BIOLOGICAL OPINION
FOR THE
RESTORATION ACTIVITIES AT STREAM CROSSINGS (STREAM CROSSING PROGRAMMATIC)

01EIFW00-2012-F-0015

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

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JUN 15 2012

Date ______________________

Table of Contents

List of Tables

List of Figures

1. BACKGROUND AND INFORMAL CONSULTATION

1.1 Introduction

The U.S. Fish and Wildlife Service (Service) has prepared this Biological Opinion (Opinion) of the effects of the programmatic Restoration Activities at Stream Crossings in Idaho/Nevada (Program) on bull trout (*Salvelinus confluentus*) and bull trout critical habitat. Letters from the Forest Service, Bureau of Land Management (Bureau), and Army Corps of Engineers (Corps) requesting formal consultation with the Service under section 7 of the Endangered Species Act (Act) of 1973, as amended, for its proposal to implement a program to address fish passage problems associated with stream crossings in Idaho, were received by the Service on December 12, December 16 and December 19, 2012, respectively. The Forest Service, Bureau, and Corps (Action Agencies) determined that the proposed action is likely to adversely affect bull trout and bull trout critical habitat. As described in this Opinion, and based on the Biological Assessment (USFS and BLM 2011, entire) developed by the Action Agencies and other information, the Service has concluded that the program, as proposed, is not likely to jeopardize the continued existence of bull trout nor result in adverse modification of its critical habitat.

The Action Agencies have also determined the Program is not likely to adversely affect grizzly bear (*Ursus arctos horribilis*), Canada lynx (*Lynx canadensis*), northern Idaho ground squirrel (*Urocitellus brunneus brunneus)*, Macfarlane's four-o'clock (*Mirabilis macfarlanei*), Spalding's catchfly (*Silene spaldingii*), water howellia (*Howellia aquatilis*) and slickspot peppergrass (*Lepidium papilliferum*). In this document, the Service is providing concurrence with those determinations. You also determined that there would be no effect to woodland caribou (*Rangifer tarandus caribou*) and Kootenai River white sturgeon (*Acipenser transmontanus*), or the candidate species yellow-billed cuckoo (*Coccyzus americanus*) and Columbia spotted frog (*Rana luteiventris*); we acknowledge these determinations.

The Program is expected to last 10 years from issuance of this Opinion. Actions covered by this consultation are those restoration projects (as described below) at stream crossings proposed by the Forest Service and the Bureau, and the associated permits issued by the Corps under section 404 of the Clean Water Act required for project implementation.

1.2 Consultation History

This stream crossing programmatic renews a similar effort completed in 2006 (Stream Crossing Structure Replacement and Removal Program, reference number 2006-F-0206) which recently expired. This 2012 effort builds on what we have learned during the that time, includes all of Idaho (and that portion of northern Nevada managed by the Twin Falls District of the Bureau), and includes the Army Corps of Engineers (Corps) as one of the Action Agencies in order to fulfill their consultation needs for any project-related permits. Under the previous stream crossing programmatic effort, nearly 70 stream crossings were replaced or removed, opening up or improving habitat for listed fish in Idaho. The previous effort reduced workloads and improved efficiencies for all involved agencies, and resulted in on-the-ground restoration actions which benefitted listed fishes and their associated habitats. The new, updated Program will continue the efficiencies afforded by this programmatic action, will broaden the breadth and scope of authorized activities to allow for additional restoration work to occur in a timely and effective manner, and will result in the incremental conservation of bull trout and other aquatic resources.

The Service and Action Agencies have been engaged for over two years in the renewal of this programmatic action. During that time, numerous conference calls and email conversations have taken place. The following is a summary list of the most important correspondence relative to this consultation.

January 26, 2010	The Forest Service, Bureau, and Service had a conference call to discuss the status of the 2005 Stream Crossing Structure Replacement and Removal Program and to begin the process of renewing the Program consultation.
December 16, 2010	Participating agencies (the Forest Service, Bureau, NOAA Fisheries, Army Corps of Engineers, and the Service) had a conference call to discuss the process for initiating consultation and to discuss what to change from the previous programmatic.
March 1, 2011	The Forest Service and the Service met in Boise at the American Fisheries Society Meeting to discuss the proposed action.
May 23, 2011	The Service received an e-mail from the Forest with an initial draft Assessment attached.
July 29, 2011	Participating agencies and the Service had a conference call to discuss the draft Assessment and provide comments.
August – October 2011	Several draft Assessments were distributed among the agencies, reviewed, and commented upon.
October 20, 2011	Agencies agreed that the Assessment was ready for submittal for formal consultation.
December 12, 2011	The Service received the Forest Service's request for consultation.
December 16, 2011	The Service received the Corps request for consultation.
December 19, 2011	The Service received the Bureau's request for consultation. '
April 23, 2011	The Service, Forest Service, Bureau and Corps agreed to extend the deadline for the Opinion.
May 9, 2012	The Service sent a draft Opinion to the Action Agencies for review.
May 14 – 21, 2012	The Service received comments back from the Action Agencies.

1.3 Informal Consultations

The Action Agencies determined that for grizzly bear, Canada lynx, northern Idaho ground squirrel, Macfarlane's four-o'clock, Spalding's catchfly, water howellia, and slickspot peppergrass, the Program may affect, but is not likely to adversely affect these species. The Service concurs with these determinations; our rationales for concurrence are listed below for each species that occur in some or all of the action area. Please refer to section 2.1 below for a description of the action.

1.3.1 Grizzly Bear

Grizzly bear occur in northern and east-central Idaho and therefore have the potential to be affected by project activities. Program activities have the potential to displace grizzly bears from habitats due to construction noise, activities and general disturbance. If present, short-term avoidance of the construction area by animals may occur, but activities are not expected to influence occupancy or survival. The Assessment, p. 24 lists mandatory project design features to avoid effects to grizzly bear, including avoiding work during the spring season in denning habitat; limiting the number of work days allowed within certain categories of grizzly bear habitat, and adheres to the Grizzly Bear Management and Protection Plan (Appendix G of the Assessment). Activities using high impact equipment within core habitat will not be covered by this Program and will require separate consultation. Direct impact to streams, soils and vegetation will only occur within existing disturbance areas or small areas of new disturbance near the stream crossing to be replaced. Given the design features, minimal overlap between grizzly bears and bull trout habitat or crossings that would be updated, short time frame of projects (most work would be done within three weeks) and small footprint of projects, effects to individual animals are expected to be discountable. Habitat effects are expected to be insignificant.

1.3.2 Canada Lynx

Canada lynx may occur in forested habitats within the action area, although the extent of their distribution is largely unknown. All Program activities will occur either within or near existing roads and trails in the action area where vegetation has been previously degraded or removed. Project design features (Assessment p. 25) will ensure protection of suitable lynx habitat and minimize disturbance to Canada lynx. Program activities will not be implemented within 270 yards of known active lynx dens and no suitable habitat will be degraded or removed. Impacts of Program implementation are expected to be insignificant, and will not likely adversely affect the species.

1.3.3 Northern Idaho Ground Squirrel

Northern Idaho ground squirrel (NIDGS) occurs in Adams, Valley and Washington counties of southwest Idaho. The species is not likely to be present in riparian areas that may be impacted by Program activities. Populations of NIDGS, however, do exist within meadow habitats that may be used for staging, equipment parking, storage and camps for construction and/or action agency employees. In areas where NIDGS may occur, prior to using any meadow area for Program activities, a qualified biologist will survey the site to ensure that NIDGS are not present. Any NIDGS activity sites, dens or burrows at the work site will be flagged and avoided during Program activities. NIDGS activity within 200 feet of work sites will be reported to the Level 1 Team, which will recommend a course of action, which could include site specific consultation and/or additional minimization measures. Because of these project design features (Assessment p. 25) the Service anticipates that the impacts of Program implementation will be insignificant and will not likely adversely affect the species.

1.3.4 Threatened and Endangered Plants

The four listed plant species, Macfarlane's four-o'clock, Spalding's catchfly, water howellia, and, although very unlikely, slickspot peppergrass, may occur within areas affected by projects carried out under the Program and some Program activities may have the potential to affect one or more of these species. The proposed action includes project design features, the same for each plant, on page 25 of the Assessment, for avoidance of effects to listed plants. Under these features, within the range of the species a qualified botanist will review each project site, and will determine whether a listed plant species occurs within a ¼ mile of the site, and whether project activities have the potential to affect the plant. If the botanist determines that a project carried out under the Program has the potential to adversely affect listed plants species, the Level 1 team will be notified and a separate section 7 consultation with the Service will be initiated. Any action with potential to adversely affect one of these plant species would be inconsistent with the terms of the proposed action and would not fall within the Program considered in this Opinion.

2. BIOLOGICAL OPINION

2.1 Description of the Proposed Action

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

2.1.1 Action Area

The action area is defined as all areas to be affected directly or indirectly by the proposed Federal action. Implementation of the Program may occur anywhere listed fish species and designated critical habitat for fish exist within the following administrative land management units: Payette, Boise, Sawtooth, Salmon-Challis, Nez Perce-Clearwater, Kootenai, Bitterroot, and Idaho Panhandle National Forests (including those portions located in Washington and Montana); and Bruneau, Challis, Cottonwood, Coeur d'Alene, Four Rivers, Jarbidge (including those portions located in Nevada), Salmon, and Upper Snake Field Offices of the Bureau of Land Management, as displayed in Figures 1 and 2. Each Forest or Bureau Field Office is considered an "administrative unit" for purposes of this consultation. These public lands contain waters that are part of the Salmon, Snake, Kootenai, Pend Oreille, Spokane, and Clearwater Basins. Subbasins (fourth-level hydrologic units) in the action area potentially affected by the Program are displayed in Figures 1 and 2 and listed in Table 2 (p. 35).

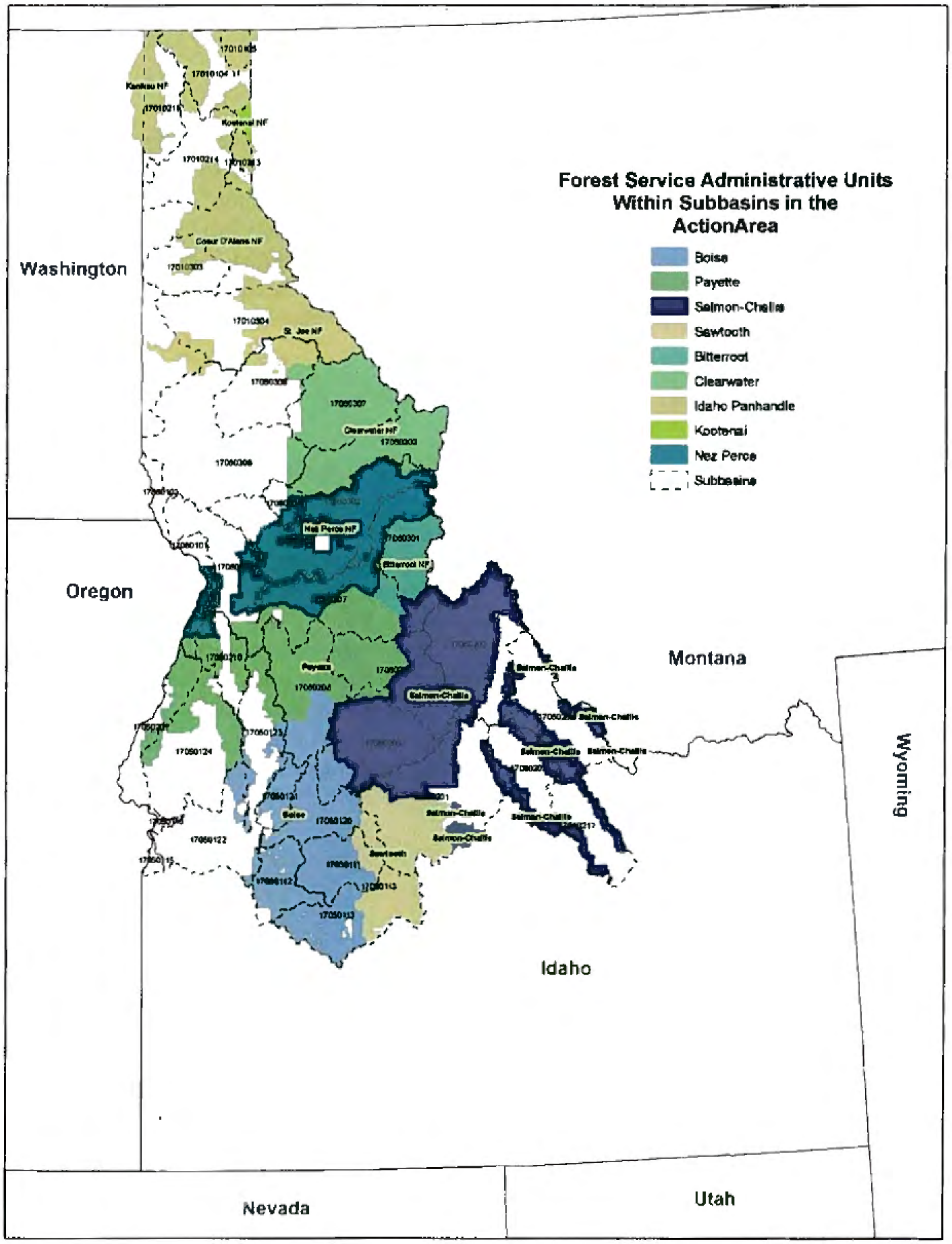

Figure 1. Forest Service Administrative Units and Subbasins in the Action Area.

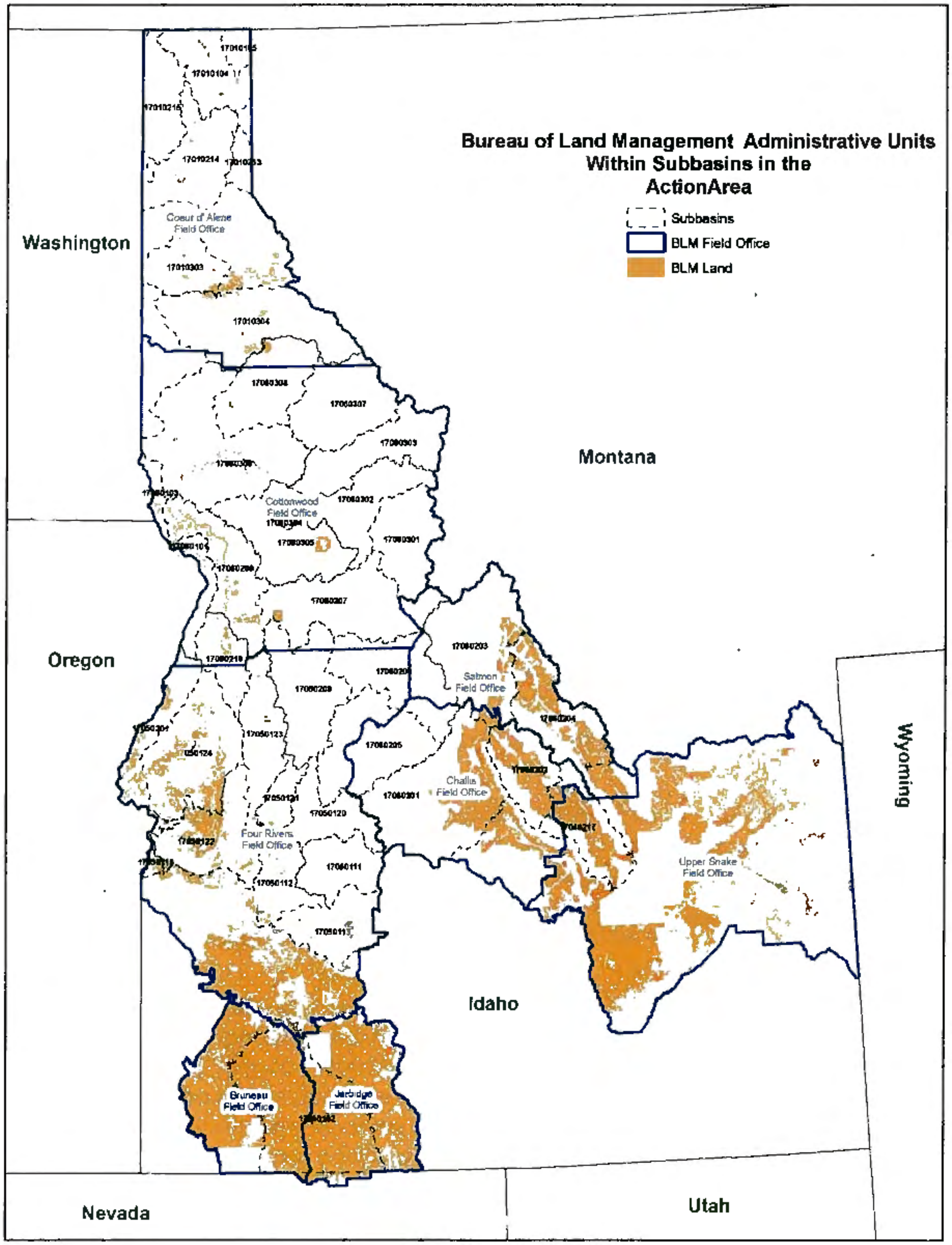

Figure 2. Bureau Administrative Units and Subbasins within the Action Area.

2.1.2 Proposed Action

The purpose of this Program is to restore physical and biological connectivity, including fish passage, in streams and subbasins within Idaho. The Program will reduce the impacts of existing road crossing structures which currently block fish migration and provide a means to decommission or close existing roads intermittently or fully if road crossings are removed. Overall Program goals are consistent with the goals of other regional plans and strategies outlined in Section I of the Assessment. The duration of the Program is ten years following issuance of this Opinion, after which all agencies may consider an extension of the Program.

2.1.2.1 Program Activities

The Action Agencies anticipate that up to 156 crossing improvement projects per year may be completed under the programmatic. As described in the Assessment, each of the administrative units proposes to complete up to 10 projects per year in occupied and/or critical habitat. Each individual stream crossing is considered one project under this Program. If an administrative unit wishes to conduct more than 10 projects in a given year, the appropriate Level 1 team must be consulted to ensure that the potential aggregate effects are within those anticipated in this Opinion. For this consultation, "occupied habitat" is a perennial or intermittent stream that is occupied, or suspected to be occupied, by listed fish species. If a project site is not occupied by listed fish, but will occur within 600 feet upstream of occupied habitat, then the project site is considered "occupied" because potential impacts would affect the area downstream that is occupied. Individual projects implemented under the Program may affect bull trout or critical habitat differently. Action effects may range from "no effect", to significant "adverse effects" that may result in take of individuals. Additionally, some projects may occur in streams which are not critical habitat or where bull trout are not known to occur.

Activities under the Program fall into the following categories, and are described fully in the Assessment on pages 12 to 24.

Crossing removal and associated channel rehabilitation: This activity is intended to restore physical and biological connectivity for ESA-listed fish, and is associated with closing, intermittently closing, or decommissioning roads and trails, including unauthorized routes. Following culvert removal, stream channels will be rehabilitated to the bankfull width, gradient, substrate composition, and active floodplain dimensions matching those features upstream and downstream of the project area.

Crossing replacement with a bridge: This activity will occur to re-establish physical and biological connectivity where an existing road or trail is required for National Forest or Bureau access or transportation needs; where an existing bridge is adversely affecting channel dynamics; where a bridge has been determined to pose a safety hazard or has outlived its useful life; or where expected 100-year flows and associated debris could not be accommodated with a culvert or open-bottomed arch. Multiple span bridges that require in-stream piers and projects with structure widths less than bankfull width are excluded

Culvert or ford replacement with a culvert or open-bottomed arch: This activity will occur to re-establish physical and biological connectivity where an existing road or trail is required for access or transportation needs and 100-year flows and associated debris can be accommodated by a culvert or open-bottomed arch. Culverts and/or fords will be removed and replaced with culverts or open-bottomed arches that incorporate stream simulation through the crossing. At a minimum, structure widths will accommodate bankfull dimensions. Embedded box culverts, structural plate arches, and corrugated metal pipe may be used.

Culvert replacement with trail ford: This activity is covered only if the trail ford reduces overall potential effects to aquatic habitat and assures fish passage by replacing the culvert with a trail ford. This category does not cover culvert replacement with a ford on roads open for full sized vehicle travel, even when used on an intermittent basis. This activity will occur to re-establish connectivity only where a road-to-trail conversion project is planned, or on an existing trail where a trail culvert is inadequate for fish passage and is difficult or impossible to maintain due to inaccessibility. Design features will typically include hardening the trail ford so that erosion is minimized and so that spawning is not encouraged at the improved crossing if there are indications that fish spawn in the general vicinity. This activity could be a component of a larger action that changes the travel status of a road converted to a trail.

Maintenance: Maintenance actions include removal of debris that has accumulated at stream crossing structures inlets during flood events, and that has been determined to obstruct fish passage or pose threats to the integrity of the crossing. Debris removed from the culvert inlet should be placed within the floodplain downstream in the immediate vicinity of the crossing. Maintenance also includes minor armoring around crossing structure inlets and re-vegetation. Minor armoring is intended to supplement existing armoring and not to be new armoring. Maintenance activities under this programmatic are only authorized at crossings which received consideration associated this consultation effort.

Road and trail relocation and decommissioning related to crossing replacement: In some instances, it may be necessary to move the location of a crossing to an area that provides better access or has less potential for failure. Changing the location of the crossing will include decommissioning and reclamation of approaches on existing crossing and construction of new approaches at proposed crossings, with no net increase in route density within riparian areas. If a crossing is moved to a new location, the crossing is considered "in-kind," when it is within one-quarter (1/4) mile of the existing crossing and includes no more than one half (1/2) acre of new road or trail reconstruction (~ ¼ mile of road at 14' width). If the proposed crossing location does not meet these requirements, separate consultation is required. Routes will be constructed with the application of Regional Best Management practices and built to agency standards for road or trail construction.

Bridge construction in migratory sockeye salmon habitat: Crossings removed or replaced in migratory habitat for sockeye salmon may only be replaced with a single span bridge. Bridges with in-stream piers will require separate consultation. Activities may only occur when the species is not present during migratory periods. Structures or fords will be removed and replaced with bridges and the stream channel will be restored to mimic natural conditions incorporating stream simulation design.

Projects within any of the categories listed above may be proposed as stand-alone projects, or as components of larger projects. Activities that are components of larger projects are considered in this Opinion only when no other adverse effects to listed fish species or critical habitat are anticipated from the whole action. If the other components of the larger project may have adverse effects, then the entire action, including stream crossing improvements, must be considered in a separate consultation. For example; given a large landscape type project that would only receive a "Likely to Adversely Affect" determination due to a culvert removal and restoration action, use of this programmatic is appropriate and the agencies may proceed with informal consultation (making reference to the Program to account for effects associated with the stream crossing component). Conversely, when a project receives a determination of "Likely to Adversely Affect" for other aspects of the project besides the culvert removal and restoration, formal consultation for the entire project is necessary, including the stream crossing.

2.1.2.2 Project Design Team

The design and construction of naturalized stream crossings typically requires expertise in multiple disciplines, such as engineering, hydrology, fluvial geomorphology, contract administration, and fisheries and wildlife biology. Project design teams should be comprised of individuals with this expertise.

Prior to design, the project design team will conduct a field review of a given proposed project in occupied habitats, identifying biological and physical requirements that need to be met during the design and implementation process. The project design team will evaluate existing and desired conditions, and consider alternatives that may be incorporated into the project design, in order to emulate natural conditions (i.e., stream simulation). The design should also evaluate the potential debris flows, flood flows, channel stability, and floodplain characteristics to ensure long-term objectives are met.

2.1.2.3 Project Documentation

Pre-project Documentation

As described in the Assessment, each proposed project will be documented and presented to the appropriate Level 1 Team. The project design team, or representative, will notify the area Level 1 Team of all proposed actions to be covered under this Program, and will provide documentation that the project meets the conditions described in the Assessment and this Opinion. Variations in design features will involve the Level 1 Team and project design team input to minimize adverse effects to listed species, stream channels, and aquatic habitat. The project design team is responsible for project documentation, design, review, implementation, and monitoring. They, or a representative, will provide to the Level 1 Team a completed Pre-Project Checklist (see Appendix A) with attachments for each unique, individual, stream crossing action.

Post-project Documentation and Monitoring

Post-project implementation and effectiveness monitoring will be conducted and information, including the Post-Project Checklist (see Appendix A), will be provided to the Level 1 Team. Level 1 Teams will conduct field reviews of randomly selected projects from previous years. Formats for annual field reviews will be developed by individual Level 1 Teams. Service Level 1 Team members will ensure that copies of post-project checklists are also submitted to the National Marine Fisheries Service Idaho Habitat Branch and the appropriate Service's Idaho offices.

2.1.2.4 Excluded Projects

The following types of projects would not be included in the proposed programmatic actions nor would they be covered under this consultation:

- Projects that would facilitate the expansion of brook trout into occupied bull trout habitat;
- Projects with structure widths less than bankfull width;
- Placement of any kind of baffled culvert or fish ladders within culverts;
- Multiple span bridges that require instream piers;
- Projects in areas where there are spawning ESA-listed fish or their redds;
- Projects not constructed during low flow conditions;
- Any newly proposed stream crossing that does not replace or remove an existing stream crossing;
- Actions that are parts of larger projects that have other components with potential adverse effects on listed fish or designated critical habitat.

2.1.2.5 Construction Phases and Project Design Features

The Action Agencies have included in the Program conservation activities and measures aimed at avoiding or minimizing potential adverse effects to listed, proposed, and candidate species and critical habitat that may be affected by the action. These include measures for fish, wildlife, and plants. Project design features to minimize effects to wildlife, critical habitat, and plants are described on pp. 24-25 of the Assessment. Construction methods and design features for fish and aquatic habitats begin on p. 15 of the Assessment and include important provisions for minimizing effects to listed fish associated with site preparation, fish avoidance, dewatering, construction activities, flow reintroduction, site rehabilitation, and maintenance. For a complete list of construction procedures, sequences and design features, refer to the Assessment, pp. 14-25. Listed below are key project construction methods and design features (bulleted lists) pertinent for each sequence.

2.1.2.5.1 Site Preparation

Site clearing, staging areas, access routes, and stockpile areas will be recommended by the project design team in order to minimize disturbance, reduce impacts to riparian vegetation, and to minimize the potential for sediment delivery to stream channels.

- Sediment barriers will be installed around disturbed areas (including project site, stockpile, and staging areas) to minimize the potential for sediment delivery into stream channels and road ditches.
- A supply of surplus sediment barriers will be on hand to respond to unanticipated events that have the potential to deliver sediment to the stream.
- Riparian buffers will be designated and flagged to reduce effects to streams and riparian conservation areas.
- Trees that are removed in order to facilitate structure placement, will be stockpiled for use in stream channel or floodplain rehabilitation or maintenance.

- Boundaries of staging areas, stockpile areas, and other locations where impacts might occur will be designated and flagged.
- Existing disturbed areas, such as road prisms, will be utilized whenever possible.
- Areas of minimally sufficient size will be cleared for use if existing disturbed areas for staging or stockpile use do not exist.

2.1.2.5.2 Fish Avoidance

- All projects will be conducted during low flow conditions to minimize effects to and avoid delaying movement of ESA-listed species.
- A fisheries biologist will conduct, or direct, a survey of the project location during project planning and also prior to implementation, in order to determine if ESA-listed fish species inhabit the project area.
- Conduct pre-work surveys within 1 week prior to project implementation. Should listed fish be observed at the site, or 600 feet downstream, which would be affected by project actions, determine appropriate methods (passive or active) for removing fish.
- Should migrating or spawning listed fish, or redds of listed fish species be observed within the project area during implementation, or 600 feet downstream of the project area, consult the Level 1 team for an appropriate course of action. As described above, projects in areas where there are spawning ESA-listed fish and/or redds are excluded from this Programmatic.
- Handling of fish will be conducted by or under the direction of a fisheries biologist, using methods directed by the following; NMFS Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act (Appendix E); Idaho Department of Fish and Game Scientific Collection Permit (or Montana, Washington, or Nevada equivalent); or NMFS steelhead collection permits, if applicable.

2.1.2.5.3 Stream Dewatering

In most cases, project design will call for dewatering the stream channel which typically consists of a pipe or side-channel diversion to carry diverted stream flow from a diversion point around the project site to a location downstream of the project site. The diversion structure may act as a temporary barrier to fish passage. Fish may be allowed to move downstream through the diversion when it is determined that entrapment will not occur. If a lined channel, rather than a pipe or side-channel diversion is used for dewatering, excavation would be required from the diversion point, through the floodplain, and down to a re-entry point below the project site. The length of the dewatered stream channel would vary, depending on the width of the road prism at the crossing. The access to the stream edge and diversion construction may impact a narrow cross section of riparian area, removing vegetation and exposing bare soil to erosion. Within-channel rerouting may occur when the stream channel is wide enough to accommodate rerouting within the active channel, at low flows, and the diversion path, which may include a pipe or one side of the existing channel, is essentially non-erosive. This method is typically associated with the construction of open-bottomed arches and bridges.

- Project sites will be dewatered and completely bypassed prior to excavation.
- Dewatering will be accomplished slowly to capture and move stranded fish and other aquatic organisms to the extent possible.

- Pumps will have a fish screen installed, and operated and maintained in accordance with NMFS fish screen criteria (see Appendix F of the Assessment).
- Diversion structures will not be constructed with material mined from the stream or floodplain.
- Prior to constructing a water diversion, a fisheries biologist will conduct or direct an inspection of the stream and identify the appropriate means necessary to minimize the potential for fish to enter a constructed diversion and associated dewatering conveyance.
- Flow diversion around the project site will be constructed using non-erodible material, such as a pipe, liner, or by using an existing re-vegetated abandoned stream channel of appropriate size to accommodate peak flows that may be expected during construction (including storm events).
- If streamflow is rerouted to one side of the existing channel, diversion structures, such as sandbags, cofferdams, or portable bladders constructed of non-erodible materials will be used.
- Outflow will be directed to an area that minimizes or prevents erosion.
- If appropriate, water collecting in the dewatered work areas (leakage, subsurface sources, and percolation) may be pumped to a temporary storage/treatment site, or into upland areas, and allowed to filter through vegetation prior to water reentering the stream channel.
- If a diversion channel is excavated, material will be stored at designated stockpile areas, for use in rehabilitating the excavated channel.

2.1.2.5.4 Construction and Earthmoving Activities

Stream simulation objectives mimic natural stream processes at a culvert removal site or at a stream crossing within a culvert, open-bottom arch, ford, or under a bridge. Fish passage, sediment transport, and flood and debris conveyance through the structure will imitate the stream conditions upstream and downstream of the crossing, as close to natural conditions as the structure type allows (i.e., stream simulation).

Machinery typically operates from the road fill and will only cross streams at dewatered areas, temporary bridges, or at designated temporary crossings. Earthmoving activities within the active stream channel would typically occur within a dewatered segment. In typical earthmoving activities associated with these actions, road fill is excavated around the crossing to just above the wetted perimeter in preparation for dewatering, although dewatering is sometimes conducted before excavation. Excavating equipment typically works from the road fill without disturbing water flow or side-casting material into stream channels.

Removal of culverts involves removal of road fill associated with existing culverts and is completed entirely within the dewatered work area. Road fill would be removed and stored at a designated stockpile site or hauled to a permanent waste area. At this point, the culvert would be removed, and the remaining material would be excavated down to streambed elevations. Excavation widths would vary depending on whether the culvert would be removed or replaced with a bankfull culvert, open-bottom arch, bridge footings, or trail ford. Excavating equipment would typically work from the road fill and cross the stream within the dewatered area or at a designated stream crossing. Excess groundwater may be removed from the work area by pumping to a settling area before discharging back into any water body. Headwalls may be applied to the culvert, arch, and bridge construction phases, outside of bankfull widths. Riprap placement for structure protection, and where needed to achieve passage objectives and maintenance of channel features, would be approved by the project design team. Concrete may be poured to provide bedding for squashed culverts in some instances.

Implementation of the following measures will minimize effects to ESA listed fish species.

- All projects will be conducted during low flow conditions, which typically occur from late summer through fall, to minimize effects to or delay of movement of ESA-listed fish.
- All in-stream and channel rehabilitation activities will be completed within one work season (site specific projects where in-stream construction activities take more than one season to complete are not included in this Program).
- Equipment and vehicles will have all plant parts, soil, and other materials that may carry noxious weed seeds removed prior to entry onto the project site.
- Equipment will be inspected for other undesirable aquatic organisms.
- Conduct excavation with minimal impact to the active stream channel.
- Excavated material will be stored in designated stockpile areas.
- Waste material will be staged in designated locations or end hauled to approved disposal site.
- Machinery will operate from the road fill and may cross streams at dewatered areas, temporary bridges, or at designated temporary crossings.
- Machinery, equipment, and materials will be stored in the staging areas, when not in use.
- In the event of local precipitation events or high flows, all project operations will cease, except efforts to minimize storm damage or excessive erosion.
- Native materials (e.g. substrate, riparian vegetation, rock, woody debris) excavated on-site, will be conserved and stockpiled for later use in channel reconstruction, filling of culverts, or other site rehabilitation, and will be kept separate from other stockpiled material which is not native to the site.
- Stream channels and floodplains will be reconstructed (simulated) in a manner which matches channel dimension, pattern, and profile for the stream type above and below the crossing to provide diverse avenues for passage by aquatic organisms.
- Design velocity, roughness, and slope compatible with the swimming abilities of appropriate species.
- Provide for wildlife and other aquatic organism passage as necessary, to provide for overall ecological connectivity.
- Structure width shall be greater than or equal to the bankfull channel width.
- Design crossings to accommodate at least 100-year flows, facilitate sediment and debris movement, and other valley and floodplain processes.
- Decommissioning of routes will remove the former roadway or trail (including any imported road base), re-establish natural topography and drainage to the extent possible, incorporate available organic material, and in general, apply methods that accelerate site restoration and discourage unauthorized use.

- Erosion control materials will be certified weed free in order to prevent the spread of noxious weeds.
- Culverts will be embedded at 20 percent or more, so that the stream bed at the widest part of the culvert is deep enough to account for scour, grade adjustments, footings, and bed integrity.
- For bridges, no abutments shall be placed within the bankfull channel nor will exposed riprap be placed within the bankfull channel unless necessary to achieve passage objectives, maintain channel features, and protect structures.
- Concrete footings would be built below the stream channel, but outside of bankfull widths, through excavation and placement of forms followed by pouring and curing of concrete.
- Reconstructed stream channels will be "pre-washed", into a reach equipped with sediment capture devices, prior to reintroduction of flow to the stream.
- Stream channels will be re-watered slowly to prevent loss of surface water downstream as the construction site streambed absorbs water and to minimize a sudden increase in turbidity.

Low Water Fords on Trails

- Approaches will access crossings at suitably graded stream sections to reduce the potential for accelerated erosion of stream banks and the stream channel; approaches will be designed to ensure long-term stability and to minimize the potential for sediment delivery.
- If spawning is anticipated at a crossing, given substrate characteristics of the site, then structures (e.g., concrete pads, angular rock, etc.) will be installed to eliminate the potential for spawning activity.
- Fords will be designed to prevent the creation of a low-water barrier to fish passage, by having similar grade and bankfull width as the channel while maintaining adequate flow to allow fish passage.
- Avoid existing or potential spawning locations.
- Fords will be 24 inches (foot and stock use only) to 50 inches (ATV use) in width.
- Approaches and fords will typically be hardened with rocks.
- Adequate drainage on approaches above the ford will be constructed to reduce hydrologic connectivity and minimize trail-generated sediment delivery.

Temporary Stream Crossings

- Use of temporary crossings should be minimized to the maximum extent necessary to complete a project.
- Existing roadways or travel paths will be used to access or cross streams as necessary, and temporary crossings will be reviewed by the project design team.
- Temporary crossings will not increase risks of channel re-routing under high flow conditions.
- Temporary crossings shall be constructed at right angles to the main channel where possible.

- Rubber matting, temporary bridges, or other means, will be utilized if the stream channel needs further protection.

Use of Explosives

Alternatives to blasting should be considered to the maximum extent possible.

- Instream boulders or bedrock (i.e., impenetrable rock) within occupied habitat should be broken without blasting, using non-explosive alternatives such as Betonamit (www.betonamit.net).
- If impenetrable rock, resistant to non-explosive alternatives, is discovered after excavation begins, blasting will occur in dewatered or dry channels only, and only outside of the buffer restrictions described in the Assessment (p. 21). Buffer widths apply to the distance between the blasting activity and the nearest occupied stream bypass entrance or exit.
- Buffer restrictions (Assessment p. 21) will be incorporated for dewatered or dry channels.

This Program does not cover the extension of the dewatered area for the sole purpose of increasing the available buffer in order to accommodate larger charge weights.

Pollution Control Measures

Best management practices (BMPs) will be designed, implemented, and maintained to provide full protection or maintenance of beneficial uses.

- In-channel sediment control devices will be used to capture sediment that is liberated during construction and re-watering of dewatered channels. Sediment control devices will be maintained throughout the construction period and until the site is stable. When risk of erosion has passed, the devices will be removed from the stream channel and sediment will be disposed of outside of the floodplain so that it is not transported into the stream channel.
- Storage of fuel and other toxicants within the riparian habitat conservation area is prohibited.
- Refueling, and maintenance of equipment, including power hand tools, is prohibited with the riparian habitat conservation area unless there are no other alternatives. Refueling sites within the riparian habitat conservation area must be approved by the Forest Service or Bureau and have an approved spill containment plan.
- Should stored fuel exceed 660 gallons in a single tank, or 1,320 gallons for all storage combined, operators will be required to have a standard Environmental Protection Agency (EPA) written Spill Prevention Control and Containment (SPCC) Plan onsite, which describes measures to prevent or reduce impacts from potential spills.
- All vehicles carrying fuel will have specific equipment and materials needed to contain or clean up any incidental spills at the project site. Equipment and materials will be specific to each project site, and can include spill kits appropriately sized for specific quantities of fuel, shovels, absorbent pads, straw bales, containment structures and liners, and/or booms.
- Prior to arriving on site, all equipment will be cleaned of external oil, grease, dirt, and mud, and all leaks will be repaired. Equipment will be inspected by the action agency before unloading at the site.

- Oil-absorbing floating booms, or other equipment such as pads and absorbent "peanuts," will be available on-site during all phases of construction and placed in a location that facilitates an immediate response to potential petroleum leakage.

2.1.2.5.5 Flow Reintroduction

Flow reintroduction will occur when the new structure is in place and stream simulation is complete.

- Reconstructed stream channel will be "pre-washed" prior to flow reintroduction.
- Sediment capture devices such as Sedimat will be placed downstream of the reach to capture sediment that maybe released during rewatering.
- Rewatering will be done slowly to minimize large pulses of sediment and to prevent loss of surface water downstream as the construction site streambed absorbs water.

2.1.2.5.6 Site Rehabilitation

Site rehabilitation would include establishing long-term erosion protection measures using boulder-sized riprap, plantings, erosion control fabric, seed, and mulch.

- Disturbed areas will be rehabilitated to conditions similar to pre-work conditions through spreading of stockpiled materials (large woody debris), seeding, and/or planting with native seed mixes or plants. If native stock is not available, soil-stabilizing vegetation (seed or plants) will be used that does not promote the establishment or spread of exotic species.
- No herbicide application will occur as part of the permitted action.
- When deemed necessary by the project design team or aquatic specialist, compacted access roads, staging areas, and stockpile areas will be mechanically loosened.
- Trees will be retained at project sites wherever possible. In-stream or floodplain rehabilitation materials such as large wood and boulders will mimic as much as possible those found in the project vicinity. Such materials may be salvaged from the project site or hauled in from offsite but cannot be taken from streams, wetlands, or other sensitive areas.
- Whenever possible, woody shrubs that need to be removed as part of the project will be excavated with root ball intact, retained on site, and replanted as part of the site rehabilitation.
- Trees (greater than 8 inches dbh) will not be felled in the riparian area for site rehabilitation purposes unless necessary for safety. If necessary for safety, trees may be felled toward the stream and left in place or placed in the stream channel or floodplain.
- Site rehabilitation activities will be completed prior to the end of the current field season, although subsequent seeding and re-vegetation may be necessary in following years.
- Any stockpiled woody debris would be scattered and placed outside of the active stream channel, unless necessary for channel stabilization or incorporated into stream restoration.

2.1.2.5.7 Maintenance

Maintenance of rehabilitated crossings may be necessary within the lifespan of this document. Maintenance activities may include removal of large wood that has accumulated at the inlet of a culvert, open-bottomed arch, or bridge and is determined to obstruct fish passage or pose threats to the crossing's integrity. Maintenance activities would usually be completed in two days or less; such maintenance activities may cause short term impacts to the stream channel or may increase turbidity. Minor armoring is intended to supplement existing armoring and not to be new armoring. Minor armoring of structures and re-vegetation of the construction site, necessary for long-term maintenance are included within this category.

- Debris will be removed and placed immediately downstream of the outlet.
- Machinery used to remove debris will operate from the road prism.

2.2 Analytical Framework for the Jeopardy and Adverse Modification Determinations

2.2.1 Jeopardy Determination

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

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

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the bull trout's current status, 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 bull trout in the wild.

As discussed below under the *Status of the Species*, interim recovery units have been designated for the bull trout for purposes of recovery planning and application of the jeopardy standard. Per Service national policy (USFWS 2006, entire), it is important to recognize that the establishment of recovery units does not create a new listed entity. Jeopardy analyses must always consider the impacts of a proposed action on the survival and recovery of the species that is listed. While a proposed Federal action may have significant adverse consequences to one or more recovery units, this would only result in a jeopardy determination if these adverse consequences reduce appreciably the likelihood of both the survival and recovery of the listed entity; in this case, the coterminous U.S. population of the bull trout.

The joint Service and National Marine Fisheries Service (NMFS) *Endangered Species Consultation Handbook* (USFWS and NMFS 1998, p. 4-38), which represents national policy of both agencies, further clarifies the use of recovery units in the jeopardy analysis:

> When an action appreciably impairs or precludes the capacity of a recovery unit 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, include in the biological opinion a description of how the action affects not only the recovery unit's capability, but the relationship of the recovery unit to both the survival and recovery of the listed species as a whole.

The jeopardy analysis in this Opinion conforms to the above analytical framework.

2.2.2 Adverse Modification Determination

This Opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the Act to complete the following analysis with respect to critical habitat.

In accordance with policy and regulation, the adverse modification analysis in this Opinion relies on four components:

1. The *Status of Critical Habitat*, which evaluates the rangewide 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 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 bull trout 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 would remain functional (or would 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 the bull trout.

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

2.3 Status of the Species and Critical Habitat

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

2.3.1 Bull Trout

2.3.1.1 Listing Status

The coterminous United States population of the bull trout was listed as threatened on November 1, 1999 (64 FR 58910). The threatened bull trout occurs in the Klamath River Basin of south-central Oregon, the Jarbidge River in Idaho and Nevada, north to various coastal rivers of Washington to the Puget Sound, east throughout major rivers within the Columbia River Basin to the St. Mary-Belly River, and east of the Continental Divide in northwestern Montana (Cavender 1978, pp. 165-166; Bond 1992, p. 4; Brewin and Brewin 1997, pp. 209-216; Leary and Allendorf 1997, pp. 715-720). The Service completed a 5-year Review in 2008 and concluded that the bull trout should remain listed as threatened (USFWS 2008, p. 53).

The bull trout was initially listed as three separate Distinct Population Segments (DPSs) (63 FR 31647, 64 FR 17110). The preamble to the final listing rule for the U.S. coterminous population of the bull trout discusses the consolidation of these DPSs, plus two other population segments, into one listed taxon and the application of the jeopardy standard under Section 7 of the Act relative to this species (64 FR 58930):

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

Thus, as discussed above under the *Analytical Framework for the Jeopardy and Adverse Modification Determinations*, the Service's jeopardy analysis for the proposed Program will involve consideration of how the Program is likely to affect the proposed interim recovery units in Idaho and Nevada for the bull trout based on their uniqueness and significance as described in the DPS final listing rule cited above, which is herein incorporated by reference. However, in accordance with Service national policy, the jeopardy determination is made at the scale of the listed species: in this case, the coterminous U.S. population of the bull trout.

2.3.1.1.1 Reasons for Listing

Though wide ranging in parts of Oregon, Washington, Idaho, and Montana, bull trout in the interior Columbia River basin presently occur in only about 45 percent of the historical range (Quigley and Arbelbide 1997, p. 1177; Rieman et al. 1997, p. 1119). Declining trends due to the combined effects of habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, angler harvest and poaching, entrainment into diversion channels and dams, and introduced nonnative species (e.g., brook trout, *Salvelinus fontinalis*) have resulted in declines in range-wide bull trout distribution and abundance (Bond 1992, p. 4; Schill 1992, p. 40; Thomas 1992, pp. 9-12; Ziller 1992, p. 28; Rieman and McIntyre 1993, pp. 1-18; Newton and Pribyl 1994, pp. 2, 4, 8-9; Idaho Department of Fish and Game 1995, pp. 1-3). Several local extirpations have been reported, beginning in the 1950s (Rode 1990, p. 1; Ratliff and Howell 1992, pp. 12-14; Donald and Alger 1993, p. 245; Goetz 1994, p. 1; Newton and Pribyl 1994, p. 2; Berg and Priest 1995, pp. 1-45; Light et al. 1996, pp. 20-38; Buchanan and Gregory 1997, p. 120).

Land and water management activities such as dams and other diversion structures, forest management practices, livestock grazing, agriculture, road construction and maintenance, mining, and urban and rural development continue to degrade bull trout habitat and depress bull trout populations (USFWS 2002a, p. 13).

2.3.1.2 Species Description

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

2.3.1.3 Life History

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

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

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

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

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

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

The iteroparous reproductive system of bull trout has important repercussions for the management of this species. Bull trout require two-way passage up and downstream, not only for repeat spawning, but also for foraging. Most fish ladders, however, were designed specifically for anadromous semelparous (fishes that spawn once and then die, and therefore require only one-way passage upstream) salmonids. Therefore, even dams or other barriers with fish passage facilities may be a factor in isolating bull trout populations if they do not provide a downstream passage route.

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

2.3.1.3.1 Population Dynamics

The draft bull trout Recovery Plan (USFWS 2002a, pp. 47-48) defined core areas as groups of partially isolated local populations of bull trout with some degree of gene flow occurring between them. Based on this definition, core areas can be considered metapopulations. A metapopulation is an interacting network of local populations with varying frequencies of migration and gene flow among them (Meefe and Carroll 1994, p. 188). In theory, bull trout metapopulations (core areas) can be composed of two or more local populations, but Rieman and Allendorf (2001, p. 763) suggest that for a bull trout metapopulation to function effectively, a minimum of 10 local populations are required. Bull trout core areas with fewer than 5 local populations are at increased risk of local extirpation, core areas with between 5 and 10 local populations are at intermediate risk, and core areas with more than 10 interconnected local populations are at diminished risk (USFWS 2002a, pp. 50-51).

The presence of a sufficient number of adult spawners is necessary to ensure persistence of bull trout populations. In order to avoid inbreeding depression, it is estimated that a minimum of 100 spawners are required. Inbreeding can result in increased homozygosity of deleterious recessive alleles which can in turn reduce individual fitness and population viability (Whitesel et al. 2004, p. 36). For persistence in the longer term, adult spawning fish are required in sufficient numbers to reduce the deleterious effects of genetic drift and maintain genetic variation. For bull trout, Rieman and Allendorf (2001, p. 762) estimate that approximately 1,000 spawning adults within any bull trout population are necessary for maintaining genetic variation indefinitely. Many local bull trout populations individually do not support 1,000 spawners, but this threshold may be met by the presence of smaller interconnected local populations within a core area.

For bull trout populations to remain viable (and recover), natural productivity should be sufficient for the populations to replace themselves from generation to generation. A population that consistently fails to replace itself is at an increased risk of extinction. Since estimates of population size are rarely available, the productivity or population growth rate is usually estimated from temporal trends in indices of abundance at a particular life stage. For example, redd counts are often used as an indicator of a spawning adult population. The direction and magnitude of a trend in an index can be used as a surrogate for growth rate.

Survival of bull trout populations is also dependent upon connectivity among local populations. 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. 7). Increased habitat fragmentation reduces the amount of available habitat and increases isolation from other populations of the same species (Saunders et al. 1991, p. 22). Burkey (1989, p. 76) 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 of local populations may be low and probability of extinction high. Migrations also facilitate gene flow among local populations because individuals from different local populations interbreed when some stray and return to nonnatal streams. Local populations that are extirpated by catastrophic events may also become reestablished in this manner.

In summary, based on the works of Rieman and McIntyre (1993, pp. 9-15) and Rieman and Allendorf (2001, pp 756-763), the draft bull trout Recovery Plan identified four elements to consider when assessing long-term viability (extinction risk) of bull trout populations: (1) number of local populations, (2) adult abundance (defined as the number of spawning fish present in a core area in a given year), (3) productivity, or the reproductive rate of the population, and (4) connectivity (as represented by the migratory life history form).

2.3.1.4 Status and Distribution

As noted above, in recognition of available scientific information relating to their uniqueness and significance, five population segments of the coterminous United States population of the bull trout are considered essential to the survival and recovery of this species and are identified as: (1) Jarbidge River, (2) Klamath River, (3) Coastal-Puget Sound, (4) St. Mary-Belly River, and (5) Columbia River. Each of these segments is necessary to maintain the bull trout's distribution, as well as its genetic and phenotypic diversity, all of which are important to ensure the species' resilience to changing environmental conditions.

A summary of the current status and conservation needs of the bull trout within these units is provided below. A comprehensive discussion of these topics is found in the draft bull trout Recovery Plan (USFWS 2002a, entire; 2004a, b; entire).

Central to the survival and recovery of the bull trout is the maintenance of viable core areas (USFWS 2002a, p. 54). A core area is defined as a geographic area occupied by one or more local bull trout populations that overlap in their use of rearing, foraging, migratory, and overwintering habitat, and, in some cases, their use of spawning habitat. Each of the population segments listed below consists of one or more core areas. One hundred and twenty one core areas are recognized across the United States range of the bull trout (USFWS 2005, p. 9).

A core area assessment conducted by the Service for the 5 year bull trout status review determined that of the 121 core areas comprising the coterminous listing, 43 are at high risk of extirpation, 44 are at risk, 28 are at potential risk, 4 are at low risk and 2 are of unknown status (USFWS 2008, p. 29).

The action area for the program falls within the Jarbidge River and the Columbia River population segments.

2.3.1.4.1 Jarbidge River

This population segment currently contains a single core area with six local populations: East Fork Jarbidge River, West Fork Jarbidge River, Dave Creek, Jack Creek, Pine Creek and Slide Creek. According to the 2004 USFWS Recovery Plan, this population segment was estimated to have fewer than 500 resident and migratory adult bull trout, representing about 50 to 125 spawners. A recent study by USFWS and the U.S. Geological Survey (Allen et al. 2010) indicate that numbers of bull trout in the upper Jarbidge River basin are much higher than estimated in the recovery plan. Results from the Allen et al. 2010 study indicate that almost four times the estimated number of bull trout inhabit the core area and that these fish show substantial movements between tributaries, increased abundance with increasing altitude, and growth rates indicative of a high quality habitat (Allen et al. 2010, p. 20). The current condition of the bull trout in this segment is attributed to the effects of dams and diversions, livestock grazing, mining, roads, angler harvest, forest management practices, and the introduction of nonnative fishes (USFWS 2004a, p. iii). The draft bull trout Recovery Plan identifies the following conservation needs for this segment: (1) maintain the current distribution of the bull trout within the core area, (2) maintain stable or increasing trends in abundance of both resident and migratory bull trout in the core area, (3) restore and maintain suitable habitat conditions for all life history stages and forms, and (4) conserve genetic diversity and increase natural opportunities for genetic exchange between resident and migratory forms of the bull trout. An estimated 270 to 1,000 spawning fish per year are needed to provide for the persistence and viability of the core area and to support both resident and migratory adult bull trout (USFWS 2004a, p. 62-63). Currently this core area is at high risk of extirpation (USFWS 2005, p. 9).

2.3.1.4.2 Columbia River

The Columbia River population segment includes bull trout residing in portions of Oregon, Washington, Idaho, and Montana. Bull trout are estimated to have occupied about 60 percent of the Columbia River Basin, and presently occur in 45 percent of the estimated historical range (Quigley and Arbelbide 1997, p. 1177). This population segment currently contains 97 core areas and 527 local populations. About 65 percent of these core areas and local populations occur in Idaho and northwestern Montana.

The condition of the bull trout populations within these core areas varies from poor to good, but generally all have been subject to the combined effects of habitat degradation, fragmentation and alterations associated with one or more of the following activities: dewatering, road construction and maintenance, mining and grazing, blockage of migratory corridors by dams or other diversion structures, poor water quality, incidental angler harvest, entrainment into diversion channels, and introduced nonnative species.

The Service has determined that of the total 97 core areas in this population segment, 38 are at high risk of extirpation, 35 are at risk, 20 are at potential risk, 2 are at low risk, and 2 are at unknown risk (USFWS 2005, pp. 1-94).

The draft bull trout Recovery Plan (USFWS 2002a, p. v) identifies the following conservation needs for this population segment: (1) maintain or expand the current distribution of the bull trout within core areas, (2) maintain stable or increasing trends in bull trout abundance, (3) maintain and restore suitable habitat conditions for all bull trout life history stages and strategies, and (4) conserve genetic diversity and provide opportunities for genetic exchange.

2.3.1.4.5.1 Columbia River Recovery/Management Units

Achieving recovery goals within each management unit is critical to recovering the Columbia River population segment. Recovering bull trout in each management unit would maintain the overall distribution of bull trout in their native range. Individual core areas are the foundation of management units and conserving core areas and their habitats within management units preserves the genotypic and phenotypic diversity that will allow bull trout access to diverse habitats and reduce the risk of extinction from stochastic events. The continued survival and recovery of each individual core area is critical to the persistence of management units and their role in the recovery of a population segment (USFWS 2002a, p. 54).

The draft bull trout Recovery Plan (USFWS 2002a, p. 2) identified 22 recovery units within the Columbia River population segment. These units are now referred to as management units. Management units are groupings of bull trout with historical or current gene flow within them and were designated to place the scope of bull trout recovery on smaller spatial scales than the larger population segments.

The action area for this Programmatic includes Forest Service and Bureau managed lands in Idaho, which spans nine management units: Clark Fork River; Kootenai River; Imnaha-Snake River; Hells Canyon Complex; Coeur d'Alene Lake Basin; Clearwater River; Salmon River; Southwest Idaho (Boise, Payette and Weiser river basins); Little Lost River. More information regarding the management units can be found in the USFWS Bull Trout 2002 Draft Recovery Plan, chapters 3, 4, 12, 13, 15, 16, 17, 18, and 19.

2.3.1.5 Previous Consultations and Conservation Efforts

2.3.1.5.1 Consultations

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

Our analysis showed that we consulted on a wide array of actions which had varying levels of effect. Many of the actions resulted in only short-term adverse effects, some with long-term beneficial effects. Some of the actions resulted in long-term adverse effects. No actions that have undergone consultation were found to appreciably reduce the likelihood of survival and recovery of the bull trout. Furthermore, no actions that have undergone consultation were anticipated to result in the loss of local populations of bull trout.

2.3.1.5.2 Regulatory mechanisms

The implementation and effectiveness of regulatory mechanisms vary across the coterminous range. Forest practices rules for Montana, Idaho, Oregon, Washington, and Nevada include streamside management zones that benefit bull trout when implemented.

2.3.1.5.3 State Conservation Measures

State agencies are specifically addressing bull trout through the following initiatives:

- Washington Bull Trout and Dolly Varden Management Plan developed in 2000.
- Montana Bull Trout Restoration Plan (Bull Trout Restoration Team appointed in 1994, and plan completed in 2000).
- Oregon Native Fish Conservation Policy (developed in 2004).
- Nevada Species Management Plan for Bull Trout (developed in 2005).
- State of Idaho Bull Trout Conservation Plan (developed in 1996). The watershed advisory group drafted 21 problem assessments throughout Idaho which address all 59 key watersheds. To date, a conservation plan has been completed for one of the 21 key watersheds (Pend Oreille).

2.3.1.5.4 Habitat Conservation Plans

Habitat Conservation Plans (HCP) have resulted in land management practices that exceed State regulatory requirements. Habitat conservation plans addressing bull trout cover approximately 472 stream miles of aquatic habitat, or approximately 2.6 percent of the Key Recovery Habitat across Montana, Idaho, Oregon, Washington, and Nevada. These HCPs include: Plum Creek Native Fish HCP, Washington Department of Natural Resources HCP, City of Seattle Cedar River Watershed HCP, Tacoma Water HCP, and Green Diamond HCP.

2.3.1.5.5 Federal Land Management Plans

PACFISH is the "Interim Strategy for Managing Anadromous Fish-Producing Watersheds and includes Federal lands in Western Oregon and Washington, Idaho, and Portions of California." INFISH is the "Interim Strategy for Managing Fish-Producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana, and Portions of Nevada." Each strategy amended Forest Service Land and Resource Management Plans and Bureau of Land Management Resource Management Plans. Together PACFISH and INFISH cover thousands of miles of waterways within 16 million acres and provide a system for reducing effects from land management activities to aquatic resources through riparian management goals, landscape scale interim riparian management objectives, Riparian Habitat Conservation Areas (RHCAs), riparian standards, watershed analysis, and the designation of Key and Priority watersheds. These interim strategies have been in place since 1992 and are part of the management plans for Bureau of Land Management and Forest Service lands.

The Interior Columbia Basin Ecosystem Management Plan (ICBEMP) is the strategy that replaces the PACFISH and INFISH interim strategies when federal land management plans are revised. The Southwest Idaho Land and Resource Management Plan (LRMP) is the first LRMP under the strategy and provides measures that protect and restore soil, water, riparian and aquatic resources during project implementation while providing flexibility to address both short- and long-term social and economic goals on 6.6 million acres of National Forest lands. This plan includes a long-term Aquatic Conservation Strategy that focuses restoration funding in priority subwatersheds identified as important to achieving Endangered Species Act, Tribal, and Clean Water Act goals. The Southwest Idaho LRMP replaces the interim PACFISH/INFISH strategies and adds additional conservation elements, specifically, providing an ecosystem management foundation, a prioritization for restoration integrated across multiple scales, and adaptable active, passive and conservation management strategies that address both protection and restoration of habitat and 303(d) stream segments.

The Southeast Oregon Resource Management Plan (SEORMP) and Record of Decision is the second LRMP under the ICBEMP strategy which describes the long-term (20+ years) plan for managing the public lands within the Malheur and Jordan Resource Areas of the Vale District. The SEORMP is a general resource management plan for 4.6 million acres of Bureau of Land Management administered public lands primarily in Malheur County with some acreage in Grant and Harney Counties, Oregon. The SEORMP contains resource objectives, land use allocations, management actions and direction needed to achieve program goals. Under the plan, riparian areas, floodplains, and wetlands will be managed to restore, protect, or improve their natural functions relating to water storage, groundwater recharge, water quality, and fish and wildlife values.

The Northwest Forest Plan covers 24.5 million acres in Washington, Oregon, and northern California. The Aquatic Conservation Strategy (ACS) is a component of the Northwest Forest Plan. It was developed to restore and maintain the ecological health of watersheds and the aquatic ecosystems. The four main components of the ACS (Riparian Reserves, Watershed Analysis, Key Watersheds, and Watershed Restoration) are designed to operate together to maintain and restore the productivity and resiliency of riparian and aquatic ecosystems.

It is the objective of the Forest Service and the Bureau of Land Management to manage and maintain habitat and, where feasible, to restore habitats that are degraded. These plans provide for the protection of areas that could contribute to the recovery of fish and, overall, improve riparian habitat and water quality throughout the basin. These objectives are accomplished through such activities as closing and rehabilitating roads, replacing culverts, changing grazing and logging practices, and re-planting native vegetation along streams and rivers.

2.3.1.6 Conservation Needs

The recovery planning process for the bull trout (USFWS 2002a, p. 49) has identified the following conservation needs (goals) for bull trout recovery: (1) maintain the current distribution of bull trout within core areas as described in recovery unit chapters, (2) maintain stable or increasing trends in abundance of bull trout as defined for individual recovery units, (3) restore and maintain suitable habitat conditions for all bull trout life history stages and strategies, and (4) conserve genetic diversity and provide opportunity for genetic exchange.

The draft bull trout Recovery Plan (USFWS 2002a, p. 62) identifies the following tasks needed for achieving recovery: (1) protect, restore, and maintain suitable habitat conditions for bull trout, (2) prevent and reduce negative effects of nonnative fishes, such as brook trout, and other nonnative taxa on bull trout, (3) establish fisheries management goals and objectives compatible with bull trout recovery, (4) characterize, conserve, and monitor genetic diversity and gene flow among local populations of bull trout, (5) 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, (6) use all available conservation programs and regulations to protect and conserve bull trout and bull trout habitats, (7) assess the implementation of bull trout recovery by management units, and (8) revise management unit plans based on evaluations.

Another threat now facing bull trout is warming temperature regimes associated with global climate change. Because air temperature affects water temperature, species at the southern margin of their range that are associated with cold water patches, such as bull trout, may become restricted to smaller, more disjunct patches or become extirpated as the climate warms (Rieman et al. 2007, p. 1560). Rieman et al. (2007, pp. 1558, 1562) concluded that climate is a primary determining factor in bull trout distribution. Some populations already at high risk may require "aggressive measures in habitat conservation or restoration" to persist (Rieman et al. 2007, p. 1560). Conservation and restoration measures that would benefit bull trout include protecting high quality habitat, reconnecting watersheds, restoring flood plains, and increasing site-specific habitat features important for bull trout, such as deep pools or large woody debris (Kinsella 2005, entire).

2.3.2 Bull Trout Critical Habitat

2.3.2.1 Legal Status

Ongoing litigation resulted in the U.S. District Court for the District of Oregon granting the Service a voluntary remand of the 2005 critical habitat designation. Subsequently the Service published a proposed critical habitat rule on January 14, 2010 (75 FR 2260) and a final rule on October 18, 2010 (75 FR 63898). The rule became effective on November 17, 2010. A justification document was also developed to support the rule and is available on our website (http://www.fws.gov/pacific/bulltrout). The scope of the designation involved the species' coterminous range, which includes the Jarbidge River, Klamath River, Coastal-Puget Sound, St. Mary-Belly River, and Columbia River population segments (also considered as interim recovery units)[1].

Rangewide, the Service designated reservoirs/lakes and stream/shoreline miles in 32 critical habitat units (CHU) as bull trout critical habitat (see Table 1). Designated bull trout critical habitat is of two primary use types: (1) spawning and rearing; and (2) foraging, migrating, and overwintering (FMO).

[1] The Service's 5 year review (USFWS 2008, p. 9) identifies six draft recovery units. Until the bull trout draft recovery plan is finalized, the current five interim recovery units are in affect for purposes of section 7 jeopardy analysis and recovery. The adverse modification analysis does not rely on recovery units.

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

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

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

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

The final rule continues to exclude some critical habitat segments based on a careful balancing of the benefits of inclusion versus the benefits of exclusion. Critical habitat does not include: (1) waters adjacent to non-Federal lands covered by legally operative incidental take permits for habitat conservation plans (HCPs) issued under section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended, in which bull trout is a covered species on or before the publication of this final rule; (2) waters within or adjacent to Tribal lands subject to certain commitments to conserve bull trout or a conservation program that provides aquatic resource protection and restoration through collaborative efforts, and where the Tribes indicated that inclusion would impair their relationship with the Service; or (3) waters where impacts to national security have been identified (75 FR 63898). Excluded areas are approximately 10 percent of the stream/shoreline miles and 4 percent of the lakes and reservoir acreage of designated critical habitat. Each excluded area is identified in the relevant CHU text, as identified in paragraphs (e)(8) through (e)(41) of the final rule. It is important to note that the exclusion of waterbodies from designated critical habitat does not negate or diminish their importance for bull trout conservation. Because exclusions reflect the often complex pattern of land ownership, designated critical habitat is often fragmented and interspersed with excluded stream segments.

2.3.2.2 Conservation Role and Description of Critical Habitat

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

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

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

The Olympic Peninsula and Puget Sound CHUs are essential to the conservation of amphidromous bull trout, which are unique to the Coastal-Puget Sound population segment. These CHUs contain marine nearshore and freshwater habitats, outside of core areas, that are used by bull trout from one or more core areas. These habitats, outside of core areas, contain PCEs that are critical to adult and subadult foraging, migrating, and overwintering.

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

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

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

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

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

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

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

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

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

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

2.3.2.3 Current Rangewide Condition of Bull Trout Critical Habitat

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

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

There is widespread agreement in the scientific literature that many factors related to human activities have impacted bull trout and their habitat, and continue to do so. Among the many factors that contribute to degraded PCEs, those which appear to be particularly significant and have resulted in a legacy of degraded habitat conditions are as follows:

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

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

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

4. In the Coastal-Puget Sound region where amphidromous bull trout occur, degradation of mainstem river FMO habitat, and the degradation and loss of marine nearshore foraging and migration habitat due to urban and residential development.

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

The bull trout critical habitat final rule also aimed to identify and protect those habitats that provide resiliency for bull trout use in the face of climate change. Over a period of decades, climate change may directly threaten the integrity of the essential physical or biological features described in 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 nonnative fishes).

2.4 Environmental Baseline of the Action Area

This section assesses the effects of past and ongoing human and natural factors that have led to the current status of the species, its habitat and ecosystem in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area that have already undergone section 7 consultations, and the impacts of state and private actions which are contemporaneous with this consultation. The two broad indicators most relevant to addressing effects to bull trout are those addressing sediment delivery to the stream, and physical barriers. Other indicators may be affected by the action, but effects are not considered as pertinent relative to the actions being addressed in the Program. Therefore, for the remainder of the baseline and effects sections below, discussions will focus on these two broad indicators.

2.4.1 Bull Trout

2.4.1.1 Status of the Bull Trout in the Action Area

Bull trout in the action area occur within the 38 subbasins (4th field Hydrologic Units or HU) identified in Figures 1 and 2 and listed in Table 2. Major river basins in the action area include the mainstem Snake River, Weiser, Boise, Payette, Salmon, Little Lost, Lemhi, Pahsimeroi, Clearwater, Kootenai, Clark Fork, Priest, Bruneau and Jarbidge. The status of bull trout populations within these basins 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 complete 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. The Clearwater, Kootenai, Salmon, Pahsimeroi, and Little Lost basins have bull trout populations in a variety of conditions, including some that are relatively strong (areas with 2,500 to 5,000 adults or more). The Jarbidge, Boise, Payette, and Lemhi basins also have bull trout populations in a variety of conditions, with each basin's abundance best characterized as moderate (approximately 500 adults). Populations in the Weiser, Pend Oreille (River), Clark Fork, Priest, and the Snake River Hells Canyon basins are weak, with less than 500 adults in each basin. This is significantly lower than the numbers necessary for recovery or long-term persistence of the species in these areas (Rieman and Allendorf 2001, p. 756; USFWS 2005, p. 32). It is not practical or necessary in the context of this programmatic consultation to present detailed information regarding the status of each bull trout population within the action area. Site specific information will be made available to the Level 1 teams on a project by project basis.

During crossing replacements or removals it is possible that resident and migratory (fluvial or adfluvial) life history forms, and adult, subadult, and juvenile age classes of bull trout may be present in the area where individual actions are implemented. Presence will be evaluated during project design. Migratory adult bull trout may be moving downstream through a particular project site, resident adult bull trout may be present in or moving throughout the project site, and juvenile bull trout may be rearing in the stream near the project site. The life history stage that is present at a particular site will be determined and documented in the pre-project checklist. Some projects under the Program may be implemented in areas where bull trout are not present but where other listed fish or critical habitat exists.

2.4.1.2 Factors Affecting the Bull Trout in the Action Area

As previously described in the Status of the Species section of this Opinion, bull trout distributions, abundance, and habitat quality have declined rangewide primarily from the combined effects of habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, angler harvest, entrainment, and introduced non-native fish species such as brook trout. There are numerous natural and anthropogenic influences on bull trout throughout the state of Idaho. Although restoration actions, including culvert removals conducted under the previous consultation effort, and ongoing research efforts have positively affected bull trout, the majority of anthropogenic influences have contributed to the species decline by reducing bull trout numbers, reproduction, and distribution.

For more information regarding factors affecting specific core areas within the action area, please refer to the individual chapters in the Service's 2002 Bull Trout Draft Recovery Plan for the Columbia River (USFWS 2002a, entire) and the 2004 Jarbidge River Draft Recovery Plan (USFWS 2004a, entire; Allen et al. 2010, entire). The individual chapters in the Service's draft plans identified the categories of activities that have had the most significant adverse impacts on bull trout in recovery unit. In the Boise, Payette, and Weiser River basins (Southwest Idaho Recovery Unit), these factors include dams, forest management practices, livestock grazing, agricultural practices, transportation networks, mining, fisheries management, residential development and urbanization. In the Salmon River basin, livestock grazing, logging, roads, mining, noxious weeds, and irrigation withdrawals were identified. In the Clearwater River basin, operation and maintenance of dams and other water diversions, forest management practices, livestock grazing, agriculture, road construction and maintenance, mining and noxious weeds are factors affecting the species. The Kootenai River and Clark Fork (including Lake Pend Oreille and Priest Lake) basins have been impacted by isolation and habitat fragmentation caused by dams, forestry management practices, livestock grazing, agricultural practices, channelization, transportation networks, mining, residential development, fisheries management, and invasive species. Effects in the Hells Canyon Recovery Unit were primarily related to large hydroelectric dams, land management activities, water diversions, mining, timber harvest, road construction and crossings, grazing, and the presence of brook trout. Elevated stream temperatures, fish passage barriers, brook trout, and fish angling were identified in the Little Lost River basin. The Jarbidge is impacted by dams and diversions, increasing water temperatures, forest management practices, livestock grazing, transportation networks, mining, residential development, fisheries management, isolation and fragmentation, recreation, and naturally occurring events.

Baseline conditions for all listed fish and designated critical habitat are described using the basic concepts of the USFWS and NOAA Fisheries Service matrix of pathways and indicators (USFWS and NMFS 1998, entire). Variations of these matrices have been developed to assess ecosystem processes, depending on specific administrative units, scale, and other adaptations. Programmatic examples set by the biological assessment for the Forest Service Region 6 Fish Passage Restoration (USFS 2003b, entire); and the biological assessment for the Southwest Idaho Ecogroup Land and Resource Management Plan Revisions (USFS 2003a, entire) will be followed. See Appendix D of the Assessment for explanation of matrix indicators and definition of reference values.

Table 2 describes the status of sediment and physical barrier indicators for all the subbasins in the action area. The sediment and physical barrier indicators are described as Functioning Appropriately (FA), Functioning at Risk (FR), or Functioning at Unacceptable Risk (FUR): they are the two main watershed condition indicators that may be affected by the Program and they subsequently have the potential to affect chemical contaminants (through sediment) and substrate embeddedness (through sediment). Additional indicators will not be assessed in this Opinion because programmatic actions are not expected to affect them.

Table 2. Subbasins within the Action Area and Watershed Condition Indicator Status

Subbasin		Watershed Condition Indicators[1]	
4th HU	Subbasin Name (primary ownership)	Sediment	Barriers
17050111	N Middle Fork Boise (FS)	FUR	FUR
17050112	Boise-Mores (FS)	FR	FUR
17050113	South Fork Boise (FS)	FR	FUR
17050115	M Snake-Payette (BLM)	FR	FUR
17050120	South Fork Payette (FS)	FUR	FUR
17050121	Middle Fork Payette (FS)	FUR	FUR
17050122	Payette (BLM)	FUR	FUR
17050123	North Fork Payette (FS)	FUR	FUR
17050124	Weiser River (FS)	FUR	FUR
17050201	Brownlee (FS)	FR	FR
17060101	Hells Canyon (FS)	FR	FR
17060103	L Snake-Asotin (BLM)	FR	FA
17050102	Bruneau (BLM)	FR	FA
17040217	Little Lost (BLM)	FR	FR
17060201	Upper Salmon (FS)	FR	FUR
17060202	Pahsimeroi (BLM)	FR	FUR
17060203	M Salmon-Panther (FS)	FR	FR
17060204	Lemhi River (BLM)	FR	FR
17060205	U M Fork Salmon (FS)	FR	FA
17060206	L Mid Fork Salmon (FS)	FR	FA
17060207	M Salmon-Chamberlain (FS)	FR	FA
17060208	South Fork Salmon (FS)	FR	FR
17060209	Lower Salmon (FS)	FR	FA
17060210	Little Salmon (FS)	FUR	FUR
17060301	Upper Selway (FS)	FA	FA
17060302	Lower Selway (FS)	FR	FR
17060303	Lochsa (FS)	FUR	FUR
17060304	M Fork Clearwater (FS)	FUR	FR
17060305	S Fork Clearwater (FS)	FUR	FR
17060306	Mainstem Clearwater (BLM)	FUR	FA
17060307	Lower NF Clearwater (FS)	FUR	FR
17060308	Upper NF Clearwater (FS)	FR	FUR
17010101	Middle Kootenai (FS)	FA	FA
17010104	Lower Kootenai (FS)	FR	FA
17010213	Lower Clark Fork (FS)	FA	FA
17010214	Pend Oreille Lake (FS)	FR	FA
17010215	Priest (FS)	FR	FR
17010304	St. Joe River (FS)	FR	FUR

[1]FUR = functioning at unacceptable risk; FR = functioning at risk; FA = functioning appropriately. See Appendix D of the Assessment for details regarding the rating classifications.

Overall watershed conditions (which are characterized by various habitat elements, including substrate conditions and sediment delivery) are functioning at risk or unacceptable risk in most of the subbasins (Table 2), but may vary substantially within each subbasin. Continued effects from past land use activities – such as mining, grazing, road construction and locations, and timber harvest – degrade overall watershed conditions. Road densities and locations contribute to degraded conditions because of their effect on sediment delivery and riparian conditions. There are approximately 2,000-2,500 barriers and an undoubtedly greater number of undersized crossings, which have a higher risk of failure, within the project area. Chronic sediment production and potential sediment delivery due to crossing failures is currently very high. Water quality is continually affected by sediment throughout the region.

Passage barriers and undersized culverts not only act as barriers to fish passage but also contribute to increased sediment in stream channels. The constricted flows at culverts or bridges are largely due to poor installation or undersized structures. In many instances high water velocities amplified by undersized culverts have created large scour pools at the culvert discharge point, altering the stream elevation below the natural gradient. Over time, culverts become elevated above the stream and create a physical barrier to fish passage. In other cases, water also drains under and around culverts, and migrating fish attempting to follow these flows can become stranded or impinged against the culvert or road fill.

Physical Barriers are functioning at risk or unacceptable risk in most subbasins throughout Idaho, but may vary substantially within each subbabin, and is the driving purpose of this Program. Subbasins with wilderness areas tend to have fewer passage barriers because of the lower road densities. In combination with physical barriers on Federal lands, there are a significant number of culverts that are physical barriers on non-Federal lands throughout Idaho, fragmenting habitats and fish populations even further. Road crossings that create barriers to fish passage usually result from installation of culverts that are undersized and placed at the wrong slope. This can lead to high flow velocities within the culvert and outlet drops at culverts that exceed the jump heights of fish, both of which may act as barriers to fish passage.

In addition to habitat fragmentation related to culverts, agricultural practices, such as water diversions and dewatering of stream reaches for irrigation, create migration barriers throughout western states. Even more, the larger hydroelectric, flood-control, and irrigation dams contribute to the isolation of numerous resident fish populations and block historical habitat to both resident and anadromous salmonids.

It is important to note that watershed condition ratings do not necessarily capture the range of conditions within that watershed or subbasin. For the Program considered here it is not readily feasible to accurately characterize watershed conditions at a finer scale than the overall watershed, but we do recognize the range of conditions that occur within and across each watershed. Effects associated with the Program will also vary and the risks to bull trout from a given action will be affected by the baseline watershed conditions where the action takes place.

2.4.2 Bull Trout Critical Habitat

2.4.2.1 Status of Bull Trout Critical Habitat in the Action Area

The Service published a final rule designating critical habitat for bull trout rangewide on October 18, 2010 (effective November 17, 2010). Figure 3, below, shows bull trout critical habitat within the action area. In Idaho, there are 8,771.6 stream miles of critical habitat and 170,217.4 lake or reservoir acres designated. Most of the critical habitat occurs on federal lands managed by the Forest Service or Bureau. For more information regarding critical habitat across the state of Idaho, see section 2.3.2 of this Opinion. Across the action area, streams may provide spawning and rearing critical habitat or foraging, migrating, and overwintering (FMO) critical habitat, depending on site specific stream characteristics and local bull trout population life history expressions. Effects of the Program on critical habitat will often depend on what kind of critical habitat is provided at the specific project site. It is not practical or necessary in the context of this programmatic consultation to present detailed information regarding the status of critical habitat throughout the action area. Site specific information will be made available to the Level 1 teams on a project by project basis.

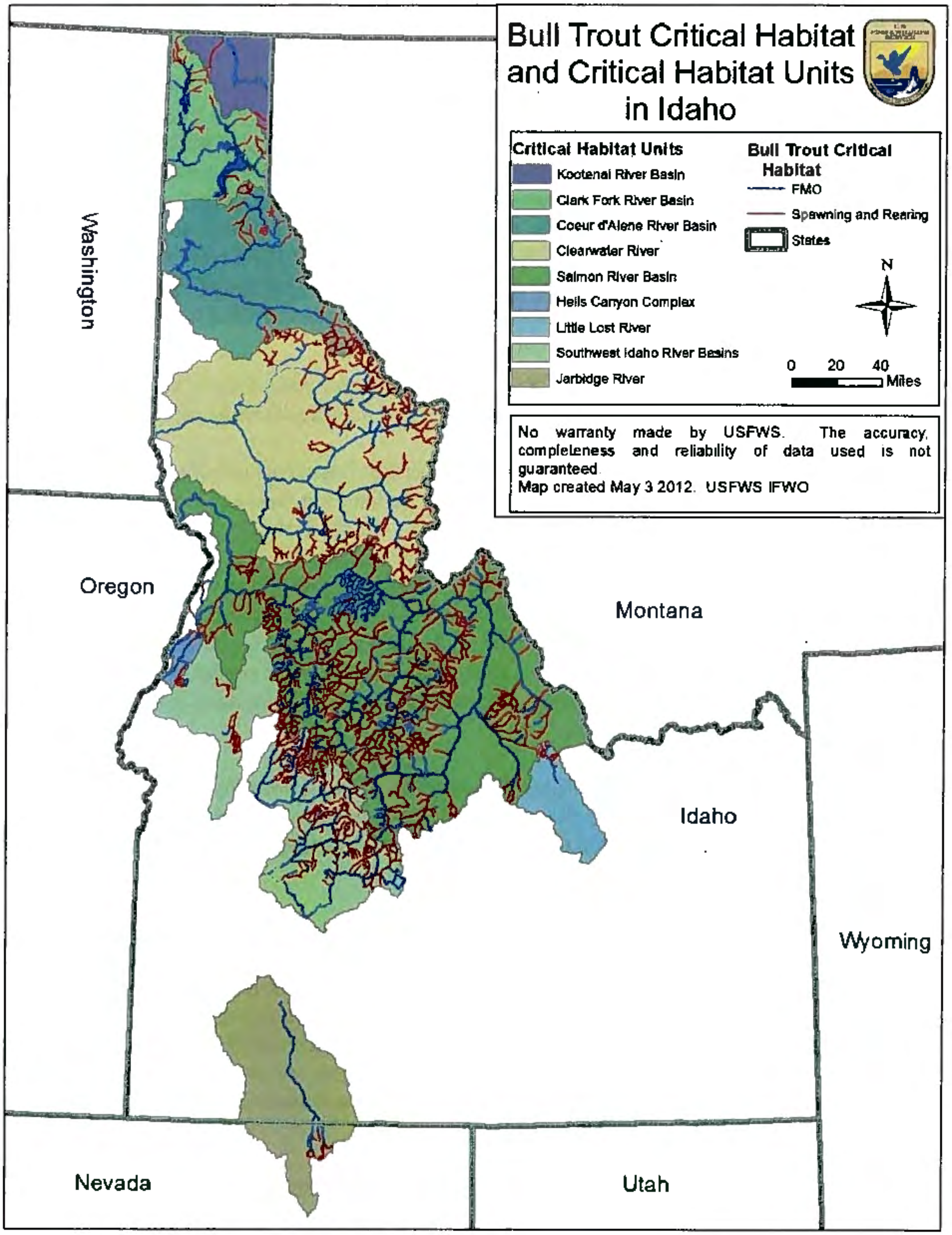

Figure 3. Bull Trout Critical Habitat and Core Areas in the Action Area

2.4.2.2 Factors Affecting Bull Trout Critical Habitat in the Action Area

Primary constituent elements (PCEs) (see Section 2.3.2.2) are used to describe biological and physical habitat features that are essential to the conservation of bull trout. The matrix of watershed condition indicators, as summarized in Table 2, provides a means to assess the baseline condition of the PCEs in the action area and the potential effects of the action on the PCEs. Analysis of the habitat indicators can provide a thorough evaluation of the existing baseline condition and potential project impacts to the PCEs of proposed critical habitat for bull trout. Table 3 shows the relationship between the PCEs for bull trout critical habitat and the habitat indicators. The following, for informational purposes and for analysis of effects to PCEs, describe how the indicators are related to evaluating the function of each PCE for proposed bull trout critical habitat. The information is summarized in Table 3.

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

The analysis of *floodplain connectivity* considers the hydrologic linkage of off-channel areas with the main channel and overbank-flow maintenance of wetland function and riparian vegetation and succession. Floodplain and riparian areas provide hydrologic connectivity for springs, seeps, groundwater upwelling and wetlands and contribute to the maintenance of the water table. The analysis of *changes in peak/base flows* addresses subsurface water connectivity and *substrate embeddedness* addresses inter-gravel flows. *Increase in drainage network* and *road density and location* address potential changes to groundwater sources and subsurface water connectivity. *Streambank condition, floodplain connectivity* and *riparian conservation areas* address groundwater influence. *Chemical contamination/nutrients* address concerns regarding groundwater water quality.

2. ***Migratory 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.***

Physical, biological or chemical barriers to migration are addressed directly through water quality habitat indicators, including *temperature*, *sediment, chemical contamination/nutrients* and *physical barriers*. The analysis of these indicators assess whether barriers have been created due to impacts such as high temperatures or high concentrations of turbidity or contaminants. Analysis of *change in peak/base flows* and *average wetted width/maximum depth ratio* assess whether changes in flow might create a seasonal barrier to migration. An analysis of *refugia* considers the habitat's ability to support strong, well distributed, and connected populations for all life stages and forms of bull trout.

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

Floodplain connectivity and *riparian conservation areas* provide habitat to aquatic invertebrates, which in turn provide a forage base for bull trout. *Pool frequency and quality* and *substrate embeddedness* contributes to the variety and density of aquatic invertebrates and other fish species. Changes in *temperature*, *sediment*, and *chemical contaminants and nutrients* affect aquatic invertebrate production, floodplain and riparian areas provide habitat to aquatic invertebrates, which in turn provide a forage base for bull trout. The combined analyses of all the Matrix habitat indicators and the other seven PCEs provide information to assess whether there is an abundant food base in the analysis area. Therefore, any impairment to the food base will be addressed by way of summarizing the biological and habitat indicators.

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

Large woody debris increases channel complexity and creates pools and undercut banks, so the analysis of the current amounts and sources of *large woody debris* available for recruitment is pertinent to this PCE. *Pool frequency and quality* considers the number of pools per mile as well as the amount of cover and temperature of water in the pools. *Average wetted width/maximum depth ratio* is an indicator of channel shape and pool quality. Low ratios suggest deeper, higher quality pools. *Large pools,* consisting of a wide range of water depths, velocities, substrates and cover, are typical of high quality habitat and are a key component of channel complexity. Analysis of *off-channel habitat* describes side-channels and other off-channel areas. *Streambank condition* analyzes the stability of the banks, including features such as undercut banks. The analysis of riparian *conservation areas* and *floodplain connectivity, disturbance history, and disturbance regime* includes the maintenance of habitat and channel complexity, the recruitment of large woody debris, and the connectivity to off-channel habitats or side channels. Complex habitats provide refugia for bull trout and in turn, analysis of *refugia* assesses complex stream channels. All of these habitat indicators consider the numerous characteristics of instream bull trout habitat and quantify critical components that are fundamental to creating and maintaining complex in-stream habitat over time.

5. ***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.***

This PCE is addressed directly by the analysis of *temperature*. It is also addressed through consideration of *refugia*, which by definition is high quality habitat of appropriate temperature. Availability of refugia is also considered in analysis of *pool frequency and quality* and *large pools*. *Average wetted width/maximum depth ratio* is an indication of water volume, which indirectly indicates water temperature, i.e., low ratios indicate deeper water, which in turn indicates possible refugia. This indicator in conjunction with *change in peak/base flows* is an indicator of potential temperature and refugia concerns particularly during low flow periods. *Streambank condition*, *floodplain connectivity*, *road density and location* and *riparian*