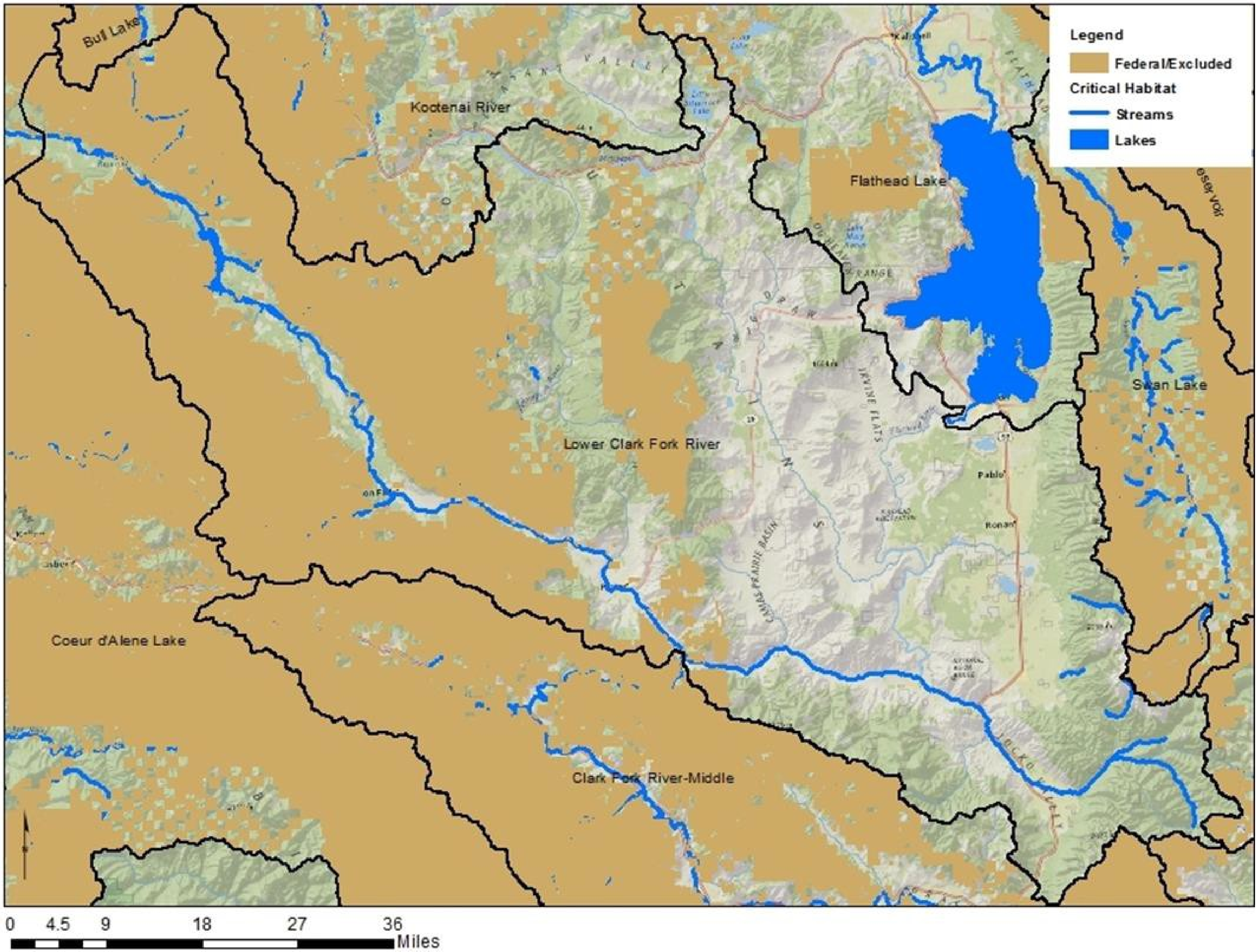
Map 2a: *Designated critical habitat and action area (unshaded) in Coeur d'Alene Lake Core Area.*



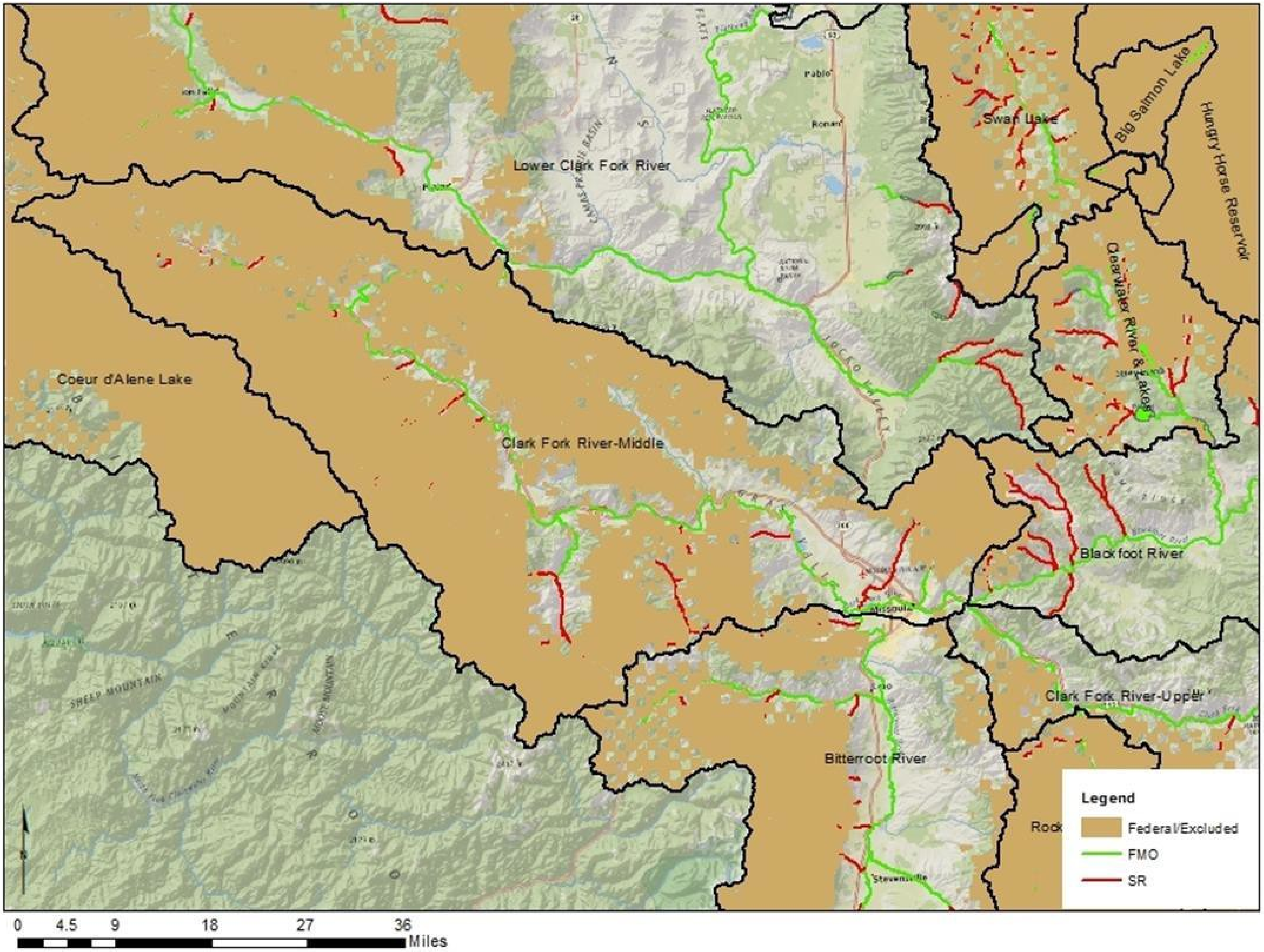
Map 3a: *Bull trout occupied waters and action area (unshaded) in portions of the Lake Pend Oreille and Flathead Lake Core Area.*



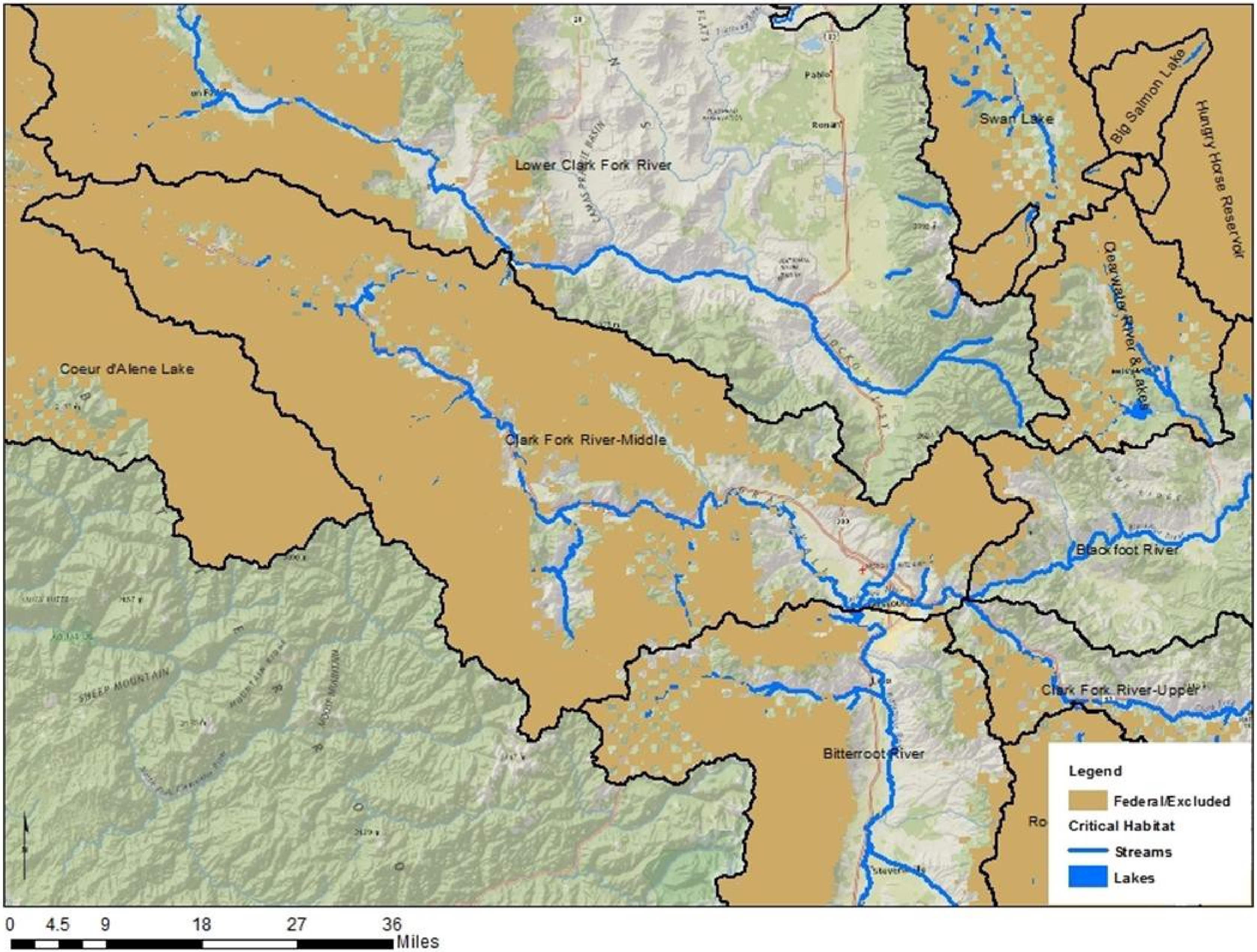
Map 3b: *Designated critical habitat and action area (unshaded) in Lake Pend Oreille, Flathead Lake and Swan Lake Core Areas.*



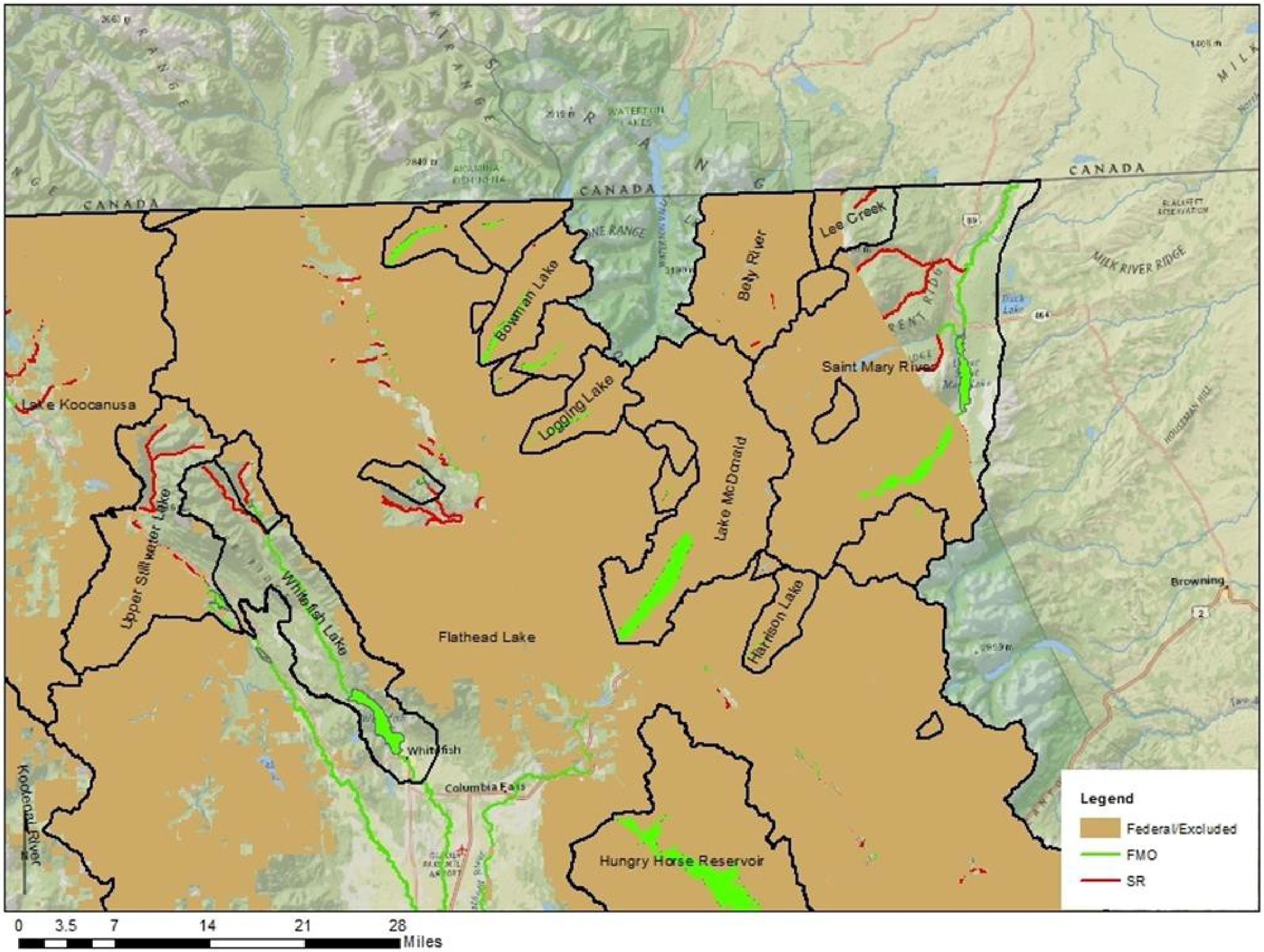
Map 4a: *Bull trout occupied waters and action area (unshaded) in Middle Clark Fork River Core Area.*



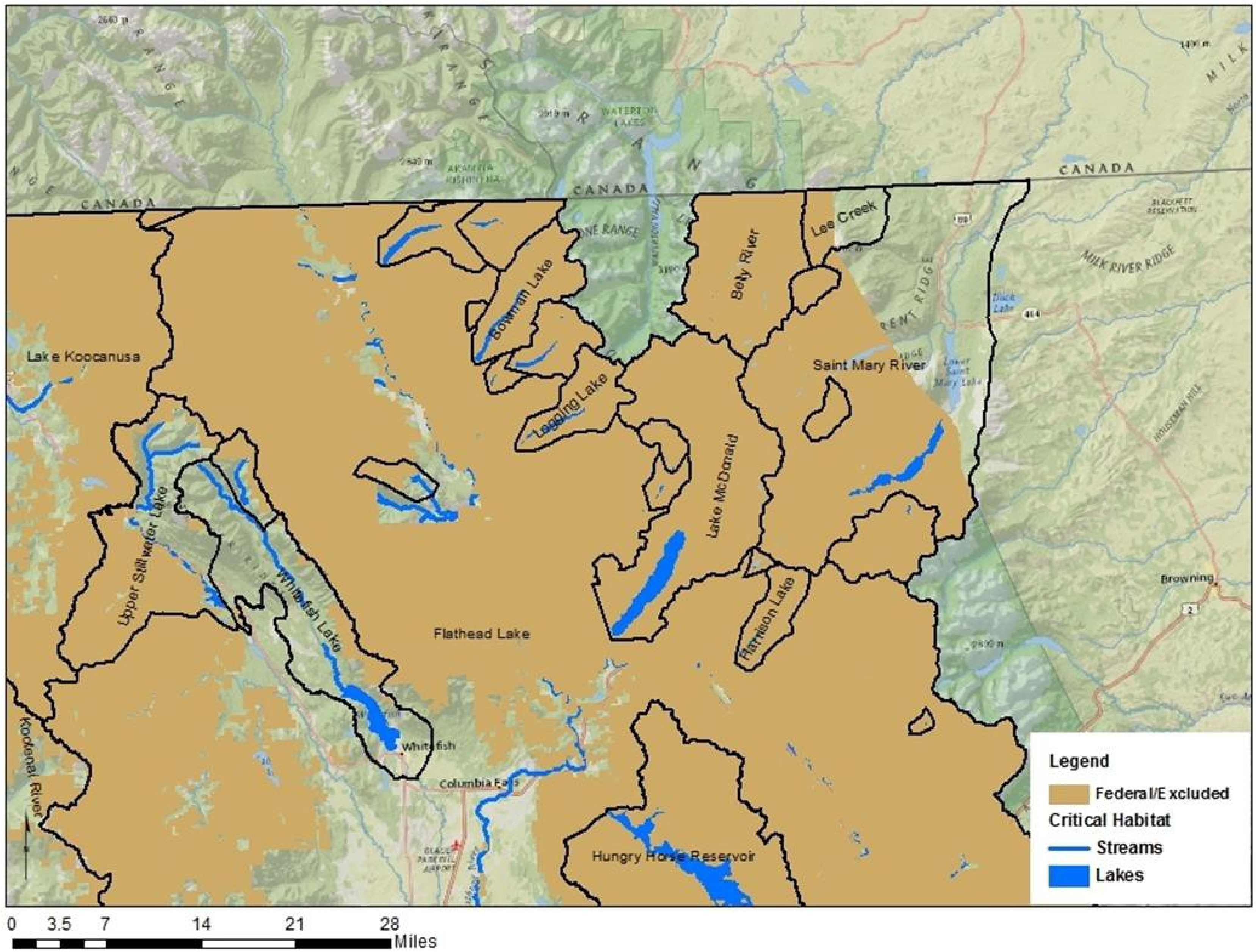
Map 4b: *Designated critical habitat and action area (unshaded) in Middle Clark Fork River Core Area.*



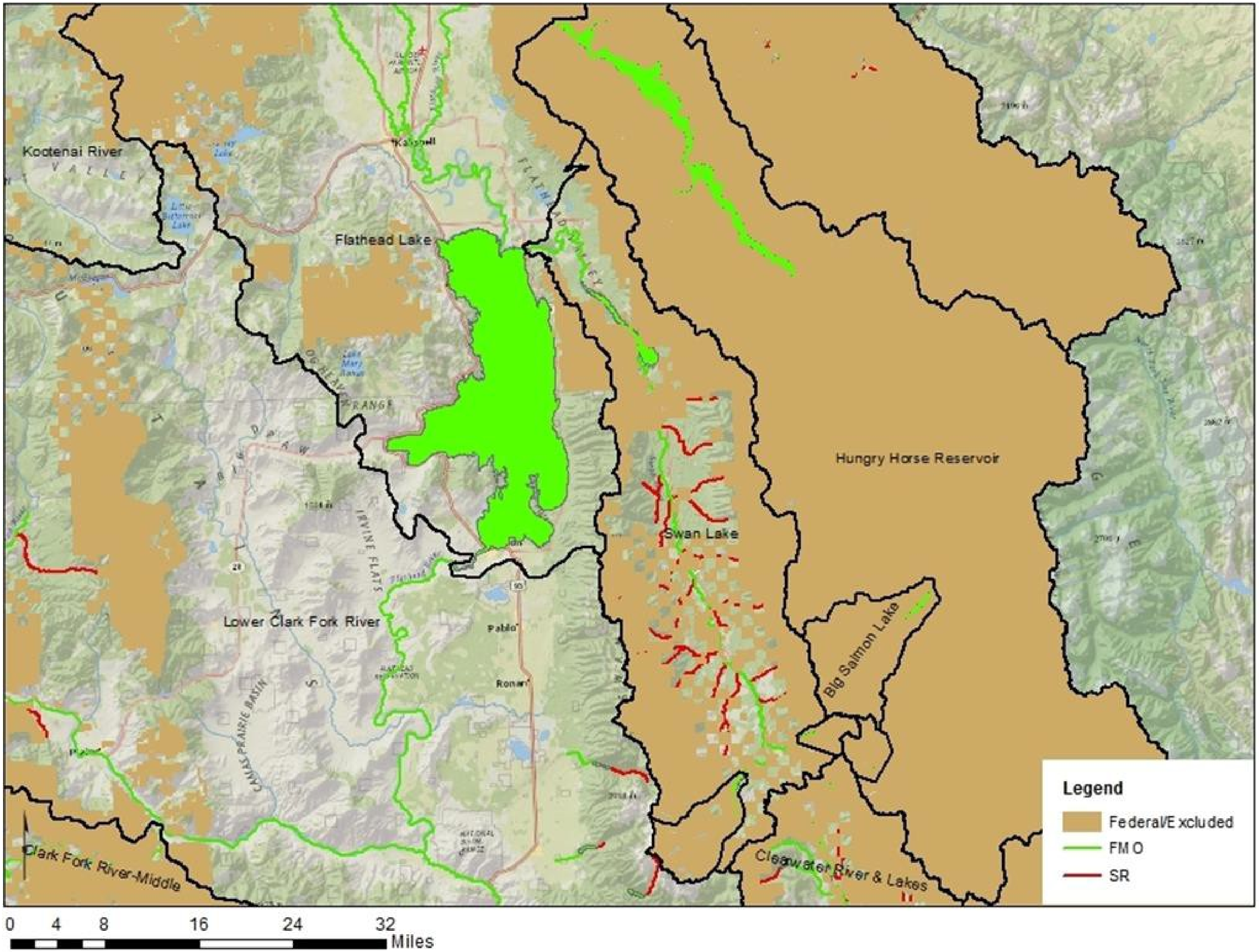
Map 5a: *Bull trout occupied waters and action area (unshaded) in Flathead Lake (north portion), Whitefish Lake, and St. Mary River Core Areas.*



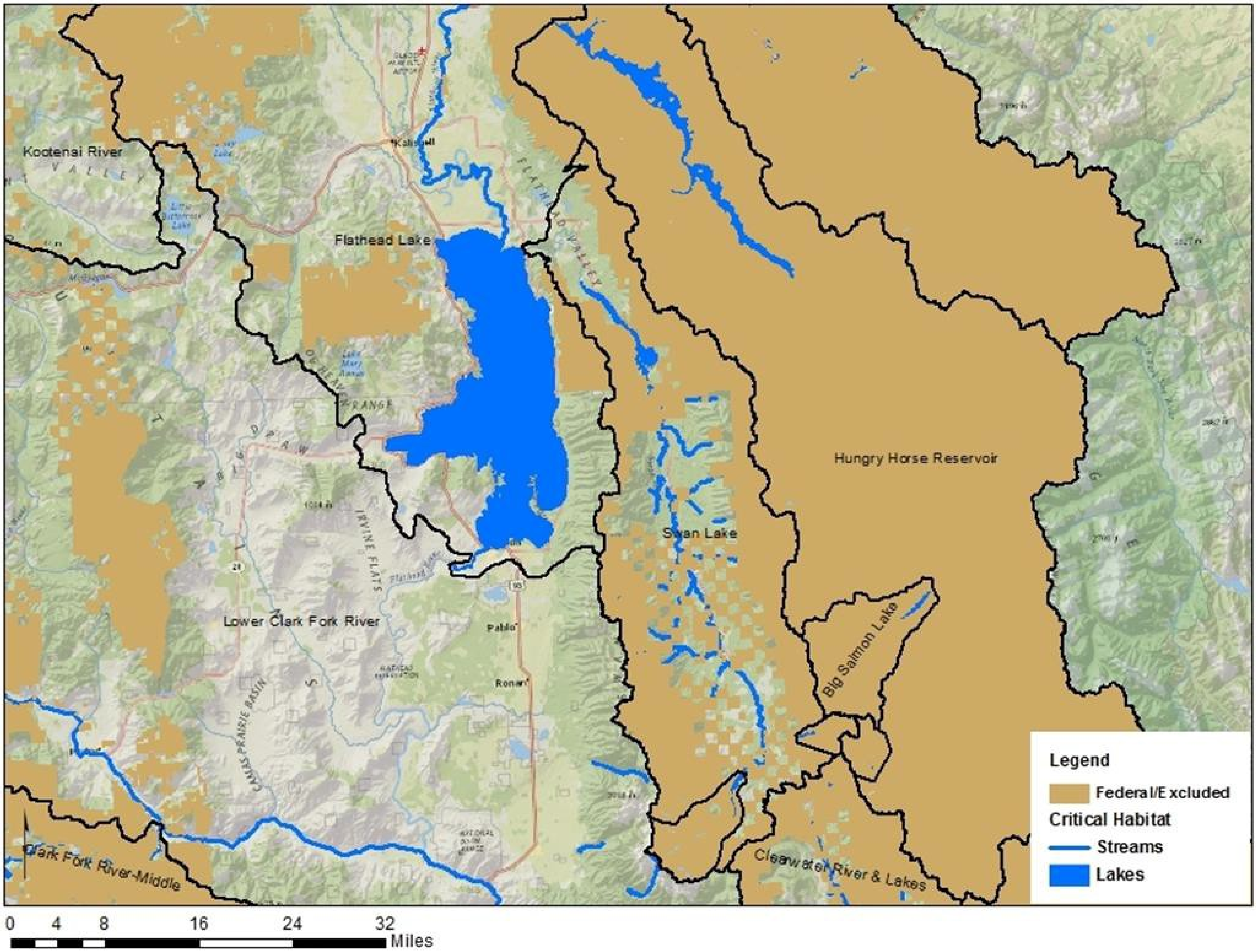
Map 5b: *Designated critical habitat and action area (unshaded) in Flathead Lake (north portion), Whitefish Lake and St. Mary River Core Areas.*



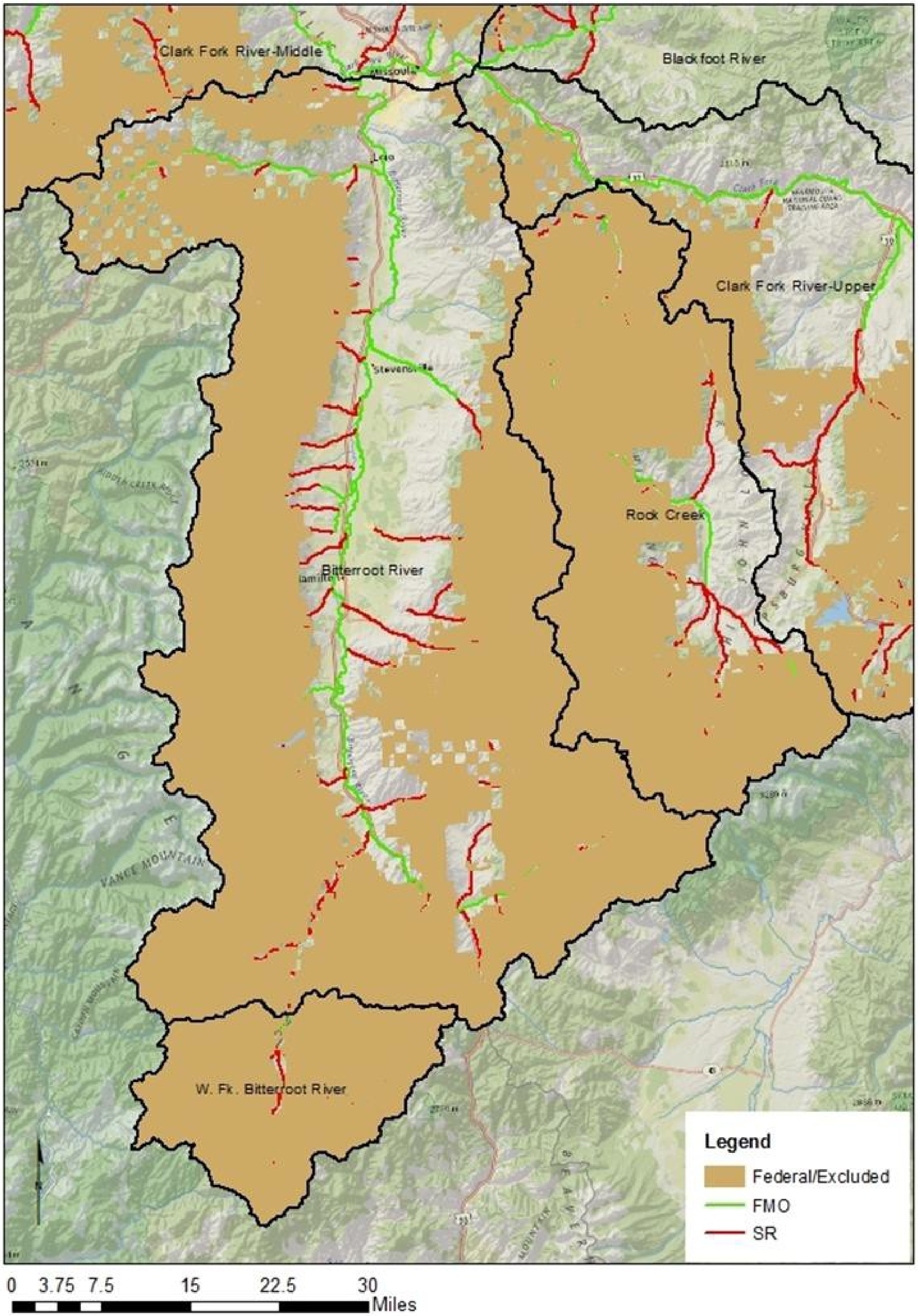
Map 6a: *Bull trout occupied waters and action area (unshaded) in Flathead Lake (south portion), Swan Lake, and Lindbergh Lake Core Areas.*



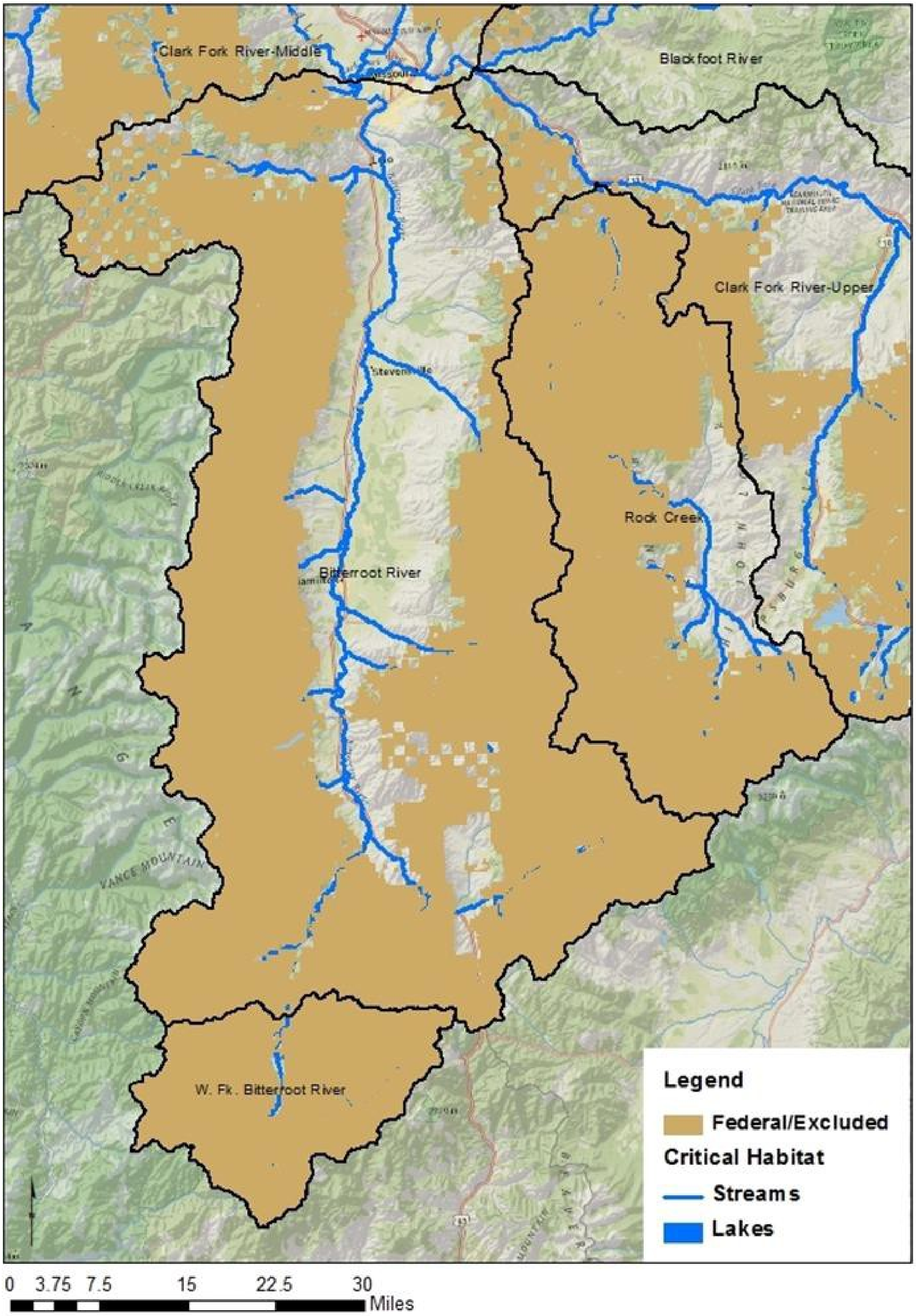
Map 6b: *Designated critical habitat and action area (unshaded) in Flathead Lake (south portion), Swan Lake, and Lindbergh Lake Core Areas.*



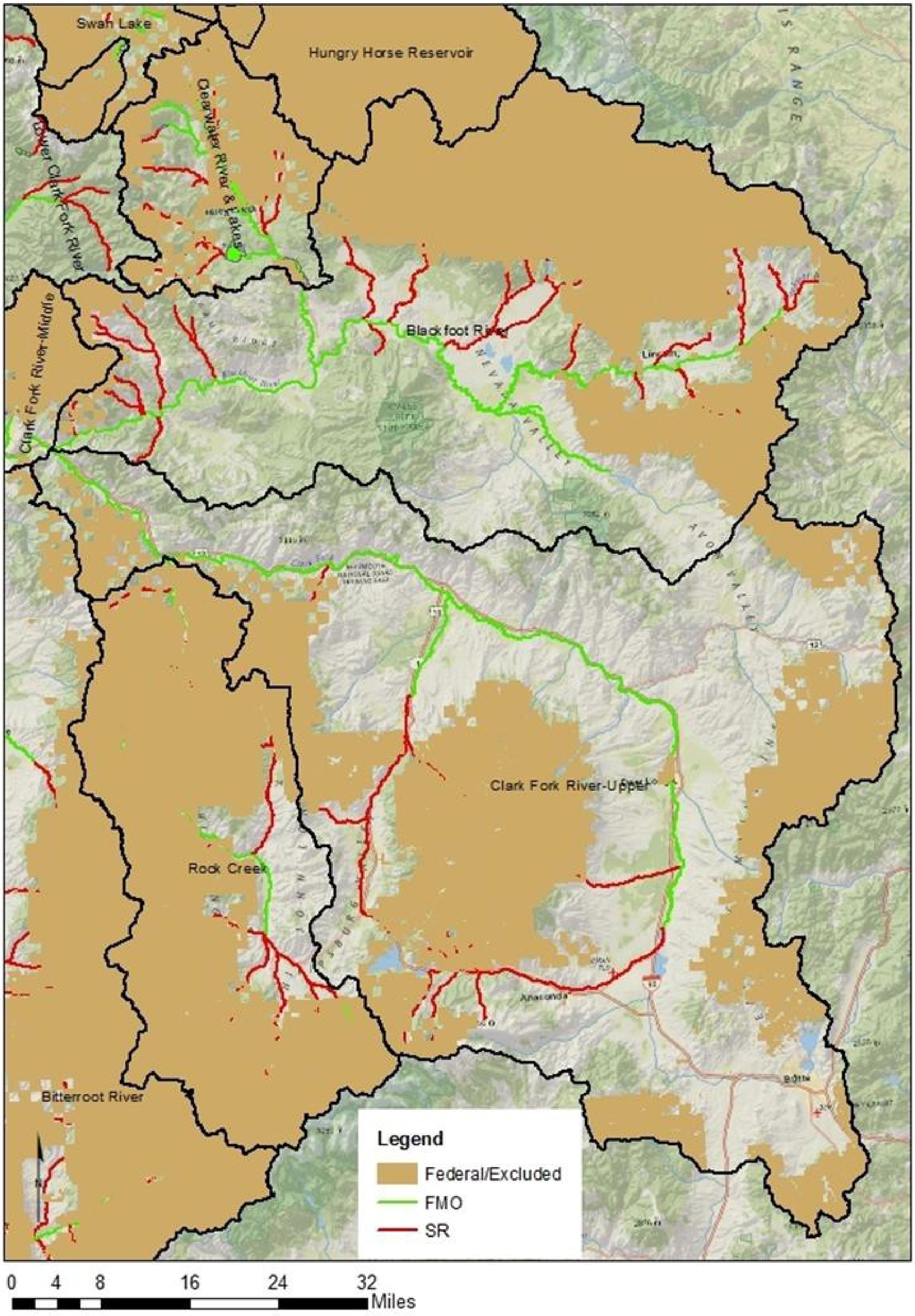
Map 7a: *Bull trout occupied waters and action area (unshaded) in Bitterroot River, West Fork Bitterroot River, and Rock Creek Core Areas.*



Map 7b: *Designated critical habitat and action area (unshaded) in Bitterroot River, West Fork Bitterroot River, and Rock Creek Core Areas.*



Map 8a: *Bull trout occupied waters and action area (unshaded) in Blackfoot River and Upper Clark Fork River Core Areas.*



Map 8b: *Designated critical habitat and action area (unshaded) in Blackfoot River and Upper Clark Fork River Core Areas.*