United States Department of the Interior

U.S. Fish and Wildlife Service

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MAR 17 2015

David Mabe
Snake Basin Office Director
National Marine Fisheries Service
800 Park Boulevard, Plaza IV, Suite 220
Boise, Idaho 83712-7743

Subject: Idaho Habitat Restoration Programmatic—Idaho—Biological Opinion
In Reply Refer to: 01EIFW00-2014-F-0456

Dear Mr. Mabe:

Enclosed are the U.S. Fish and Wildlife Service's (Service) Biological Opinion (Opinion) and concurrences with the National Marine Fisheries Service's (NMFS) determinations of effect on species listed under the Endangered Species Act (Act) of 1973, as amended, for the proposed Idaho Habitat Restoration Programmatic (Program) for the Salmon River Basin, Clearwater River Basin, Hells Canyon Subbasin, and the Lower Snake-Asotin Subbasin (Idaho). In a letter dated April 21, 2014, and received by the Service on April 23, 2014, NMFS requested formal consultation on the determinations under section 7 of the Act that the proposed Program is likely to adversely affect bull trout (*Salvelinus confluentus*) and bull trout critical habitat. NMFS determined that the proposed Program is not likely to adversely affect Canada lynx (*Lynx canadensis*), Northern Idaho ground squirrel (*Spermophilus brunneus brunneus*), yellow-billed cuckoo (*Coccyzus americanus*), MacFarlane's four o'clock (*Mirabilis macfarlanei*), water howellia (*Howellia aquatilis*), and Spaulding's catchfly (*Silene spaldingii*), and requested our concurrence with these determinations.

Habitat restoration projects completed under this Program will be funded, permitted, or implemented by NMFS and the following action agencies: Army Corps of Engineers (USACE), Bureau of Reclamation (BOR), Natural Resources Conservation Service (NRCS), Forest Service (USFS), and Bureau of Land Management (BLM). While NMFS has been the lead action agency for the consultation process the consultation fulfills section 7 requirements for all the action agencies listed above.

The enclosed Opinion and concurrences are based primarily on our review of the proposed action, as described in your May 28, 2014 revised Biological Assessment (Assessment), and the anticipated effects of the action on listed species, and were prepared in accordance with section 7 of the Act. Our Opinion concludes that the proposed project will not jeopardize the survival and recovery of bull trout and will not destroy or adversely modify critical habitat. A complete record of this consultation is on file at this office.

Thank you for your continued interest in the conservation of threatened and endangered species. Please contact Pam Druliner at (208) 378-5348 if you have questions concerning this Opinion.

Sincerely,

MAR 17 2015

Michael Carrier
State Supervisor

Enclosure

cc: NOAA (Stelle, Fesenmyer)
BLM (Murphy, Hoefer)
USACE (D. Mitchell, Urbanek)
BOR (Paquin, J. Peterson)
OSC (M. Edmondson)
USFS (Rasure, Krueger, Nalder, Roerick, B. Mitchell, L. Nutt, Filbert, A. Egnew, Spaulding, Jacobson)
NRCS (Burwell, Koziol)

BIOLOGICAL OPINION
FOR THE
IDAHO HABITAT RESTORATION PROGRAMMATIC

01EIFW00-2014-F-0456

MAR 1 7 2015

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

Supervisor ______________________

MAR 1 7 2015

Date ______________________

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1. BACKGROUND AND INFORMAL CONSULTATION

1.1 Introduction

The U.S. Fish and Wildlife Service (Service) has prepared this Biological Opinion (Opinion) of the effects of the Idaho Habitat Restoration Programmatic (Program) on bull trout (*Salvelinus confluentus*) and its designated critical habitat. In a letter dated April 21, 2014 and received on April 23, 2014 the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) requested formal consultation with the Service under section 7 of the Endangered Species Act (Act) of 1973, as amended, for the Program. Habitat restoration projects under this Program will be funded, permitted, or implemented by NMFS, U.S. Army Corps of Engineers (USACE), Bureau of Reclamation (BOR), Natural Resources Conservation Service (NRCS), United States Forest Service (USFS), and the Bureau of Land Management (BLM). NMFS, as the lead agency for this effort, 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 February 2015 Biological Assessment (NMFS 2015, entire) developed by NMFS and other information, the Service has concluded that the action, as proposed, is not likely to jeopardize the continued existence of bull trout nor result in adverse modification of critical habitat.

NMFS has also determined the action is not likely to adversely affect Canada lynx (*Lynx canadensis*), Northern Idaho ground squirrel (*Spermophilus brunneus brunneus*), yellow-billed cuckoo (*Coccyzus americanus*), MacFarlane's four o'clock (*Mirabilis macfarlanei*), water howellia (*Howellia aquatilis*), and Spalding's catchfly (*Silene spaldingii*). In this document, the Service is providing concurrences with those determinations.

1.2 Consultation History

NMFS, USACE, BOR, NRCS, USFS, and the BLM collectively called the *action agencies*, initiated a programmatic consultation for routine aquatic habitat restoration projects throughout the Salmon River Basin, Clearwater River Basin, Hells Canyon Subbasin, and the Lower Snake-Asotin Subbasin, in Idaho. The action agencies fund, permit, or implement stream restoration projects in central Idaho. Such projects will restore degraded habitat conditions and promote recovery of ESA-listed salmon and steelhead. As described in the Biological Assessment (Assessment), NMFS estimates that the action agencies will collectively implement between 10 and 20 projects per year under this programmatic consultation, but a greater number of projects per year is possible.

The following correspondence has taken place between NMFS and the Service prior to issuance of this Opinion.

July 9, 2014	NMFS circulated a draft biological assessment to the other action agencies and to the Service for comments. The Service provided general comments to NMFS on the draft assessment.

October 21, 2014	NMFS provided another draft biological assessment to the Service for review.
November 15, 2014	The Service provided comments on the October 21, 2014 draft.
December 6, 2014	The Service and NMFS met to discuss comments and the draft biological assessment.
December 9, 2014	NMFS provided a newly revised draft biological assessment.
December 2014 – March 2015	NMFS and the Service worked to further refine the proposed action and biological assessment.
April 21, 2014	NMFS submitted a final biological assessment and initiated formal consultation with the Service. Based on comments NMFS received from other action agencies, NMFS revised this biological assessment.
May 28, 2014	NMFS provided a revised final Assessment and formal consultation was initiated on this date.
February 18, 2015	NMFS provided a revised final Assessment with an updated project description.

1.3 Informal Consultations

NMFS determined that for Canada lynx, Northern Idaho ground squirrel, Macfarlane's four-o'clock, water howellia, and Spalding's catchfly, 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 Canada Lynx

Canada lynx may occur in forested habitats within the action area, although the extent of their distribution is largely unknown and lynx are very rare in Idaho. Most habitat restoration activities will occur in stream and riparian areas, or very nearby, where vegetation has been previously degraded or removed. Activities may temporarily displace lynx, if they are present, in proximity to project areas when activities are occurring due to increased human presence and activity. However, the likelihood of disturbing a lynx is very low due to their low likelihood of their presence in the specific project areas, and in the action area in general. Program activities will not be implemented within 270 yards of known active lynx dens and, although it was not specified in the program description, given the restoration focus of this Program, it is unlikely that suitable habitat will be degraded or removed. Impacts of Program implementation are expected to be insignificant and will not adversely affect the species. Critical habitat lies outside of the action area.

1.3.2 Northern Idaho Ground Squirrel

Northern Idaho ground squirrel (NIDGS) occurs in Adams, Valley and Washington counties of southwest Idaho. Northern Idaho ground squirrel (NIDGS) does not make significant use of riparian areas, but may be impacted by Program activities such as staging, parking vehicles, storage, setbacks or removal of berms, dikes, levees, etc. Any squirrel activity sites, den, or burrows encountered at a work site will be flagged and avoided during site preparation, staging, or construction and earthmoving activities. Squirrel activity within 200 feet of work sites (including removal or setbacks of berms, dikes, levees, etc.) will be reported to the Service, which will recommend a course of action, which could include initiation of site-specific consultation. Herbicides will not be applied where ground squirrels are known to be present. Because of these conservation measures the Service anticipates that effects of the Program will be insignificant and will not adversely affect the Northern Idaho ground squirrels.

1.3.3 Yellow-Billed Cuckoo

Disturbance of the riparian vegetation is the primary potential effect to yellow-billed cuckoo that could be associated with programmatic projects. Yellow-billed cuckoo populations depend upon large expanses of specific types of riparian habitat (cottonwood galleries, riparian woodlands, etc.) for successfully nesting. In the action area, historic records of yellow-billed cuckoo are known from the Salmon River near the towns of Salmon and Challis. Recent survey efforts (2003 to 2011) in the Salmon River historic locations were not successful in documenting any detection of yellow-billed cuckoo, which might be due to habitat fragmentation along the main-stem, or the historic occurrences may have been of migrants. The recent surveys noted that few suitably large remnant cottonwood patches exist for yellow-billed cuckoo in the Salmon River and Big Lost River (Cavallaro 2011, p. 7). Although the Salmon River is within the action area, most activities occurring under the Program will occur in previously disturbed sites higher in drainages away from cuckoo habitat, and large patches of riparian vegetation will remain intact. It is unlikely many, if any at all, projects will occur within suitable habitat or along the mainstem of the river, but if they should, activities will avoid fragmentation, degradation, or destruction of riparian habitat capable of supporting yellow-billed cuckoos. Because it is unlikely yellow-billed cuckoo will be present during projects, and the lack of spatial overlap with currently locations of occurrences and Program activities, and conservation measures designed to minimize potential effects to the species, the proposed action is not likely to significantly impact populations, individuals, or suitable habitat for yellow-billed cuckoo.

1.3.4 Plants

Macfarlane's four-o'clock, Spalding's catchfly, and water howellia occur in very limited areas within the anadromous watersheds, and it is unlikely individual projects will occur within occupied habitat. However, if one or more ESA-listed plant species are present and may be affected by an individual project, the additional protective measures and coordination with the Service will ensure effects to the plant remain insignificant. 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. In all cases, all appropriate measures will be incorporated into contract or equipment rental agreements to avoid introduction of invasive plants and noxious weeds into project areas. Herbicides will not be applied where ESA-listed plant species are known to be present. Given the low likelihood of projects occurring in occupied habitat, conservation measures, and project limitations, effects to plants from projects implemented under the Program are considered insignificant.

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."

For proposed activities where there is an existing programmatic consultation in place (i.e. Idaho Stream Crossing Programmatic, road and trail maintenance, or weed treatment, etc.) for the action agency(ies) within the proposed action area, the proposed project shall be completed under and in accordance with the pre-existing consultation and will adhere to the specific proposed action, conservation measures, monitoring requirements, and terms and conditions, etc. from the pre-existing consultation. The intent of the Program is not to replace other programmatics which have been developed by action agencies, NMFS, and the Service, and which may have design features, analysis, and terms and conditions specific to that unit.

2.1.1 Action Area

For this Program, the action area includes all subbasins in Idaho that contain anadromous fish species listed under the Act (ESA-listed species) (Table 1 and Figure 1). The action area covers 18 subbasins (4th -field HUCs), encompassing all areas potentially affected directly or indirectly by this programmatic consultation. Because of the potential for downstream effects and additive effects within watersheds, the action area encompasses entire subbasins where ESA-listed anadromous fish species and designated critical habitat occur. Whereas the action area encompasses the entire Clearwater and Salmon river basins, for the Snake River Basin the action area includes only the Snake River and its tributaries along the Idaho-Oregon border from Hells Canyon Dam down to the Clearwater River confluence.

Table 1. Action Area Subbasins (4th Field Hydrologic Unit Code [HUC])

4th-field HUC	HUC Name
17060101	Hells Canyon
17060103	Lower Snake-Asotin
17060201	Upper Salmon
17060202	Pashimeroi
17060203	Middle Salmon-Panther
17060204	Lemhi
17060205	Upper Middle Fork Salmon
17060206	Lower Middle Fork Salmon
17060207	Middle Salmon-Chamberlain
17060208	South Fork Salmon
17060209	Lower Salmon
17060210	Little Salmon
17060301	Upper Selway
17060302	Lower Selway
17060303	Lochsa
17060304	Middle Fork Clearwater
17060305	South Fork Clearwater
17060306	Clearwater

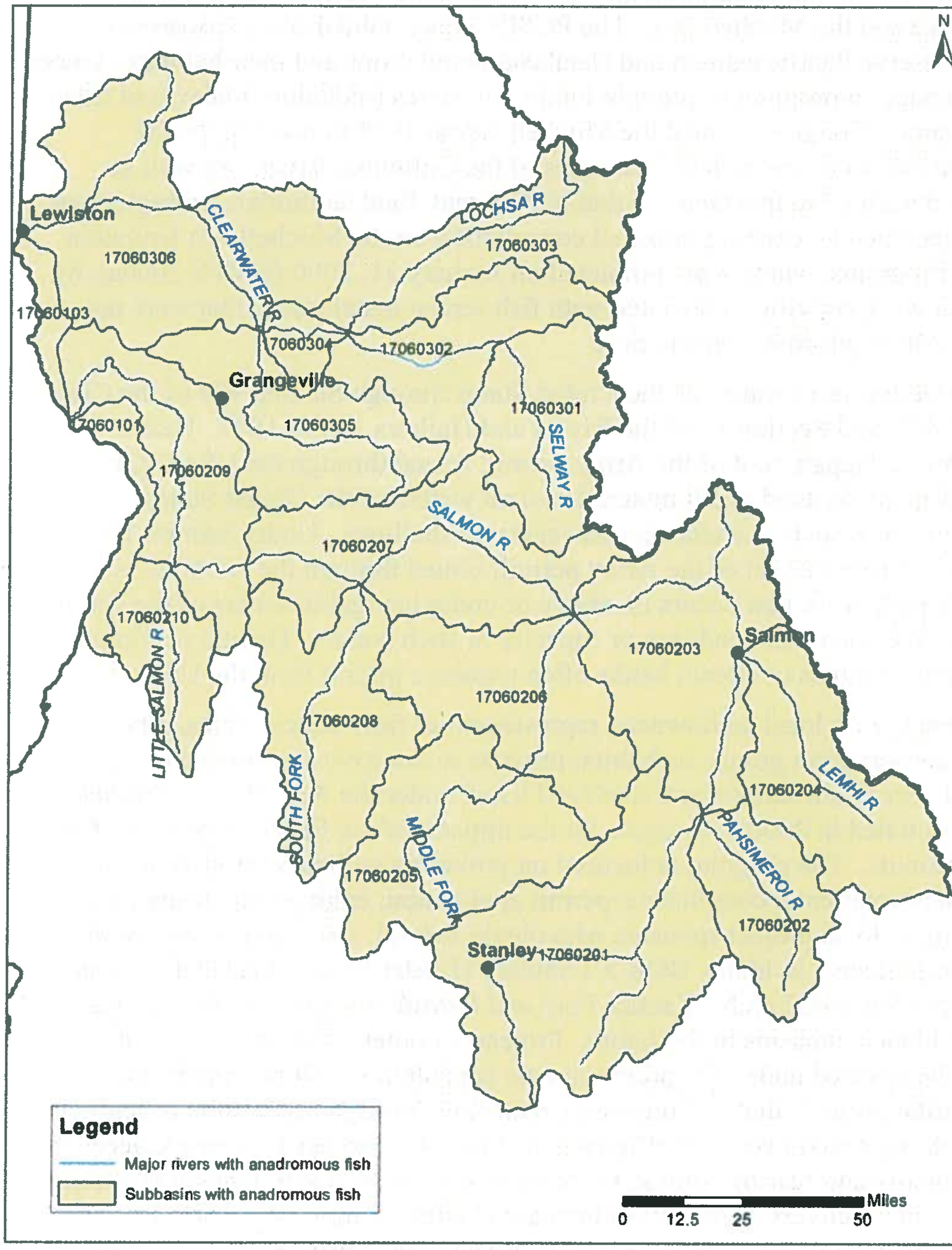

Figure 1. Action Area Subbasins (subbasins occupied by listed anadromous fish species)

2.1.2 Action Agencies

The action agencies in this programmatic consultation are NMFS, USACE, BOR, NRCS, USFS, and the BLM. Here we briefly describe the mechanisms through which each agency funds, permits, or implements habitat restoration projects in Idaho. It should be recognized that they are not limited to the mechanisms described below.

NMFS provides funding for habitat restoration projects through the Pacific Coast Salmon Recovery Fund (PCSRF) and the Mitchell Act. The PCSRF was established by Congress to protect, restore, and conserve Pacific salmon and steelhead populations and their habitats. Under the PCSRF, NMFS manages a program to provide funding to states (including Idaho) and tribes of the Pacific Coast region. Congress passed the Mitchell Act in 1938 to provide for the conservation of salmon and steelhead fishery resources of the Columbia River. As well as covering the activities described in this Opinion that NMFS may fund, authorize, or implement, this consultation supplements the existing informal consultation on the Mitchell Act Irrigation Diversions Screening Programs, which was completed on January 31, 2000 (NMFS 2000a), by including the in-stream work activities associated with fish screen installations that were not covered in the NMFS 2000a informal consultation.

The USACE regulates activities in waters of the United States through Section 404 of the Clean Water Act (CWA) of 1972 and Section 10 of the Rivers and Harbors Act of 1899. Under Section 404 of the CWA, a Department of the Army permit, issued through the USACE, is required for the discharge of dredged or fill material into all waters of the United States, including special aquatic sites such as wetlands and vegetated shallows. Under Section 10 of the Rivers and Harbors Act, a Department of the Army permit, issued through the USACE, is required for any structure or work that occurs in, above or under navigable waters of the United States or affects the course, location, condition or capacity of such waters. Habitat restoration projects that alter stream channels or stream banks often require a permit from the USACE.

BOR works in partnership with local landowners, representatives from states, tribes, other federal agencies, and conservation groups on habitat projects to improve spawning and rearing habitat for Columbia River Basin salmon and steelhead listed under the Act. BOR's Tributary Habitat Program was initiated in 2000 to mitigate for the impacts of the Federal Columbia River Power System on salmonids. The program is focused on providing technical services including project coordination, environmental compliance, permit application, engineering design, and construction monitoring to local project sponsors who obtain federal, state, and private funding to construct the habitat projects. In Idaho, BOR's Tributary Habitat Program currently includes the Little Salmon, Upper Salmon, Lemhi, Yankee Fork and Pahsimeroi River subbasins, but could expand to other Idaho subbasins in the future. Projects in other subbasins occupied by listed fish would also be covered under this programmatic consultation. BOR contributions focus on in-stream habitat projects that: (1) increase streamflow through acquisition or lease of water rights, or through improved irrigation efficiency; (2) remove barriers to improve access to a greater range of spawning and rearing habitat; (3) replace screens on water diversions to reduce entrainment of fish in water delivery systems; (4) increase channel complexity; or (5) reconnect side-channels and floodplains to main stream channels. Reclamation currently focuses on the project categories listed above, but could engage in any of the other project categories included in this programmatic consultation.

NRCS provides technical and financial assistance to private landowners and others for habitat restoration projects with funding the agency administers under the Federal Farm Bill. NRCS also participates as a partner organization in habitat restoration projects that utilize other funding sources. NRCS contributes technical expertise in an array of disciplines to these projects.

USFS administers public lands throughout Idaho, covering many miles of stream and riparian habitat. This consultation will cover USFS habitat restoration actions for which there is not a pre-existing consultation in place. For categories of habitat restoration activities for which the USFS has an existing programmatic consultation in place with NMFS and the Service (e.g.,. stream road crossings, weeds treatment), such activities will continue to be covered under the existing programmatic consultation—as explained below under descriptions of specific activity categories.

BLM administers public lands throughout Idaho, covering many miles of stream and riparian habitat. This consultation will cover BLM habitat restoration actions for which there is not a pre-existing consultation in place. For categories of habitat restoration activities for which the BLM has an existing programmatic consultation in place with NMFS and the Service (e.g.,. stream road crossings, weeds treatment) for anadromous watersheds in Idaho, such activities will continue to be covered under the existing programmatic consultation, as explained below under descriptions of specific activity categories.

2.1.3 Proposed Action

2.1.3.1 Program Implementation Procedures

A habitat restoration project conducted under this consultation may involve multiple parties: One or more federal agencies, a project sponsor, a private landowner, and contractors. This Opinion refers to the project sponsor as the entity planning and implementing an individual project. The project sponsor will most often be non-federal (e.g., Trout Unlimited or the Nez Perce Tribe), but could in some cases be the federal action agency itself (e.g., USFS). If there is multiple action agencies involved in an individual project, the action agencies will choose one agency to be the lead action agency for the project. The lead action agency will ensure that the project sponsor follows all applicable conservation measures and submits all applicable pre- and post-project reports to NMFS and the Service. A federal action agency may also choose to complete project documentation for the project sponsor (e.g., NRCS or USACE working with a private landowner).

If one or more action agency intends to fund, permit, or carry out an individual project under this programmatic consultation, the lead action agency will first briefly confirm, via a phone call or email to the local NMFS biologist or NMFS Snake Basin Area Office in Boise, that the project will fit under the parameters (beneficial restoration activities) and conservation measures of this programmatic. The lead action agency will then provide the project sponsor with a Project Information Form (Appendix A). The Project Information Form will specify the lead action agency for the project. The lead action agency will ensure that the project sponsor completes and submits the Project Information Form to NMFS and the Service (and simultaneously to all other action agencies involved in the project) at least 60 days before initiating the project (or 90 days in some cases, as explained below). NMFS and the Service will review the project information and determine whether additional information or a site visit is necessary. If NMFS or the Service determines that a site visit is necessary, the project sponsor and lead action agency will coordinate a site visit for NMFS and/or the Service staff at least 30 days prior to the planned project start date. NMFS and the Service will verify, through reviewing the Project Information Form and any additional information provided by the project sponsor, or a site visit, that the project falls under this programmatic consultation. Before the project begins, a NMFS biologist will email the project sponsor (and all action agencies involved in the project) to confirm that the project fits under this programmatic consultation for listed anadromous species; and a Service biologist will also email the project sponsor (and all action agencies involved in the project) to confirm that the project fits under this programmatic consultation for all other listed species. For complex projects with engineering plans, the project sponsor will contact NMFS as early as possible in the project development phase to allow sufficient time for a NMFS and/or Service site visit and discussion of applicable project design and conservation measures.

The project sponsor will email the Project Information Form to NMFS (SnakeBasin@noaa.gov), the Service (the appropriate Service representative for the area), and to all other action agencies included in the project. The project sponsor will submit the Project Completion Form (Appendix B) to NMFS and the Service within 90 days of project completion, to the same email addresses as above. If the project required dewatering for in-stream work, the Project Completion Form will describe all fish handling. The project sponsor will also list on the form any herbicides used. Reasonable land access for post-project monitoring will be a condition required for any permits covered under this programmatic.

For some restoration categories, the project sponsor will submit engineering plans to NMFS (attached to the Project Notification Form) so that NMFS can evaluate the plans for their consistency with the criteria in *Anadromous Passage Facility Design* (NMFS 2011a). The Project Sponsor will submit engineering plans at least 90 days before the planned project start date. The Project Sponsor will email the engineering plans to NMFS along with the Project Notification Form to SnakeBasin@noaa.gov. The categories requiring engineering review include fish screens, fish passage facilities at dams, new diversion structures, installation of grade control structures greater than 3-foot height aggregate, and channel reconstruction projects. The Project Sponsor may need to adjust the project plans in response to NMFS review.

Each action agency in this consultation will submit an annual report to NMFS and the Service by April 1 each year, listing all projects completed under the programmatic consultation for the previous year. A representative from each action agency will participate in an annual meeting or phone call to discuss the implementation of the program, types of modifications approved, how to improve conservation under the program, and how to make the program more efficient.

2.1.3.2 Categories of Habitat Restoration Activities

The intent of the Programmatic is to restore or improve fish habitat for listed species, therefore the overarching goals of the activities that could be carried out under this Program are to benefit listed fish and critical and essential habitat. The proposed action consists of nine categories of restoration activities: (1) Fish Screening; (2) Fish Passage; (3) In-stream Flow; (4) In-stream Structures; (5) Side Channels and Floodplain Function; (6) Channel Reconstruction; (7) Riparian Habitat; (8) Road and Trail Erosion Control, Maintenance, and Decommissioning; and (9) Surveying and Monitoring. Table 2 lists these action categories and identifies specific action types included under each category. Each of the action categories are then described in more detail in the following sections. Some restoration projects may involve multiple categories.

NMFS estimates that the action agencies will collectively implement between 10 and 20 projects per year under this programmatic consultation, based on the number of individual consultations in past years on habitat restoration projects, but a greater number of projects per year could be completed. Based on individual consultations in past years, projects under this programmatic consultation are likely to be distributed throughout action area (Figure 1, below); and the most frequent action categories are likely to be riparian restoration, channel and floodplain reconstruction, and instream flow projects.

Table 2: Proposed Actions

Action Category	Specific Actions Included in the Consultation
Fish Screening	• Install, upgrade, or maintain fish screens
Fish Passage	• Install or improve fish passage facilities (e.g., fish ladders or other fishways) at diversion structures and other passage barriers • Remove or modify water control structures (irrigation diversion structures) • Replace culverts and bridges to provide fish passage and/or to reduce risk of culvert failure and chronic sedimentation, using the stream simulation methods from NMFS (2011b).
In-stream Flow	• Lease or purchase water rights to improve in-stream flows • Change or consolidate points of diversion *(NMFS must review plans)* • Increase efficiency of irrigation practices (e.g., convert open ditches to pipes, or convert surface water diversions to ground water wells)

In-stream Structures	• Provide grade control with boulder weirs or roughened channels
	• Install in-stream habitat structures including:
	  • Rootwads, large woody debris (LWD), and log jams
	  • Boulders
	  • Spawning gravels

Side Channels and Floodplain Function	• Reconnect and restore historic side channels • Modify or remove berms, dikes, levees, and fill
Channel Reconstruction	• Reconstruction of existing stream channels into historic or newly constructed channels

Riparian Habitat	• Plant riparian vegetation
	• Reduce riparian impacts from livestock:
	  • Install fencing
	  • Develop livestock watering facilities away from streams
	  • Install livestock stream crossings (culverts, bridges, or hardened fords)
	• Control invasive weeds through physical removal or with herbicides
	• Stabilize stream banks through bioengineering

Road and Trail Erosion Control, Maintenance, and Decommissioning	• Decommission or obliterate unneeded roads
	• Relocate portions of roads and trails away from riparian buffer areas
	• When part of a larger restoration project, reduce sediment from existing roads:
	  • Improve and maintain road drainage features
	  • Reduce road access and usage through gates, fences, boulders, logs, tank traps, and signs
	  • Remove or stabilize pre-existing cut and fill or slide material

Action Category	Specific Actions Included in the Consultation

Surveying and Monitoring	• Survey project sites:
	  • Take physical measurements
	  • Install recording devices
	  • Determine fish presence
	• Monitor project site and stream habitat after project completion
	• Install Passive Integrated Transponder (PIT) tag detection arrays

The restoration activities covered under this consultation will be aimed at protecting or restoring fish and wildlife habitat, with long-term benefits for listed fish species. However, project construction activities may adversely affect listed fish species in the short-term. In order to minimize these adverse effects, the proposed action includes a general set of conservation measures applicable to all projects, as well a set of conservation measures specific to each category of activity. This Opinion first lists the general conservation measures, and then provides a detailed description of each action category, along with specific conservation measures for each category.

2.1.3.3 General Conservation Measures

In order to minimize the magnitude and duration of short-term adverse effects on ESA-listed species and critical habitat—and to avoid a chance of long-term adverse effects—all projects under this programmatic consultation will comply with the following set of conservation measures.

2.1.3.3.1 Pre-Construction and Project Design Conservation Measures

- Timing of in-water work: In-water work will occur only within the preferred work windows listed in the Assessment Appendix C.
- Fish screens: All water intakes in which fish could be entrained and injured, including pumps used to isolate an in-water work area, will have a fish screen installed, operated, and maintained according to the criteria in NMFS 2011a (or most current version).
- Site assessment for contaminants: If an action involves excavation of more than 20 yards of material in an area with past mining impacts or other land uses known to cause chemical contamination, then the project sponsor will complete a site assessment for contaminants. The Assessment (p. 13) includes a detailed description of what must be included in the site assessment.
- Site layout and flagging: Prior to construction, the action area will be flagged to identify the following: (1) Sensitive resource areas, such as areas below ordinary high water, spawning areas, springs, and wetlands; (2) equipment entry and exit points; (3) road and stream crossing alignments; (4) staging, storage, and stockpile areas; and (5) no-spray areas and buffers for herbicides.
- Temporary erosion controls: Temporary erosion controls will be in place before any significant alteration of the action site, and will be appropriately installed down slope of project activity within the riparian buffer area until site rehabilitation is complete. Once the site is stabilized, temporary erosion control measures must be removed.
- Emergency erosion and chemical spill controls: The project sponsor will ensure that there is an adequate supply of sediment control materials (e.g., silt fence, straw bales),

including an oil-absorbing floating boom and absorbent pads whenever surface water is present.

- Temporary access roads:
  - Do not build temporary access roads where grade, soil, or geomorphic features suggest slope instability, including slopes greater than 30 percent.
  - Minimize the removal of riparian vegetation when creating temporary access roads. The project sponsor will estimate the amount of vegetation to be removed in the Project Information Form.
  - Minimize the number and length of temporary access roads, and design roads to avoid erosion and soil compaction.
  - Minimize soil disturbance and compaction whenever a new temporary road is necessary within 150 feet of a stream, waterbody, or wetland by clearing vegetation to ground level and placing clean gravel over geotextile fabric, unless otherwise approved in writing (email) by NMFS.
  - At temporary stream crossings, equipment will cross the stream in the wet only under the following conditions.
    - No stream crossings may occur at sites where: (1) Adults are actively spawning, or immediately upstream (300 feet) of actively spawning adults; (2) holding adult listed fish are present; or (3) eggs or alevins are in the gravel.
    - Do not place temporary crossings in areas that may increase the risk of channel re-routing or avulsion, or in potential spawning habitat, e.g., pools and pool tailouts.
    - Minimize the number of temporary stream crossings and trips across and use existing stream crossings whenever reasonable. In habitat occupied by listed fish species, limit stream crossings in the wet to no more than two round trips, unless otherwise approved by a NMFS and a Service biologist.
    - Equipment and vehicles may cross the stream in the wet only where the streambed is bedrock and naturally stable, or where mats or off-site logs are placed in the stream and used as a crossing. Vehicles and machinery will cross streams at right angles to the main channel wherever possible.
    - Where necessary to minimize impacts to the stream, install temporary bridges and culverts to allow for equipment and vehicle crossing over perennial streams to access construction areas.
  - When the project is completed, all temporary access roads will be obliterated, and the soil will be stabilized and revegetated. Road obliteration refers to the most comprehensive degree of road decommissioning and involves decompacting the road surface and ditch, pulling the fill material onto the running surface, and reshaping the roadbed to match the hillside contour. The project sponsor will obliterate temporary roads in wet areas or areas prone to flooding as soon as possible after project completion and before the start of fall rains.
- Choice and use of equipment: Heavy equipment will be selected (when possible) and operated in a manner that minimizes adverse effects to the environment (e.g., minimally-sized, low pressure tires, minimal hard turn paths for tracked vehicles, temporary mats or plates within wet areas or sensitive soils).

- Vehicle staging: All equipment shall be cleaned and leaks repaired at least 150 feet from any natural waterbody or wetland prior to entering the project area. The project sponsor will remove external oil and grease prior to arriving onsite. Thereafter, equipment will be inspected daily for leaks or accumulations of grease, and any identified problems fixed before operation within 150 feet of any natural waterbody or wetland.
- Invasive species: Inspect and, if necessary, wash vehicles and equipment to prevent introducing terrestrial invasive species prior to bringing equipment on the work site. Inspect and sanitize water craft, waders, boots, and any other gear to be used in or near water to prevent the spread of invasive species or whirling disease.
- Erosion and sediment control: Erosion and sediment control are paramount considerations for all ground-disturbing construction activities, particularly when activities occur in or near waterways. The project sponsor will describe all temporary and permanent erosion and sediment control measures to be used during the project on the Project Information Form. Erosion control measures will be appropriate for site and weather conditions. The following conservation measures are designed to prevent soil erosion or to collect, retain, and treat storm water runoff and pollutant discharges during all phases of construction.
    - A supply of emergency erosion control materials will be on hand; and temporary erosion controls will be installed and maintained in place until site restoration is complete. Temporary erosion control measures may include, but not be limited to, fiber wattles, silt fences, jute matting, wood fiber mulch and soil binder, or geotextiles and geosynthetic fabric.
    - Ground disturbance will not occur during wet conditions (i.e., during or immediately following rain events).
    - Sequence or schedule work to reduce exposed bare soil subject to wind erosion. Water may be used to control dust.
    - Vegetation may be grubbed only from areas where permanent ground alteration will occur. Vegetation is to be cut at ground level and root wads retained where temporary clearing occurs.
    - Wood fiber mulch and tackifier (hydro-applied) may be used to reduce erosion of bare soil if the project sponsor provides certification from the manufacturer that the materials are noxious weed free and nontoxic to aquatic and terrestrial animals, soil microorganisms, and vegetation. This certification will be available for inspection upon request by NMFS and the Service. See the Idaho State Noxious Weed List found in IDAPA 02.06.22 for a list of 64 different species of weeds which are designated noxious by state law.
    - Permanent soil stabilization outside the ordinary high water mark (OHWM) is best accomplished with reestablishment of native vegetation where possible. The project sponsor will begin site restoration immediately following completion of ground disturbing activities. Temporary soil stabilization measures, e.g., jute matting, are required until permanent measures are established and functioning properly. Guidance on selecting and planting native seed or plant materials, including plant densities and species composition, will be provided by technical experts familiar with local site conditions.
    - For all projects, sediment will be removed from erosion controls once the sediment has reached one-third of the exposed height of the control. If

inspections show that the pollution controls are ineffective, the project sponsor will immediately mobilize work crews to repair, replace, or reinforce controls as necessary.

- o Re-watering stream channels: For stream channels which have been isolated and dewatered during project construction: (1) Reconstructed stream channels will be "pre-washed" into a reach equipped with sediment capture devices, prior to reintroduction of flow to the stream; and (2) stream channels will be re-watered slowly to minimize a sudden increase in turbidity.
- o When reintroducing stream flow to a dewatered stream reach, the project sponsor will monitor the stream for turbidity. An appropriate and regularly calibrated turbidity meter, measuring nephelometric turbidity units (NTUs), is required. A sample must be taken prior to expected turbidity pulses at a relatively undisturbed area approximately 100 feet upstream from in-water disturbance to establish background turbidity levels. A sample must then be taken every hour and approximately 600 feet downstream from the point of discharge, or most appropriate downstream site, during sediment pulses and be compared against the background measurement. If turbidity levels exceed 50 NTUs over background levels for two consecutive readings (2 hours), the project sponsor must cease work immediately and take measures to reduce turbidity before continuing to reintroduce stream flow.

- Prevention of chemical contamination from construction equipment and materials: The use of heavy machinery increases the risk for accidental spills of fuel, lubricants, hydraulic fluid, or similar contaminants into the riparian zone, or directly into the water, where they could adversely affect habitat, injure or kill aquatic food organisms, or directly impact ESA-listed species. In order to minimize the potential for introducing hazardous materials to the aquatic system, the Project Sponsor will adhere to the following measures.
  - o No uncured concrete or form materials will be allowed to enter the active stream channel.
  - o All vehicle staging, fueling, storage and washout areas will be located at least 150 feet away from aquatic areas and adequately buffered such that runoff is incapable of being delivered to surface waters or wetlands.
  - o Any waste liquids generated at the staging areas will be temporarily stored under cover on an impervious surface such as tarpaulins until such time they can be properly transported to and treated at an approved facility for treatment of hazardous materials.
  - o Spill containment kits adequate for the types and quantity of hazardous materials stored at the site are required.
  - o All vehicles will be thoroughly cleaned before use at the site (outside 150 feet from water, see conservation measure for "Vehicle staging" above).

- Hydraulic fluids used in any vehicle that will be operated in live water will be non-toxic to salmonids[1].

- Stockpile Materials: Any LWD, topsoil, and native channel material displaced by construction will be stockpiled for use during site restoration.

2.1.3.3.2 Construction Conservation Measures

- Work area isolation: Any work area within the wetted channel will be isolated from the active stream whenever ESA-listed fish are reasonably certain to be present, or if the work area is 300 feet upstream from spawning habitats, unless NMFS and the Service agree in writing (email) that the work can be done with less potential risk to listed fish without isolating and dewatering the work area (e.g., placing LWD). When work area isolation is required, engineering design plans will include all isolation elements and fish release areas. Any pump used to dewater an area must be screened with a fish screen that meets NMFS's fish screen criteria (NMFS 2011a, or most current).
- Removing fish from in-stream work areas: When work area isolation is required, a fish biologist will determine how to remove ESA-listed fish, with least harm to the fish, before in-water work begins. This will involve either passive movement of fish out of the project reach through slow dewatering, and/or actively removing the fish from the project reach. Should active removal be warranted, a fish biologist will clear the area of fish before the site is dewatered using one or more of a variety of methods including seining, dipping, or electrofishing, depending on specific site conditions. All handling of fish, using any method, will be conducted by or under the direction of a fish biologist, using methods directed by the following: National Marine Fisheries Service (NMFS) Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act (http://www.westcoast.fisheries.noaa.gov/publications/reference_documents/esa_refs/section4d/electro2000.pdf). A fish biologist will conduct or supervise the following activities and all the associated fish handling activities will be completed on the same day.
  - Slowly remove approximately 80 percent of the stream flow from the work area to allow some fish to leave the work area volitionally.
  - Install blocknets on one end of the dewatering area.
  - Capture or herd fish through seining and relocate to unaffected stream reach.
  - Install other blocknet.
  - Electrofish to capture and relocate fish not caught during seining.
  - Continue to slowly dewater the stream reach.
  - Collect any remaining fish in cold-water buckets and relocate to unaffected stream reach.

[1] The following criteria should be met to determine if a hydraulic fluid is nontoxic to salmonids during acute exposure: (a) The test species used should be a salmonid (most often this will be rainbow trout, but occasionally Chinook salmon or coho salmon are tested); (b) The test duration should be 96 hours; (c) The test should be conducted using the water accommodated fraction (WAF) (the WAF is used in testing hydrophobic materials to provide a "worst case scenario" for exposure to aquatic organisms); and (d) The value of the LC_{50} should be >1000 mg/L. Several products on the market meet these specifications.

  - Use aerators or replace the water in the buckets at least every 15 minutes with cold clear water.
  - While block nets are set, inspect them regularly throughout the day for fish. Relocate any living fish to an area far enough away to avoid additional impingement risk.
  - For each project, the Project Sponsor will report the number of fish handled to the NMFS and the Service in the Project Completion Form (Appendix B).
- Fish passage: Fish passage (downstream, unless upstream was available prior to implementation) will be provided for any adult or juvenile ESA-listed fish likely to be present in the action area during construction, unless passage did not exist before construction or the stream is naturally impassable at the time of construction.
- Earthwork: Complete earthwork (including drilling, excavation, dredging, filling and compacting) as quickly as possible. During excavation, stockpile native streambed materials above the bankfull elevation, where it cannot reenter the stream, for later use.
- Rock: Riprap may be used to protect culvert inlet/outlets within the road prism when culvert upgrades or installation are a component of the restoration project. Rock for in-stream structures will not be mined from the stream. Rock will be sourced from an approved location that will not result in adverse effects to listed species (Fesenmyer 2015, pers. comm).
- Construction water: Surface water may be diverted to meet construction needs, but only if developed sources are unavailable or inadequate. Diversions for construction water will not exceed 10 percent of the available flow and will have the appropriate State of Idaho permitting (i.e., temporary water right) and hoses will be appropriately screened (NMFS 2011a).
- Discharge water: Design, build, and maintain facilities to collect and treat all construction discharge water using the best available technology applicable to site conditions. Provide treatment to remove debris, nutrients, sediment, petroleum hydrocarbons, metals and other pollutants likely to be present.
- Stationary power equipment: Generators, cranes, and any other stationary equipment operated within 150 feet of any natural waterbody or wetland will be maintained as necessary to prevent leaks and spills from entering the water.
- Power equipment: Gas-powered equipment with tanks larger than 5 gallons will be refueled in a vehicle staging area placed 150 feet or more from a natural waterbody or wetland.
- Work from top of bank: Heavy equipment will work from the top of the bank. Heavy equipment will only work from the stream channel if the channel has been dewatered or is naturally dry.
- High flows: Project operations will cease under high flow conditions that may result in inundation of the project area, except for efforts to avoid or minimize resource damage.

2.1.3.3.3 Post-construction Conservation Measures

- Site restoration: When construction is finished, all stream banks, soils, and vegetation will be cleaned and restored as necessary using stockpiled LWD, topsoil, slash, and native channel material to renew ecosystem processes that form and maintain productive fish habitats.

- Revegetation: Each area requiring revegetation will be replanted prior to or at the beginning of the first growing season following construction. Reestablishment of vegetation will be achieved in disturbed areas to at least 70 percent of pre-project conditions within three years. An appropriate mix of species will be used to achieve establishment and erosion control objectives, preferably comprised of forb, grass, shrub, or tree species native to the project area or region and appropriate to the site. Invasive species will not be used. Vegetation, such as willow, sedge and rush mats, will be salvaged from disturbed or abandoned floodplains, stream channels, or wetlands to be replanted during site restoration. Fencing will be installed as necessary to protect the vegetation. Surface fertilizer will not be applied within 50-feet of any stream channel, waterbody, or wetland. Short-term stabilization measures may include the use of non-native sterile seed mix (when native seeds are not available), weed-free certified straw, jute matting, and other similar techniques.
- Site access: The Project Sponsor and lead action agency will retain the right of reasonable access to the site of actions funded, permitted, or carried out using this Opinion, such that the Project Sponsor can monitor the success of the project.
- Obliteration: When the project is completed, all temporary access roads will be obliterated, the soil will be stabilized, and the site will be revegetated.

2.1.3.3.4 Additional Conservation Measures Specific for Wildlife and Plants

- Canada Lynx: Activities will not be located within 270 yards of known active lynx dens (based on sight distance and attenuation of sound in forested environments).
- Northern Idaho Ground Squirrel: Any squirrel activity sites, den, or burrows encountered at a work site will be flagged and avoided during site preparation, staging, or construction and earthmoving activities. Squirrel activity within 200 feet of work sites will be reported to the Service which will recommend a course of action, which could include initiation of site-specific consultation. Herbicides will not be applied where ground squirrels are known to be present.
- Yellow-Billed Cuckoo: Activities will avoid fragmentation, degradation, or destruction of riparian habitat known to support yellow-billed cuckoos.
- Plants: If one or more ESA-listed plant species are present and may be affected by the project, the project may require protective measures and the appropriate level of consultation. Due to soil disturbance that will occur, and use of heavy equipment that could carry seeds and plant parts into project areas, all appropriate measures will be incorporated into contract or equipment rental agreements to avoid introduction of invasive plants and noxious weeds into project areas. Herbicides will not be applied where ESA-listed plant species are known to be present.
- Disposal sites, storage sites, and staging areas will not affect listed species or their habitats (Fesenmyer 2015, pers. comm.).

2.1.3.4 Category Specific Descriptions and Conservation Measures

2.1.3.4.1 Fish Screening

Purpose: To prevent fish from entering and becoming entrained in unscreened or inadequately screened diversions.

Description: This category includes installing, replacing, upgrading, or maintaining off-channel screens (and fish bypass systems where applicable) to prevent fish entrapment in irrigation canals or other surface water diversions, for existing legal water diversions. Diversion water intake and return points will be designed, modified, or replaced to prevent salmonids of all life stages from swimming or being entrained into the irrigation system. Intake pipes for all purposes will be screened with mesh sizes small enough to prevent fish from entering the pipes. Salmonids will be prevented from becoming entrained or impinged by improperly designed screens. This category also covers periodic maintenance of fish screens.

All fish screens will be built to NMFS criteria, detailed in Anadromous Salmonid Passage Facility Design (NMFS 2011a). Most fish screens will be installed a short distance downstream from the headgate, but some may be as much as 0.1 mile below the point of diversion. Installation of a fish screen typically involves excavation, installation of bedding material, construction of forms for pouring concrete, installation of the drum screen and paddle wheel, and backfilling of bedding and other material. For smaller diversions, a modular screen may be used that does not require concrete. Estimated total area of disturbance, depending on the size of screen, may be as large as 50 feet of ditch length with a disturbance width of 25 feet. A plastic fish bypass pipe will also be installed, directing approximately 0.8 cubic feet per second (cfs) of diverted flow back to the stream. Bypass pipes are usually 8 inches to one foot in diameter and are buried below the ground surface by a backhoe. Pipe distances will vary from tens to hundreds of feet. Fish bypass structures will be designed and located to facilitate safe reentry of fish into the stream channel.

For fish screens designed and implemented by the Idaho Fish and Game (IDFG) Screen Shop, in lieu of individual review of screening projects, the IDFG Screen Shop will submit semi-annual progress reports listing, and briefly describing, all covered projects in the Planning/Design (Phase I), Implementation (Phase II), and Operation and Maintenance (Phase III) stages.

For fish screen projects that are not implemented by the Screen Shop, NMFS (or an individual trained by NMFS to certify that fish screen designs meet NMFS criteria) will approve screen design plans prior to screen installation to ensure that plans are consistent with NMFS' criteria (NMFS 2011a). During the conceptual design stage (generally three months to two years prior to construction), the project sponsor will complete and submit to NMFS the "Fish Screen Design Plans Checklist" (Assessment Appendix E). NMFS will review this checklist and may: (1) Give approval to move forward with the design; (2) remain engaged with the design process if the project is of sufficient scale to warrant this; or (3) waive further engineering involvement (if a small scale project). If NMFS does not waive further NMFS' involvement in the design process, the project sponsor will submit the final design to NMFS for review at least 90 days prior to construction (or 60 days for small projects requiring less than two weeks construction time).

The owner or operator of the screen is responsible for seeing that debris is periodically removed from screens within irrigation ditches, thus ensuring that structures continue to function properly and do not increase the risk of erosion by blocking ditch flow.

Conservation Measures

- All fish screens, including screens installed in temporary and permanent pump intakes, will be designed to meet the criteria in NMFS' Anadromous Salmonid Passage Facility Design (NMFS 2011a, or most recent version). Irrigation diversion intake and return points will be designed (to the greatest degree possible) to prevent all native fish life stages from swimming or being entrained into the irrigation system.

- All fish screens will be sized to accommodate the current documented diversion rate or the maximum instantaneous diversion rate associated with the legal water right, whichever is less. "Accommodate" means that screens will not be overtopped and will remain effective over the entire range of expected water diversion.

2.1.3.4.2 Fish Passage

Purpose: Restore or maintain fish passage at man-made barriers, particularly at diversion structures and at road stream crossings. The objective of this category is to allow all life stages of salmonids access to historical habitats from which they have been excluded by non-functioning structures, or by in-stream profile discontinuities resulting from insufficient depth or excessive jump heights and velocities. Additionally, at road stream crossings, prevent stream bank and roadbed erosion, facilitate natural sediment and wood movement, and eliminate or reduce excess sediment loading.

Fish passage improvement projects covered under this consultation include: (1) Installing or improving fish passage facilities at existing barriers; (2) removing or modifying artificial barriers (e.g., diversion structures) to create passage; and (3) replacing culverts or bridges at stream road crossings to benefit fish habitat. For projects covered under this consultation, the proposed action also includes periodic maintenance of fish passage facilities to ensure proper function, such as cleaning debris buildup or replacing parts.

2.1.3.4.2.1 Fish Passage Facilities

Description: The project sponsor may propose to: (1) Re-engineer improperly designed fish passage facilities; (2) complete periodic maintenance of fish passage facilities to ensure proper function (e.g., cleaning debris buildup, replacement of parts); or (3) install a fish ladder at an existing facility. Construction of fish passage facilities is limited to existing dams. The installation of fish passage facilities at new dams or new diversion structures is not included under the proposed action. All projects will follow the criteria in NMFS' *Anadromous Salmonid Passage Facility Design* (NMFS 2011a). NMFS will review engineering plans for installing or modifying fish ladders as described in the Assessment.

Conservation Measures

- A completed or modified fish passage facility will be available for inspection by NMFS staff to verify the structure is successful in providing fish passage.
- For all passage projects at diversion structures, the diversion must be screened to NMFS criteria (NMFS 2011a) and have a measuring device, which will be a totalizing flow meter where possible, and an adjustable headgate.
- For periodic maintenance of fish passage facilities, any heavy equipment needed will work from the streambank.

2.1.3.4.2.2 Removal or Modification of Water Control Structures

Description: This action includes removal of water control structures, such as channel-spanning weirs, diversion structures, and other similar structures. Structures retaining contaminated sediments are not proposed and will require individual consultation.

Conservation Measures

- If a project involves the removal of multiple barriers on one stream or in one watershed over the course of a work season, the Project Sponsor will remove the most upstream barrier first if possible. This way, work at the upstream sites can be completed without ESA-listed anadromous fish in the project area.
- Modified diversion structures will be sized to accommodate current documented water use or the instantaneous maximum diversion rate allowed by state law; must be screened to NMFS criteria (NMFS 2011a); and must have a measuring device, which will be a totalizing flow meter where possible, and an adjustable headgate.

2.1.3.4.2.3 Bridge and Culvert Replacement or Removal

Description: For unimpaired fish passage, it is desirable to have a crossing that is a larger than the channel bankfull width, allows for a functional floodplain, allows for a natural variation in bed elevation, and provides bed and bank roughness similar to the upstream and downstream channel. Projects covered under this consultation will use the Streambed Simulation Design Method in NMFS's Anadromous Salmonid Passage Facility Design document (NMFS 2011a). The structures for this design method are typically open-bottomed arches or boxes but could have buried floors in some cases. Bridges that span the stream channel are also appropriate. This method utilizes streambed materials that are similar to the adjacent stream channel. In general, streambed simulation should provide sufficient channel complexity to provide passage conditions similar to that which exists in the adjacent natural stream, including sufficient depth, velocity, and resting areas. The designers will be skilled in engineering, hydrology/fluvial geomorphology, and fisheries biology. Design plans will be included with the Project Information Form, describing how the project meets the conservation measures listed below. Construction times for such projects will depend on the complexity of the project and could take multiple weeks.

For most culvert replacement projects, project design will call for re-routing of streamflows to isolate the project work area from the stream prior to excavation. In most cases, a pipe would carry the streamflow around the project site to a location immediately downstream of the construction zone. An excavated lined channel could also be used. Fish passage will be provided for any adult or juvenile ESA-listed salmonids likely to be present in the action area during construction, unless passage did not exist before construction (likely to be the case for most projects in this action category) or the stream is naturally impassable at the time of construction.

Restoration activities at stream crossings undertaken by USFS and BLM on federal land in Idaho are covered under a separate NMFS and Service programmatic consultation (NMFS 2012), and are therefore not covered under this consultation. However, both actions describe similar activities and conservation measures, and result in similar effects; this programmatic activity is specific for implementation on private lands or Federal lands managed by other agencies other than USFS or BLM.

Conservation Measures

- Stream crossings shall be designed to the standards in NMFS (2011a, or more recent version) and will use the Streambed Simulation Design Method.

- Channel width: In addition, culverts and bridges will provide a clear, unobstructed opening that is at least as wide as 1.5 times the active channel width for un-incised channels[2]. If a stream is entrenched (entrenchment ratio of less than 1.4), the crossing width will accommodate the floodprone width. Floodprone width is the channel width measured at twice the maximum bankfull depth.
- Channel vertical clearance: The minimum vertical clearance between the culvert bed and ceiling should be more than 6 feet, to allow access for debris removal. Smaller vertical clearances may be used if a sufficient inspection and maintenance plan is provided with the design that ensures that the culvert will be free of debris during the fish passage season.
- Channel slope: The slope of the reconstructed streambed within the culvert should approximate the average slope of the adjacent stream from approximately ten channel widths upstream and downstream of the site in which it is being placed, or in a stream reach that represents natural conditions outside the zone of the road crossing influence. For purposes of maintaining streambed integrity within the road crossing, the maximum slope of streambed simulation where closed bottom culverts are used should not exceed 6 percent. Design detail and/or a long-term maintenance plan should be included that reflects how the streambed within the culvert will be maintained in its design condition over time.
- Embeddment: If a culvert is used, the bottom of the culvert should be buried into the streambed not less than 30 percent and not more than 50 percent of the culvert height, and a minimum of 3 feet. For bottomless culverts the footings or foundation must be designed for the largest anticipated scour depth. The ability to maintain the engineered streambed in the design configuration over the life of the project must be demonstrated by the design (such as by using size analysis of streambed material in the adjacent stream reaches).
- Maximum length of road crossing: Culvert lengths using streambed simulation designs should be less than 150 feet. If the length is greater than 150 feet, a bridge should be considered.
- Fill materials: Fill materials should be comprised of materials of similar size composition to natural bed materials that form the natural stream channels adjacent to the road crossing. The design must demonstrate long-term stability of the passage corridor, through assessment of hydraulic conditions through the passage corridor over the fish passage design flow range, and through assessment of the ability of the stream to deliver sufficient transported bed material to maintain the integrity of the streambed over time. Larger material may be used to assist in grade retention and to provide resting areas for migratory fish.

[2] Active channel width means the stream width measured perpendicular to stream flow between the ordinary high water lines, or at the channel bankfull elevation if the ordinary high water lines are indeterminate. This width includes the cumulative active channel width of all individual side- and off-channel components of channels with braided and meandering forms, and measure outside the area influence of any existing stream crossing, e.g., five to seven channel widths upstream and downstream.

- Water depth and velocity: Water depth and velocity must closely resemble those that exist in the adjacent stream. To provide resting zones, special care should be used to provide areas of greater than average depth and lower than average velocity throughout the length of the streambed simulation, reasonably replicating those found in the adjacent stream. Hydraulic controls to maintain depth at low flows may be required.
- Bridge replacements must be single-span structures (i.e., no bents, piers, or other support structures below the OHWM).
- For replacement of an existing culvert or bridge with a new bridge, the project sponsor will remove all other artificial constrictions within the functional floodplain of the project area as follows: (1) Remove existing roadway fill, embankment fill, approach fill, or other fills; (2) install relief conduits through existing fill; (3) remove vacant bridge supports below total scour depth, unless the vacant support is part of the rehabilitated or replacement stream crossing; and (4) reshape exposed floodplains and streambanks to match upstream and downstream conditions.
- Hard bank stabilization (e.g., riprap) at crossing structures will be limited to the width of the existing road prism.
- Grade control structures to prevent head-cutting above or below the culvert or bridge being replaced or upgraded may be built using rock or wood. Grade control structures typically consist of boulder and/or wood structures that are keyed into the banks, span the channel, and are buried in the substrate. Grade control structures will provide fish passage for juvenile and adult salmonids, and will be designed to most current version of the Anadromous Salmonid Passage Facility Design manual (NMFS 2011a).
- Streamflow during project construction will be routed through a pipe or an excavated lined channel in order to minimize sediment delivery to the stream.
- Excavated lined channel to dewater the project area: Where the project design calls for an excavated, lined channel to dewater the project area (rather than a pipe), excavation would be required from the diversion point through the floodplain and road fill, and down to a reentry point below the project site. Excavation would not be conducted in the live channel. Excavated material from the diversion channel would be stored at a designated stockpile site (subject to erosion control measures) for use in filling the excavated channel after the stream is re-watered or other site rehabilitation actions. The bypass channel or pipe will provide fish passage for any adult or juvenile ESA-listed salmonids likely to be present in the action area during construction, unless passage did not exist before construction or the stream reach is naturally impassable at the time of construction.
- If the project would facilitate the expansion of brook trout into occupied bull trout habitat, a Service biologist will determine whether or not the project shall be considered a restoration activity and thus appropriate for coverage for bull trout under this program.

2.1.3.4.3 In-stream Flow

Purpose: Increase in-stream flows to improve fish spawning, rearing, and migration conditions; and to restore riparian functions. This consultation will cover the acquisition of water to improve streamflow, and will also cover activities that would modify irrigation systems to leave more water in-stream or allow the water to flow farther downstream before being diverted. This consultation will not provide take coverage to the action agencies or project sponsors for the impacts of diverting water.

Description: This action category includes: (1) Leasing or purchasing water to improve in-stream flows; (2) moving or consolidating points of diversion in order to leave more water in-stream for a longer downstream distance; (3) converting surface water diversions to groundwater sources to leave more water in-stream during the irrigation season; and (4) increasing the efficiency of water transmission facilities in order to leave "saved" water in the stream. No projects under this category will result in the diversion of water in excess of the legal water right, and the intent is for the actions to reduce the amount of water being withdrawn. Construction of new diversion structures is only eligible for coverage under this programmatic consultation if the new structures provide fish passage based on NMFS criteria (NMFS 2011a).

Multiple existing diversions may be consolidated into one diversion. The consolidated diversion will be located at the most downstream existing diversion point. Moving points of diversion downstream in order to re-water severely impaired stream reaches would typically involve installation of a pumping system to offset the loss of head, and possibly installation of engineered riffles (including rock structures) where old diversions are removed. Small in-stream rock structures that facilitate proper pump station operations are allowed when designed in association with the pump station. Infiltration galleries and lay-flat stanchions are not proposed as part of this Program. NMFS estimates that individual projects to move or consolidate diversions will take between 1 and 14 days of in-channel work, depending on the complexity of the project.

If diversion consolidation involves building a new diversion structure, NMFS will review engineering plans as described in the Assessment.

Flood or other inefficient irrigation systems may be converted to drip or sprinkler irrigation. This proposed activity will involve the installation of pipe, possibly trenched and buried into the ground. Pumps may be installed to pressurize the system. The criteria, plans and specifications, and operation and maintenance protocols of the NRCS conservation practice standards for "Irrigation System, Sprinkler" may be consulted for guidance (NRCS 2011b). Open ditch irrigation water conveyance systems will be replaced with pipelines to reduce evaporation and transpiration losses. Leaking irrigation ditches and canals will be converted to pipeline or lined with concrete, bentonite, or appropriate lining materials, following guidance from NRCS (2011a; 2011c).

Ground water wells can be drilled as an alternative water source to surface water withdrawals and should result in a net decrease of water usage over existing conditions. No wells will be drilled within one quarter mile from a stream, unless the Project Sponsor can demonstrate (in the Project Information Form) that the new well is not likely to decrease streamflow in the adjacent stream. Water from the wells will be pumped into ponds or troughs for livestock, or used to irrigate agricultural fields. Abandoned in-stream diversion infrastructure will be removed or downsized. The criteria, plans and specifications, and operation and maintenance protocols of the NRCS conservation practice standards for water well code (NRCS 2010) may be consulted for guidance.

Conservation Measures

- If a project opens up fish passage to a previously inaccessible tributary, the lead action agency will ensure that all diversions in this tributary that could entrain ESA-listed fish

species are on the IDFG Screen Shop's list for diversions needing screening and that water users will agree to allow installation of a fish screen and bypass system.
- The water diversion rate after a project is completed will not exceed the legal water right or the current use if the current use has been less than the legal water right.
- Periodic maintenance of irrigation diversions completed under this programmatic will be conducted to ensure their proper function (i.e., cleaning debris buildup, and replacement of parts). Heavy equipment will not enter streams for maintenance of diversions.
- Removal of unneeded diversion structures will follow the conservation measures described above under Fish Passage.
- Any change in the point of diversion to be covered under this consultation must leave more water in-stream than current conditions or must leave water in-stream for a greater downstream distance than the current point of diversion.
- Abandoned ditches and other similar structures that are in continuity with the stream will be converted into off channel habitat where feasible and appropriate. In all other instances, abandoned ditches will be plugged or backfilled, as appropriate, to prevent fish from getting trapped in them.
- For ground water wells and irrigation efficiency actions, the Project Sponsor will include information in the Project Notification Form to demonstrate that the project will not increase consumptive use of water.
- When making improvements to pressurized irrigation systems, the Project Sponsor will install a totalizing flow meter capable of measuring rate and duty of water use. For non-pressurized systems, the Project Sponsor will install a staff gage or other measuring device capable of measuring instantaneous rate of water flow, ensuring that the measuring device does not compromise fish passage at the site. Acceptable types of measuring devices include all those approved by the Idaho Department of Water Resources (IDWR) (see http://www.idwr.idaho.gov/WaterManagement/WaterMeasurement/PDFs/MinAccepStand.pdf)

2.1.3.4.4 In-Stream Structures

Purpose: Restore in-stream habitat structure and provide grade control. The purpose of these enhancements is to decrease flow velocities; increase in-stream structural complexity and diversity; and provide in-stream spawning, rearing, and resting habitat for fish. This category includes: (1) Installing grade control structures such as boulder weirs; and (2) installing in-stream habitat structure, for example large wood debris (LWD) or stream gravels. Such activities will be implemented in stream reaches with degraded habitat conditions caused by human land uses.

2.1.3.4.4.1 Grade Control through Boulder Weirs or Roughened Channels

Description: The project sponsor may install boulder weirs and roughened channels for grade control at culverts, to mitigate headcuts, and to provide passage at small dams or other channel obstructions that cannot otherwise be removed. Structures will be constructed from rock or wood. For wood-dominated systems, grade control engineered log jams (ELJs) should be considered as an alternative. Grade control ELJs are designed to arrest channel downcutting or incision and retain sediment, lower stream energy, and increase water elevations to reconnect floodplain habitat and diffuse downstream flood peaks. Grade control ELJs also serve to protect infrastructure that is exposed by channel incision and to stabilize over-steepened banks. Unlike hard weirs or rock grade control structures, a grade control ELJ is a complex broad-crested structure that dissipates energy more gradually.

For boulder weirs, roughened channels, and other grade control structures that have an aggregate height of greater than 3 feet, NMFS will review the design plans and engineering calculations. The project sponsor should provide NMFS with the following information, plus any additional information requested.

- A longitudinal profile of the stream channel thalweg for 20 channel widths upstream and downstream of the structure shall be used to determine the potential for channel degradation.
- A minimum of three cross-sections – one downstream of the structure, one through the reservoir area upstream of the structure, and one upstream of the reservoir area outside of the influence of the structure – to characterize the channel morphology and quantify the stored sediment.

Conservation Measures

- All structures will be designed to fish passage standards described in NMFS (2011a or most recent version).
- Boulder weirs will be installed low in relation to channel dimensions so that they are completely overtopped during channel-forming flow events (approximately a 1.5-year flow event).
- Boulder weirs are to be placed diagonally across the channel, or in more traditional upstream pointing "V" or "U" configurations with the apex oriented upstream. The apex should be lower than the structure wings to support low flow consolidation.
- Boulder weirs are to be constructed to allow upstream and downstream passage of all native fish species and life stages that occur in the stream. This can be accomplished by providing plunges no greater than 6 inches in height, allowing for juvenile fish passage at all flows.
- Key weirs into the stream bed to minimize structure undermining due to scour, preferably at least 2.5 times their exposure height. The weir should also be keyed into both banks, if feasible greater than 8 feet.
- Include fine material in the weir material mix to help seal the weir/channel bed, thereby preventing subsurface flow. Geotextile material can be used as an alternative approach to prevent subsurface flow.
- Rock for boulder weirs shall be durable and of suitable quality to ensure permanence in the climate in which it is to be used. Rock sizing depends on the size of the stream, maximum depth of flow, planform, entrenchment, and ice and debris loading.
- Full spanning boulder weir placement shall be coupled with measures to improve habitat complexity (LWD placement, etc.) and protection of riparian areas.
- The use of gabions, cable, or other means to prevent the movement of individual boulders in a boulder weir is not allowed.
- Headcut stabilization shall incorporate the following measures.
    - Armor head-cut with sufficiently sized and amounts of material to prevent continued up-stream movement. Materials can include both rock and organic materials which are native to the area.

- o Focus stabilization efforts in the plunge pool, the head cut, as well as a short distance of stream above the headcut.
- o Minimize lateral migration of channel around head cut ("flanking") by placing rocks and organic material at a lower elevation in the center of the channel cross section to direct flows to the middle of channel.
- o Provide fish passage over a stabilized head-cut through a series of log or rock weir structures or a roughened channel.
- o Construct headcut stabilization structures using streambed simulation bed material, which will be washed into place until there is apparent surface flow and minimal subsurface material, to ensure fish passage immediately following construction if natural flows are sufficient.
- o Construct headcut stabilization structures with stream simulation materials and fines added and pressure-washed into the placed matrix. Successful washing will be determined by minimization of voids within placed matrix such that ponding occurs with little to no percolation losses, to ensure fish passage during low flows immediately following construction.
- o If possible, also address the cause of the head cut as a part of the restoration action.

2.1.3.4.4.2 Large Wood, Boulder, and Gravel Placement

Description: This action includes large wood and boulder placement, ELJs, gravel placement and tree removal for large wood projects. Such activities will occur in areas where channel structure is lacking due to past stream cleaning (i.e., large wood removal), riparian timber harvest, or other riparian and channel modifications, and in areas where natural gravel supplies are low due to anthropogenic disruptions. These projects will occur in stream channels and adjacent floodplains to increase channel stability, rearing habitat, pool formation, spawning gravel deposition, channel complexity, hiding cover, low velocity areas, and floodplain function.

The ELJs are structures designed to redirect flow and change scour and deposition patterns. While providing valuable fish and wildlife habitat, they are also designed to redirect flow and can provide stability to a stream bank or downstream gravel bar. To the extent practical, ELJs are designed to simulate stable natural log jams and can be either naturally stable due to large wood size and/or stream width or anchored in place using rebar, rock, or posts. They are also designed to create a hydraulic shadow, a low-velocity zone downstream that allows sediment to settle out and scour holes adjacent to the structure.

For in-stream structures, the project sponsor will use materials that are appropriate for the particular channel type, project objectives, and site conditions.

Conservation Measures – Large Wood and Boulder Projects

- Place large wood and boulders in areas where they would naturally occur, and in a manner that closely mimics natural accumulations for that particular stream type. For example, boulder placement may not be appropriate in low-gradient meadow streams.
- Structure types shall simulate disturbance events to the greatest degree possible and include, but are not limited to, log jams, debris flows, windthrow, and tree breakage.
- No limits are to be placed on the size or shape of structures as long as such structures are within the range of natural variability of a given location and do not block fish passage.

- The partial burial of large wood and boulders is permitted and may constitute the dominant means of placement. This applies to all stream systems but more so for larger stream systems where use of adjacent riparian trees or channel features is not feasible or does not provide the full stability desired.
- Large wood includes whole conifer and hardwood trees, logs, and rootwads. Large wood size (diameter and length) should account for bankfull width and stream discharge rates. When available, trees with rootwads should be a minimum of 1.5 times bankfull channel width in length, while logs without rootwads should be a minimum of 2.0 times bankfull widths long.
- The project sponsor will procure logs from an upland area to use as large wood. However, if NMFS and Service biologists approve, riparian trees may be dislodged or felled for constructing in-stream habitat in areas where the project will not significantly impact stream shading or stream bank stability, sufficient natural recruitment of native woody vegetation is expected, the threat of invasive vegetation filling created gaps is minimal and replanting with native woody species is planned, and the trees to be felled are not providing suitable habitat for ESA-listed terrestrial species, sensitive species, or migratory birds.
- Structures may partially or completely span stream channels or be positioned along stream banks.
- Stabilizing or key pieces of large wood will be intact, hard, with little decay, and if possible have root wads (untrimmed) to provide functional refugia habitat for fish. Consider orienting key pieces such that the hydraulic forces upon the large wood increase stability.
- When anchoring large wood the following anchoring alternatives may be used in preferential order.
  1. Use adequately-sized wood sufficient for stability.
  2. Orient and place wood in such a way that movement is limited.
  3. Use ballast (gravel or rock) to increase the mass of the structure.
  4. Use vertical piles of untreated wood.
  5. Use large boulders as anchor points for the large wood.
  6. Pin large wood with rebar to large rock to increase its weight. For streams that are entrenched (Rosgen F, G, A, and potentially B), or for other streams with very low width to depth ratios (less than 12), an additional 60 percent ballast weight may be necessary due to greater flow depths and higher velocities. The tips of any rebar posts should be curved to reduce hazards to humans and wildlife.
- Anchoring large wood by cable is not included under this programmatic.

Conservation Measures – Engineered Log Jams (ELJ)

- The ELJs will be patterned, to the greatest degree possible, after stable natural log jams.
- Grade control ELJs will be designed to arrest channel down-cutting or incision by providing a grade control that retains sediment, lowers stream energy, and increases water elevations to reconnect floodplain habitat and diffuse downstream flood peaks.
- Stabilizing or key pieces of large wood that will be relied on to provide stream bank stability or redirect flows will be intact and solid (little decay).
- If possible, acquire large wood with untrimmed rootwads to provide functional refugia habitat for fish.

- When available, trees with rootwads attached should be a minimum length of 1.5 times the bankfull channel width, while logs without rootwads should be a minimum length of 2.0 times the bankfull width.
- The partial burial of large wood and boulders may constitute the dominant means of placement, and key boulders (footings) or large wood can be buried into the stream bank or channel.
- The large wood portions of ELJ structures should be oriented such that the force of water upon the large wood increases stability. If a rootwad is left exposed to the flow, the bole placed into the stream bank should be oriented downstream parallel to the flow direction so the pressure on the rootwad pushes the bole into the stream bank and bed. Wood pieces that are oriented parallel to flow are more stable than members oriented at 45 or 90 degrees to the flow.
- If large wood anchoring is required, a variety of methods may be used. These include buttressing the wood between riparian trees, or the use of manila, sisal, or other biodegradable ropes for lashing connections. If hydraulic conditions warrant use of structural connections, rebar pinning or bolted connections may be used. Rock may be used for ballast but are limited to that needed to anchor the large wood. The tips of any rebar posts should be curved to reduce hazards to humans and wildlife.

Conservation Measures – Gravel Augmentation

- Gravel can be placed directly into the stream channel, at tributary junctions, or other areas in a manner that mimics natural debris flows and erosion.
- Augmentation will only occur in areas where the natural supply has been eliminated, significantly reduced through anthropogenic disruptions, or used to initiate gravel accumulations in conjunction with other projects, such as simulated log jams and debris flows.
- Gravel to be placed in streams shall be a properly sized gradation for that stream, clean alluvium with similar angularity as the natural bed material. When possible, use gravel of the same lithology as found in the watershed. Reference Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings (USFS 2008) to determine gravel sizes appropriate for the stream.
- Crushed rock is not permitted.
- After gravel placement in areas accessible to higher stream flow, allow the stream to naturally sort and distribute the material.
- Do not place gravel directly on bars and riffles that are known spawning areas, which may cause fish to spawn on the unsorted and unstable gravel, thus potentially resulting in redd destruction.
- Imported gravel will be free of invasive species and non-native seeds. If necessary, wash gravel prior to placement.

2.1.3.4.5 Side Channels and Floodplain Function

Purpose: To restore historical side-channel habitat and floodplain function. Off-channel habitat has been reduced by human activities in the floodplain including diking, removal of LWD, straightening of the channel, road and railroad construction, and bank armoring. Thus, there is a need in many Idaho watersheds for off-channel habitat restoration, through reestablishment of side channels, removal of levees, and floodplain restoration.

2.1.3.4.5.1 Reconnection of Historical Side Channels

Description: Side channel habitats are generally small watered remnants of river meanders. They provide important rearing habitat for juveniles and refuge habitat during high flows. They are most common in floodplains with alluvial material along a flat valley floor. Off-channel habitat includes abandoned river channels, spring-flow channels, oxbows, and flood swales.

Projects under this consultation will restore self-sustaining off-channel habitat. Self-sustaining is not synonymous with maintaining a static condition. Self-sustaining means the restored habitat would not require major or periodic maintenance but would function naturally within the processes of the floodplain. However, up to two project adjustments, including adjusting the elevation of the created side channel habitat, are included under this proposal. The long-term development of a restored side channel will depend on natural processes like floods and mainstem channel migration. Over time, the side channel may naturally get drier or be taken over by the main river flow. Designs for such projects must be completed with input from a technical expert and must demonstrate a thorough understanding of the hydrology of the project area.

The following off-channel restoration activities are included in the proposed action.

- Restoration of existing side channels, including one-time dredging, and then up to two project adjustments for the elevation of the created side channel habitat.
- Reconnecting existing side channels with a focus on restoring fish access and habitat-forming processes (hydrology, riparian vegetation), including installation of culverts or bridges through road and railroad grades, where feasible[3].
- Installation of engineered log jams, barbs, or groins to direct some flow through a side channel.

To allow the action agency(ies), NMFS, and the Service to determine whether the project fits within the proposed action, the project sponsor will include the following additional information about design plans in the Project Information Form.

- Evidence of historical channel location, such as land use surveys, historical photographs, topographic maps, remote sensing information, or personal observation.
- Hydrologic evidence that the project will be self-sustaining over time. Self-sustaining means the restored habitat would not require major or periodic maintenance, but function naturally within the processes of the floodplain.
- Indication that the proposed action will mimic natural conditions for gradient, width, sinuosity and other hydraulic parameters.

[3] Breaching road or railroad grades to access historic channels can only be accomplished with complex coordination with state, tribal, federal and private stakeholders. It is the intent of this proposed action to use the most appropriate means of accessing the historical channel, which will be decided on a case-by-case basis with stakeholders.

- Indication that the proposed action will not result in the creation of fish passage issues or post construction stranding of juvenile or adult fish.

Conservation Measures

- Side channel habitat will be constructed to prevent fish stranding by providing a continual positive grade to the intersecting river or stream, or by providing a year-round water connection.
- Ditches previously constructed to drain wetlands will be filled with native material, primarily obtained from the spoil material generated when the ditch was first constructed. The final contour will approximate the natural topography to the degree the available material allows. If the natural contour cannot be obtained with on-site material, clean imported material of similar composition to the adjacent, native banks may be used.
- Side-channel improvements can include minor excavation (less than 10 percent) of naturally accumulated sediment within historical channels. There is no limit as to the amount of excavation of fill within historic side channels as long as such channels can be clearly identified through field and/or aerial photographs.
- Excavated material removed from off- or side-channels shall be hauled to an upland site or spread across the adjacent floodplain in a manner that does not restrict floodplain capacity.
- Excavation depth will never exceed the maximum thalweg depth in the main channel.
- Restoration of existing side channels including one-time dredging and an up to two times project adjustment including adjusting the elevation of the created side channel habitat.
- Adequate precautions will be taken to prevent the creation of fish passage issues or stranding of juvenile or adult fish.
- Excavation and construction work for side channels will be conducted in isolation from the main channel. Reintroduction of flow between the main channel and the reconstructed side channel will follow the measures for re-watering of stream channels described in **2.1.3.3. General Conservation Measures** of this Opinion.

2.1.3.4.5.2 Set-back or Removal of Existing Berms, Dikes, Levees, and Fill

Description: Set-back or removal of existing berms, dikes, levees, and fill and revegetation of the floodplain will be conducted to reconnect stream channels with floodplains and restore floodplain function. Such projects will take place where floodplains have been disconnected from adjacent rivers through drain pipes and anthropogenic fill.

Conservation Measures

- Design actions to restore floodplain characteristics—elevation, width, gradient, length, and roughness—in a manner that closely mimics, to the extent possible, those that would naturally occur at that stream and valley type.
- Any non-native levee material removed will be hauled to an upland site. Native material may be spread across the floodplain provided it does not restrict riparian vegetation establishment, floodplain capacity, and does not result in stranding of juvenile salmonids. If material is used to create or alter micro-topography it must be done in a manner to prevent juvenile stranding. Overburden or fill comprised of native materials, which originated from the project area, may be used within the floodplain to create set-back

dikes and fill anthropogenic holes provided that does not impede floodplain function. When necessary, loosen compacted soils once overburden material is removed.

- Remove drain pipes, fences, and other man-made structures to the greatest degree possible.
- Where it is not possible to remove or set-back portions of dikes and berms, or in areas where existing berms, dikes, and levees support abundant riparian vegetation, openings may be created with breaches. Berms, dikes, or levees shall always be breached in a manner that ensures flows will naturally recede back into the main channel to minimize the likelihood of fish entrapment.
- When full removal is not possible and a setback is required, the new structure locations should be prioritized, if possible, to the outside of the meander belt width or to the outside or the channel meander zone margins.
- Revegetation of floodplain will follow the conservation measures in section **2.1.3.4.7 Riparian Habitat** of this Opinion.

2.1.3.4.6 Channel Reconstruction/Relocation

Purpose: This proposed action applies to stream systems that have been straightened, channelized, dredged, or otherwise modified for the purpose of flood control, increasing arable land, realignment, or other land use management goals. This action could also be appropriate for streams that are incised or otherwise disconnected from their floodplains resulting from watershed disturbances. The purpose of channel reconstruction is to improve aquatic and riparian habitat diversity and complexity, reconnect stream channels to floodplains, reduce bed and bank erosion, increase hyporheic exchange, provide long-term nutrient storage, provide substrate for macroinvertebrates, moderate flow disturbance, increase retention of organic material, and provide refuge for fish and other aquatic species. Channel reconstruction and relocation generally occur in alluvial stream systems that are free to adjust their boundaries over time.

Description: Projects may include reconstruction of existing stream channels through excavation and structure placement (LWD and boulders) or relocation (rerouting of flow) into historic or newly constructed channels that are typically more sinuous and complex. The reconstructed stream system shall be composed of a naturally sustainable and dynamic planform, cross-section, and longitudinal profile that incorporate unimpeded passage and temporary storage of water, sediment, organic material, and species. Stream channel adjustment over time is to be expected in naturally dynamic systems and is a necessary component to restore a wide array of stream functions. It is expected that for most projects that there will be a primary channel with secondary channels that are activated at various flow levels to increase floodplain connectivity to improve aquatic habitat through a range of flows. This proposed action is not intended to artificially stabilize streams into a single location or into a single channel for the purposes of protecting infrastructure or property.

Channel reconstruction consists of re-meandering or movement of the primary active channel, and may include structural elements such as streambed simulation materials, stream bank structures, and hydraulic roughness elements. For stream bed stabilization and hydraulic control structures, constructed riffles shall be preferentially used in pool-riffle stream types, while roughened channels and boulder weirs shall be preferentially used in step-pool and cascade stream types. Material selection (large wood, rock, gravel) shall also mimic natural stream system materials.

The reconstruction or relocation of existing stream channels will be accomplished through excavation and structure placement (large wood and boulders), or by rerouting stream-flow into historic or newly constructed channels that are typically more sinuous and complex. The project sponsor would design the overall project to restore floodplain characteristics; elevation, width, gradient, length, and roughness, in a manner that closely mimics, to the greatest degree possible, those that would naturally occur at that stream and valley type. A project might include one or more of the following activities: excavation of an existing channel; construction of new low and high flow channels, side channels, and alcoves, adjacent floodplains, flood channels, and wetlands; and installation of structural elements such as streambed simulation materials, stream bank restoration, and hydraulic roughness elements.

Construction work and excavation will only take place in dry channels. If necessary to create dry conditions for excavation work, streamflow will be diverted to an existing channel, side channel, or pipe. The proposed action does not include excavating new bypass channels. We estimate projects may take 2 to 4 weeks of construction work, and possibly longer.

A NMFS engineer must review design plans for channel reconstruction projects. Approval for such projects would require a long-term monitoring plan. The Assessment (pp. 37-40) includes a detailed list of what must be included in the Project Information Form and incorporated into the design.

Conservation Measures

- To the greatest degree possible, remove nonnative fill material from the floodplain to an upland site.
- When necessary, loosen compacted soils once overburden material is removed. Overburden or fill comprised of native materials, which originated from the project area, may be used within the floodplain where appropriate to support the project goals and objectives.
- Ensure that structural elements fit the geomorphic context of the stream system. For bed stabilization and hydraulic control structures, constructed riffles shall be preferentially used in pool-riffle stream types, while roughened channels and boulder weirs shall be preferentially used in step-pool and cascade stream types. Material selection (large wood, rock, gravel) shall also mimic natural stream system materials.
- Construct the streambed using Stream Simulation Design principles as described in Section 6.2 of USFS (2008), or another appropriate design guidance document.
- All channel reconstruction work and excavation will occur in dry channels. If dewatering of the existing channel is necessary, streamflow will be rerouted through a pipe or bypass channel prior to work beginning. Work area isolation and re-watering of stream channels will follow the measures in **2.1.3.3 General Conservation Measures** of this Opinion.
- Fish passage will be provided for any ESA-listed adult or juvenile fish likely to be migrating through the action area during construction, unless passage did not exist before construction or the stream reach is naturally impassable at the time of construction.

2.1.3.4.7 Riparian Habitat

Purpose: To reestablish native riparian vegetation to stabilize stream banks, provide shade, future source of LWD, and encourage the development of protective cover for fish and other aquatic species. This category includes planting riparian vegetation, managing livestock access to riparian areas, removing nonnative invasive weeds mechanically and with herbicides, and stream bank stabilization through bioengineering techniques.

2.1.3.4.7.1 Planting Riparian Vegetation

Description: Planting riparian vegetation involves planting appropriate species along streams in order to stabilize stream banks and improve riparian function.

Conservation measures

- Use only native plant species.
- Use certified noxious weed-free seed (99.9 percent), hay, straw, mulch, or other vegetation material.

2.1.3.4.7.2 Livestock Restrictions

Description: Livestock fencing, designated stream crossings, and off-channel livestock watering facility projects will be implemented by constructing fences to exclude riparian grazing, providing controlled access for walkways that livestock use to transit across streams and through riparian areas, and reducing livestock use in riparian areas and stream channels by providing upland water facilities. This proposed action does not include the installation of projects that are interrelated or interdependent to a Federal grazing allotment subject to separate consultation with NMFS and the Service.

Permanent or temporary livestock fences may be installed. For permanent fences, individual fence posts will be pounded or dug using hand tools or augers on backhoes or similar equipment. Fence posts will be set in the holes, backfilled, and fence wire strung or wooden rails placed. Wood fences that do not require setting posts and temporary electric fences may also be built. Installation of fences may involve the removal of native or non-native vegetation along the proposed fence line.

Livestock stream crossings will provide controlled access for walkways that livestock use to transit across streams and through riparian areas. Culverts or bridges will be installed for frequent crossing locations in accordance with crossings covered under this consultation. Hardened stream crossings will involve the placement of river rock along the stream bottom and at approaches.

Watering facilities will consist of various low-volume pumping or gravity-feed systems to move the water to a trough or pond at an upland site. Either above-ground or underground piping will be installed between the troughs or ponds and the water source. Water sources may include springs and seeps, streams, or groundwater wells. Placement of the pipes in the ground will typically involve minor trenching using a backhoe or similar equipment.

Conservation Measures – Fencing

- To the extent possible, fences will be placed outside the channel migration zone and allow for lateral stream movement.

- Minimize vegetation removal, especially potential LWD recruitment sources, when constructing fence lines.
- Where appropriate, construct fences at water gaps in a manner that allows downstream passage of LWD and other debris.
- When using pressure treated lumber for fence posts, complete all cutting/drilling off-site (to the extent possible) so that treated wood chips and debris do not enter water or floodprone areas. Pressure-treated lumber will not be used for fence posts in areas with frequent water contact. In these instances, alternative materials such as steel, concrete, and rot resistant wood (e.g., locust) will be used.
- Riparian fencing is not to be used to create livestock handling facilities.

Conservation Measures – Livestock Stream Crossings

- The number of crossings will be minimized.
- Locate crossings or water gaps where stream banks are naturally low. Livestock crossings or water gaps will not be located in areas where compaction or other damage can occur to sensitive soils and vegetation (e.g., wetlands) due to congregating livestock.
- To the extent possible, crossings will not be placed in areas where listed fish species spawn or are suspected of spawning (e.g., pool tailouts where spawning may occur), or within 300-feet upstream of such areas.
- Existing access roads and stream crossings will be used whenever possible, unless new construction will result in less habitat disturbance and the old trail or crossing is retired.
- Livestock trails to the stream crossings will have a vegetated buffer adequate to avoid or minimize runoff of sediment and other pollutants to surface waters.
- Crossings will be designed and constructed or improved to handle reasonably foreseeable flood risks, including associated bedload and debris, and to prevent the diversion of stream flow out of the channel and down the trail if the crossing fails.
- If necessary, the stream bank and approach lanes can be stabilized with native vegetation or angular rock to reduce chronic sediment delivery. The stream crossing or water gap should be armored with sufficient sized rock (e.g., cobble-size rock); or angular rock will be used if natural substrate is not of adequate size.
- Livestock crossings will not create barriers to the passage of adult or juvenile fish.
- The project sponsor will monitor completed fords to determine if the fords are a low flow fish passage barrier. If the ford appears to be a barrier, the action agencies and project sponsor will discuss measures to address this problem with NMFS and the Service immediately. Solutions may include installation of sills or groins.
- Stream crossings and water gaps will be designed and constructed to a width of 10 to 15 feet in the upstream-downstream direction to minimize the time livestock will spend in the crossing or riparian area.

Conservation Measures – Off-channel Livestock Watering Facilities

- The development of a spring is not allowed if the spring is occupied by ESA-listed species.
- Water withdrawals will not dewater habitats or cause low stream flow conditions that could affect ESA-listed fish. Troughs or tanks fed from a stream or river will have an existing valid water right.

- Surface water intakes will be screened to meet the most recent version of NMFS fish screen criteria (NMFS 2011a), be self-cleaning, or regularly maintained by removing debris buildup. A responsible party will be designated to conduct regular inspection and as-needed maintenance to ensure pumps and screens are properly functioning.
- Troughs will be placed far enough from a stream or will be surrounded with a protective surface to prevent mud and sediment delivery to the stream. Steep slopes and areas where compaction or damage could occur to sensitive soils, slopes, or vegetation due to congregating livestock will be avoided. Watering facilities will be located sufficiently far from streams so that congregating livestock are unlikely to damage riparian areas.
- Each livestock water development shall have a float valve or similar device, a return flow system, a fenced overflow area, or similar means to minimize water withdrawal and potential runoff and erosion.
- All troughs or tires will be equipped with bird ladders.
- Removal of vegetation around springs and wet areas will be avoided or minimized.
- When necessary, a fence will be constructed around the spring development to prevent livestock damage.
- All new wells or other stock watering sources installed under this activity will be permitted by the appropriate state or federal agency, and the project sponsor will document relevant permits in the Project Information Form. The water diversion rate from a project will not exceed the legal water right. The Project Information Form will specify who is going to maintain the facility.

2.1.3.4.7.3 Removal of Non-native Invasive Plants

Description: Under the proposed action, nonnative invasive weeds will be removed through both physical means and with herbicides. Treatment of weeds by BLM and the USFS in Idaho is covered under separate NMFS consultations, and is therefore not covered under this consultation[4].

For other action agencies, three mechanisms are proposed for control of invasive plants. These methods may be combined using an integrated weed management plan.

Manual – Manual control includes hand pulling and grubbing with hand tools; bagging plant residue for burning or other proper disposal; mulching with organic materials; shading or covering unwanted vegetation; controlling brush; and pruning using hand and power tools such as chain saws and machetes.

Mechanical – Mechanical control includes techniques such as mowing, tilling, disking, or plowing. Mechanical control may be carried out over large areas or be confined to smaller areas (known as scalping). Ground-disturbing mechanical activity will be restricted adjacent to streams, lakes, ponds, wetlands and other identified sensitive habitats. For slopes over 20 percent, no ground-disturbing mechanical equipment will be used. For slopes less than 20 percent, ground-disturbing mechanical activity will not occur within 150 feet of a waterbody.

[4] According to the Assessment p. 43 the proposed action does not cover herbicide use by USFS and BLM because they generally have consultations in place for weed treatments to meet their needs.

Chemical – The project sponsor may also propose to treat invasive weeds with herbicides. Herbicides will be applied in liquid or granular form using wand or boom sprayers mounted on or towed by trucks, backpack equipment containing a pressurized container with an agitation device, injection, hand wicking cut surfaces, and ground application of granular formulas. Herbicides will be mixed with water as a carrier (no oil-based carriers will be used) and may also contain one of several additives to promote saturation and adherence, to stabilize, to enhance chemical reactions, or to provide a dye. Aerial treatment is not part of the proposed action. Treatment of aquatic weeds with herbicides is also not part of the proposed action.

The following herbicides may be used under this consultation.

Table 3. Active Ingredients and End-Use Products

Herbicide (Active Ingredient)	End-Use Product	General Application
2,4-D amine	Amine 4 Weedar 64 Riverdale Weedestroy AM-40	Upland-Riparian
Aminopyralid	Milestone	Upland and Riparian spot spraying
Chlorsulfuron	Telar XP	Upland-Riparian
Clopyralid	Transline	Generally Upland
Dicamba	Banvel Vanquish	Upland
Glyphosate	Rodeo GlyPro Accord Concentrate AquaMaster AquaNeat Aquatic Herbicide Foresters	Upland-Riparian
Imazapic	Plateau	Upland
Metsulfuron-methyl	Escort XP	Upland-Riparian
Picloram	Tordon 22K Tordon K	Upland
Sulfometuron methyl	Oust XP	Upland-Riparian
Triclopyr	Garlon 3A Renovate 3 Tahoe 3A Triclopyr 3A Triclopyr 3SL	Upland-Riparian

Several adjuvants may be combined with the herbicides listed above prior to application. Adjuvants are generally defined as any substance added separately to a pesticide end-use product (typically as part of a spray tank mixture). Adjuvants can either enhance the activity of an herbicide's active ingredient or offset any problems associated with spray application. Typical adjuvants include surfactants, anti-foaming agents, crop oil or crop oil concentrates, drift retardants, compatibility agents, dyes, and pH buffers. Adjuvants proposed for this action include Activator 90, Spread 90, LI700, Syl-Tac, R11, Agri-Dex, and methylated seed oil (MSO); two drift retardants, 41-A and Valid; as well as three dyes (Bullseye, Insight, and Hilight).

Several inert ingredients may also be included in the herbicide. Inert ingredients are any substances, other than the active ingredient, that are intentionally added to a pesticide formulation. Inert ingredients serve to enhance the action of the active ingredient. Inert ingredients may include carriers, surfactants, preservatives, dyes, and anti-foaming agents among other chemicals. Because many manufacturers consider inert ingredients in their herbicide formulations to be proprietary, they do not list specific chemicals. Therefore, we do not know the complete list of inert ingredients in the end-use products listed in Table 3 above. A partial list of inert ingredients for the herbicide end-use products in Table 3 (those listed by the manufacturers) includes water, ethanol, isopropanol, isopropanolamine, kerosene, and polyglycol 26-2. The U.S. Environmental Protection Agency (EPA) has classified many of these chemicals as "List 3" compounds (inert ingredients of unknown toxicity) or "List 4B" compounds (other ingredients for which EPA has sufficient information to reasonably conclude that the current use pattern in pesticide products will not adversely affect public health or the environment).

No herbicides will be applied to open water, and a stream buffer of 15 feet, 50 feet, or 100 feet is required for many of the chemicals proposed under this consultation. For each individual herbicide, Table 4 lists the stream buffer in which no herbicide application is allowed. Table 5 shows additional buffer restrictions for different herbicide application methods and different windspeeds. For example, broadcast spraying is not allowed within 100 feet of a stream's ordinary high water mark (OHWM). Furthermore, of the adjuvants proposed for this action, Activator 90, Spread 90, LI700, Sylatac, Valid, Hilight, and R11 would not be used within 50 feet of open water. The MSO Agridex, and 41-A could be used up to within 15 feet of open water.

Herbicide application within 100 feet of live water would be limited to 200 acres per year for the entire program, with no more than 50 acres per year in any particular subbasin. No acreage limits would be placed on herbicide application farther than 100 feet from live water.

Table 4. Buffer Restrictions Associated with Herbicide Use (see Table 5 for additional buffer restrictions for different herbicide application methods and different wind speeds).

Active Ingredient	End-Use Product	Buffer from Open Water
2,4-D	2,4-D Amine 4 Weedar 64 Weedestroy AM-40	50 ft. 50 ft. 50 ft.
Aminopyralid	Milestone	50 ft
Chlorsulfuron	Telar XP	15 ft
Clopyralid	Transline	15 ft

Dicamba	Banvel Vanquish	50 ft 50 ft
Glyphosate	Rodeo AquaMaster AquaNeat Herbicide Foresters	15 ft 15 ft 15 ft 15 ft
Imazapic	Plateau	15 ft
Metsulfuron-methyl	Escort XP	15 ft
Picloram	Tordon 22KTordon K	100 ft 100 ft
Sulfometuron-methyl	Oust XP	15 ft
Triclopyr TEA	Garlon 3A Tahoe 3A Trichlopyr 3A Triclopyr 3SL	50 ft 50 ft 50 ft 50 ft

Table 5. Additional Buffer Restrictions for Different Herbicide Application Methods and Different Wind speeds.

Herbicide Application Method		
Broadcast Spray	**Spot Spray**	**Hand Application**
Ground-based only broadcast application methods via truck/ATV with motorized low-pressure, high-volume sprayers using spray guns, broadcast nozzles, or booms.	Spot and localized foliar and basal/stump applications using a hand-pump backpack sprayer or field-mixed or pre-mixed hand-operated spray bottle.	Hand applications to a specific portion of the target plant using wicking, wiping or injection. Technique implies that herbicides do not touch the soil during the application process.
Wind speed > 10 mph = no spraying Wind speed < 10 mph = 100 ft. minimum buffer from OHWM	Wind speed > 10 mph = no spraying Wind speed 5-10 mph = 50 ft. min. buffer from OHWM (100 ft. min.buffer for picloram) Windspeed < 5 mph = 15 ft. min. buffer from OHWM or buffer from Table 4, whichever is greater	Minimum buffer from Table 4.

Conservation Measures

- For mechanical treatment of weeds, keep ground disturbance and exposed soil to the minimum amount needed to successfully eradicate weeds.
- Follow the buffer requirements listed in Tables 4 and 5.
- No aerial application of herbicides is proposed under this consultation, nor is any application of herbicides to open water.
- A State or Federal licensed applicator will develop the herbicide application plan for any action involving herbicide use under this consultation. The plan will identify herbicides specifically targeted for a particular plant species and those that will cause the least impact to non-target plant species. The State or Federally licensed applicator will perform or directly supervise all applications of Restricted Use Pesticides (e.g., picloram).
- The applicator will prepare and carry out an herbicide safety/spill response plan to reduce the likelihood of spills or misapplication, to take remedial actions in the event of spills, and to fully report the event. The Assessment (pp. 48-49) has details on what shall be included in the plan.
- All chemicals will be applied in accordance with EPA registration label requirements and restrictions. Specific label directions, recommendations, and guidelines will be followed to reduce drift potential (i.e., nozzle size and pressure, additives, wind speed).
- 2,4-D – As a result of the National Consultation (NMFS), this herbicide shall comply with all relevant reasonable and prudent alternatives from the NMFS 2011 Biological Opinion (NMFS 2011b): (1) Do not apply when wind speeds are below 2 mph or exceed 10 mph, except when winds in excess of 10 mph will carry drift away from salmonid-bearing waters; (2) do not apply when a precipitation event, likely to produce direct runoff to salmonid bearing waters from the treated area, is forecasted by the National Weather Service or other similar forecasting service within 48 hours following application; (3) control of invasive plants within the riparian habitat shall be by individual plant treatments for woody species, and spot treatment of less than 0.10 acre for herbaceous species.
- Herbicide applicators will obtain a weather forecast for the area prior to initiating a spraying project to ensure no extreme precipitation or wind events could occur during or immediately after spraying that could allow runoff or drift into streams.
- Herbicide drift and leaching will be minimized as follows. Action agencies will:
    - Not spray when wind speeds exceed 10 miles per hour, or when wind speeds are less than 2 miles per hour if the potential for temperature inversion exists.
    - Be aware of wind directions and potential for herbicides to affect aquatic habitat area downwind.
    - Keep boom or spray as low as possible to reduce wind effects.
    - Increase spray droplet size whenever possible by decreasing spray pressure, using high flow rate nozzles, using water diluents instead of oil, and adding thickening agents.
    - Not apply herbicides during temperature inversions, or when ground temperatures exceed 80 degrees Fahrenheit.
    - Not spray when rain, fog, or other precipitation is falling or expected within 24 hours.

  - Ensure that products with leaching hazard are applied only to appropriate soil types and textures as indicated on label. Wind and other weather data will be monitored and reported for all broadcast applications.
- To address potential concerns with the use of the listed adjuvants, Activator 90, Spread 90, LI700, Syl-Tac, R11, Agri-Dex, Valid, and Hilight will not be used within 50 feet of open water. The MSO surfactant could be used up to within 15 feet of open water.
- All mixing of herbicides will occur at least 150 feet from surface water or well heads to minimize the risk of an accidental discharge.
- All hoses used to add dilution water to spray containers will be equipped with a device to prevent back-siphoning.
- Applicators will mix only those quantities of herbicides that can be reasonably used in a day.
- All empty containers will be triple rinsed and rinse disposed of by spraying near the treatment site at rates that do not exceed those on the treatment site.
- No chemical herbicides will be used within a 100-foot radius of any potable water spring development.
- Herbicides will be applied at the lowest effective label rates, including the typical and maximum rates given. For broadcast spraying, application of herbicide or surfactant will not exceed the typical label rates.
- Dyes (e.g., Insight) will be used in riparian areas, and other locations as appropriate to provide visual evidence of treated vegetation. Dyes should be used around any sensitive areas, or where larger areas are sprayed (especially when using boom sprayers, for example), to reduce overlap and over application. Hilight, however, will not be used within 50 feet of the water's edge.
- The project sponsor will use herbicides and surfactants with the least toxicity to ESA-listed fish and other non-target organisms whenever possible.
- The project sponsor will use caution when applying herbicides near streams or roadside ditches that drain directly into streams. Herbicides containing glyphosate without surfactants or toxic additives, such as Rodeo®, will be the product of choice under appropriate site conditions.
- The project sponsor will avoid the use of picloram, clopyralid, chlorsulfuron, dicamba, imazapic, triclopyr, and metsulfuron-methyl within annual floodplains where the water table is within 6 feet of the surface and soil permeability is high (silt loam and sand soils).
- The project sponsor will ensure that herbicides are not applied when wind speeds are less than 2 mph if the potential for temperature inversions exists.
- Most weed patches are expected to have overland access. However, some sites may be reached only by water travel, either by wading or inflatable raft (or kayak). The following measures will be used to reduce the risk of a spill during water transport.
  - No more than 2.5 gallons of herbicide will be transported per person or raft, and typically it will be one gallon or less.
  - Herbicide will be carried in 1 gallon or smaller plastic containers. The containers will be wrapped in plastic bags and then sealed in a dry-bag. If transported by raft, the dry-bag will be secured to the watercraft.
- Do not apply herbicides if whitebark pine is present at the site.

- Do not apply herbicides where Northern Idaho ground squirrels or ESA-listed plants are known to be present.
- On the Project Completion Form, the project sponsor will list all herbicides use and acres treated.

2.1.3.4.7.4 Stream Bank Stabilization

Description: The proposed action includes the restoration of eroding stream banks through bank shaping and installation of coir logs or other soil reinforcements – bioengineering techniques as necessary to support development of riparian vegetation and/or planting or installing large wood, trees, shrubs, and herbaceous cover as necessary to restore ecological function in riparian and floodplain habitats. The goal of stream bank restoration is to reestablish long term riparian processes through revegetation, or to ameliorate chronic erosion in locations where roads, bridges or other permanent floodplain developments preclude lateral channel migration.

The following bioengineering techniques may be used either individually or in combination.

- Woody plantings and variations (e.g., live stakes, brush layering, fascines, brush mattresses).
- Herbaceous cover, where analysis of available records (e.g., historical accounts and photographs) shows that trees or shrubs did not exist on the site within historic times, primarily for use on small streams or adjacent wetlands.
- Deformable soil reinforcement, consisting of soil layers or lifts strengthened with biodegradable coir fabric and plantings that are penetrable by plant roots.
- Coir logs (long bundles of coconut fiber), straw bales, and straw logs used individually or in stacks to trap sediment and provide a growth medium for riparian plants.
- Bank reshaping and slope grading, when used to reduce a bank slope angle without changing the location of its toe, to increase roughness and cross section, and to provide more favorable planting surfaces.
- Tree and LWD rows, live siltation fences, brush traverses, brush rows and live brush sills in floodplains, used to reduce the likelihood of avulsion in areas where natural floodplain roughness is poorly developed or has been removed.
- Floodplain flow spreaders, consisting of one or more rows of trees and accumulated debris used to spread flow across the floodplain.

Conservation Measures

- Without changing the location of the bank toe, damaged stream banks will be restored to a natural slope and profile suitable for establishment of permanent woody vegetation. This may include sloping of unconsolidated bank material to a stable angle of repose, or the use of benches in consolidated, cohesive soils. The purpose of bank shaping is to provide a more stable platform for the establishment of riparian vegetation, while also reducing the depth to the water table, thus promoting better plant survival.
- Stream bank restoration projects shall include the placement of a riparian buffer strip consisting of a diverse assemblage of species native to the action area or region, including trees, shrubs, and herbaceous species, as appropriate to site conditions. Certified seed sources that are free of noxious or invasive species will be used.

- Large wood may be used as an integral component of stream bank protection treatments. Large wood will be placed to maximize near bank hydraulic complexity and interstitial habitats through use of various large wood sizes and configurations of the placements.
- Structural placement of large wood should focus on providing bankline roughness for energy dissipation vs. flow redirection that may affect the stability of the opposite bankline.
- Wood that is already within the stream or suspended over the stream may be repositioned to allow for greater interaction with the stream.
- Large wood anchoring will not utilize cable or chain. Manila, sisal or other biodegradable ropes may be used for lashing connections. If hydraulic conditions warrant use of structural connections, then wooden posts should be used in preference to rebar or steel posts. If rebar or steel posts with a height less than 4 feet tall are used, the tops of the posts must be bent downward to reduce the hazards to humans and wildlife.
- Rock will not be used for stream bank restoration, except as ballast to stabilize large wood, unless it is necessary to prevent scouring or downcutting of an existing flow control structure (e.g., culvert or bridge support, headwall). In this case, rock may be used as the primary structural component for construction of vegetated riprap with LWD. Rock may also be used for barbs to protect an existing structure (see below) in conjunction with bioengineering stream bank stabilization techniques.
- Fencing will be installed as necessary to prevent access and grazing damage to revegetated sites and project buffer strips.
- Surface fertilizer will not be applied within 50 feet of any stream.

2.1.3.4.8 Road and Trail Erosion Control, Maintenance and Decommissioning

Purpose: To reduce sediment delivery to streams from man-made sources.

Description: This category includes road projects aimed at reducing sediment delivery to streams and thereby improving aquatic habitat, where necessary as part of a larger aquatic habitat restoration project. This includes road obliteration, relocating roads and trails away from riparian areas, road drainage system improvements, and other sediment reduction projects. Road maintenance activities within the riparian zone may include:

- Creating barriers to human access: Gates, fences, boulders, logs, tank traps, vegetative buffers, and signs.
- Surface maintenance, such as building and compacting the road prism, grading, and spreading rock or surfacing material.
- Drainage maintenance and repair of in-board ditch lines, waterbars, and sediment traps.
- Removing and hauling or stabilizing pre-existing cut and fill material or road-related slide material from a hillslope. The proposed action does not include removal of slide material from a stream.
- Water spraying for dust abatement.
- Relocating portions of roads and trails to less sensitive areas outside of riparian buffer areas.

The proposed activity does not include asphalt resurfacing, widening roads, or new construction or relocation of any permanent road inside a riparian buffer area except for a bridge approach in accordance with **2.1.3.4.2 Fish Passage**. Road grading and shaping will maintain, not destroy, the designed drainage of the road, unless modification is necessary to improve drainage problems that were not anticipated during the design phase. Road maintenance will not be attempted when surface material is saturated with water and erosion problems could result. Where road maintenance on Federal lands is covered under a separate existing consultation with the Service and NMFS, this consultation will not apply.

The project sponsor may decommission and obliterate roads that are no longer needed, e.g., logging roads. Road decommissioning and obliteration include the following.

- Installation of water bars, sediment catch basins, and creation of surface drainage patterns.
- In-sloping or out-sloping of road surfaces.
- Removal of asphalt and gravel from road surfaces.
- Removal or alteration of culverts and bridges. Dissipaters, chutes, or rocks will be placed at remaining culvert outlets.
- Re-contouring of stream crossings.
- Installation of cross drains.
- Removal of fill or sidecast material.
- Reshaping of the road prism.
- Revegetation of all surfaces to reduce surface erosion of bare soils, including transplanted shrubs from nearby vegetation. Grass and forb seeds will typically be applied to any bare soil.

Conservation Measures

- Disturbance of existing vegetation in ditches and at stream crossings will be minimized to the extent necessary to restore hydrologic functions.
- For road obliteration projects, culvert removal will be designed to restore the natural drainage pattern.
- Only water may be used for dust abatement. The proposed action does not include the use of dust-abatement and stabilization chemicals.
- Waste material generated from road maintenance activities and slides will be disposed of on stable, non-floodplain sites, approved by a geotechnical engineer or other qualified personnel.
- Ditches and culverts will be promptly cleaned of materials resulting from slides or other debris.
- Berms will not be left along the outside edge of roads, unless an outside berm was specifically designed to be a part of the road, and low-energy drainage is provided.
- Ditch back slopes will not be undercut, to avoid slope destabilization and erosion acceleration.
- When blading and shaping roads, road surface material will not be sidecast onto the fill. All excess material that cannot be bladed into the surface will be hauled to a site where sediment will not enter water. Slides and rock failures including fine material of more than approximately one-half yard at one site will be hauled to approved disposal sites that will not affect listed species (Fesenmyer 2015, pers. comm.). Fine materials (1 inch or smaller) from slides, ditch maintenance, or blading may be worked into the road. Scattered clean rocks (1 inch or larger) may be raked or bladed off the road in locations

where there is a sufficient buffer between the road and stream to prevent materials from washing into the water.

- Road maintenance will not be attempted when surface material is saturated with water and erosion problems could result. When replacing or adding cross drains, coarse rock shall be used at outlets of the cross drains to dissipate energy in locations where the water is likely to create gullies.

2.1.3.4.9 Surveying and Monitoring

Purpose: To collect information about the project site, current habitat conditions, and species presence and abundance; and to monitor the site for several years after project completion to assess the effectiveness of the project. In addition, this consultation covers the installation of PIT tag detection arrays for monitoring fish movement. Electrofishing for research purposes is not included under this consultation. However, electroshocking and other fish removal methods are included in the proposed action for the purpose of removing fish from an instream work area prior to dewatering, as described under **Section 2.1.3.3 General Conservation Measures**.

2.1.3.4.9.1 Surveying and Monitoring at Habitat Restoration Project Sites

Description: Conduct habitat and animal inventories in riparian areas, streams, and wetlands, and install monitoring equipment. Under this category, work may include survey equipment and crews using hand tools for the following activities.

- Measuring and recording physical measurements by visual estimates or with survey instruments.
- Manually installing rebar or other markers along transects or at reference points.
- Manually installing piezometers and staff gauges to assess hydrologic conditions.
- Manually installing recording devices for stream flow and temperature.
- Excavating cultural resource test pits using hand shovel only.

Conservation Measures

- Hydraulic and topographic measurement within the wetted channel may be completed anytime except during the spawning and incubation periods for ESA-listed species, unless a natural resource specialist with experience in fish handling verifies that no redds occur within 300 feet downstream from the measurement site.
- No in-water work will occur within 300 feet of spawning areas during anadromous fish spawning and incubation times, which will be dictated by the approved work window.
- Workers will avoid redds and ESA-listed spawning fish while walking within or near stream channels to the extent possible. Avoidance will be accomplished by examining pool tailouts and low-gradient riffles for clean gravel and characteristic shapes and flows prior to walking or snorkeling through these areas.
- If redds or listed spawning fish are observed at any time, workers will step out of the channel and walk on dry land at a distance from the active channel.
- Surveyors will coordinate with local agencies to prevent redundant surveys.
- Excavated material from cultural resource test pits will be placed away from stream channels. All material will be replaced back into test pits when testing is completed.
- Multiple stream sites will be used for field trips to minimize effects on any given stream or riparian buffer area.

- Rebar stakes left on site must have the tops bent downward to reduce hazards to humans and wildlife.

2.1.3.4.9.2 Installation of PIT Tag Detection Arrays

Description: Passive Integrated Transponder (PIT) tag detection arrays consist of antennas laid out on stream substrate perpendicular to stream flow in order to detect and identify fish marked with PIT tags. This habitat restoration programmatic consultation would cover only the installation and maintenance of PIT tag arrays in Idaho, and not the actual fish studies (capture, handling, tagging, sampling, live release, etc.) associated with the operation of the PIT tag arrays, which would be covered under separate NMFS and FWS permits or consultations.

The PIT tag antennas can be fixed to stream substrate using manta ray anchors, all thread, and end caps, which are driven into the substrate with hand tools. A trench may be excavated for cable placement. Excavation of substrate would be completed using hand tools, including a hydraulic pump and jackhammer where necessary to dislodge embedded substrate. All excavated substrate material would be redistributed within the channel at the project site. On-shore construction could include installation of posts with concrete footers (pre-formed) to support electrical equipment; and installation of a power source (domestic, thermoelectric generator, or solar panels). Where thermoelectric power is used, propane tanks (up to 250 gallons) would be placed onsite.

The PIT tag detection array installations are often completed within a day, although some sites could require multiple days of in-stream or on-shore work. The PIT tag array sites are typically selected for substrate and channel structure most readily classified as "migration corridors." As a result, sites are typically downstream of spawning habitat and have low habitat complexity, little LWD, uniform depth, larger substrate, and high velocities. Generally, these conditions result in sites with little potential for spawning and lower value as juvenile rearing habitat.

Conservation Measures

- Installation would occur during periods of low in-stream flow, preferably in advance of adult migration. If the project sponsor proposes to install a PIT tag array outside of the preferred in-stream work window, the project sponsor must specify an alternative low-water work window in the Project Information Form. NMFS must provide electronic approval of this variance prior to the work proceeding.
- In-stream and bank disturbance will be minimized to preserve the current condition of each site and all work will be conducted by hand.
- Staging of equipment and materials will occur more than 150 feet from all streams.
- Arrays must not be placed in areas that are likely to be used for spawning. Prior to installations, the project sponsor will review available redd survey data to evaluate the possible presence of redds near project locations. Additionally, a reach no shorter than 100 yards upstream and downstream of each site will be surveyed for the presence of redds and adult salmonids immediately prior to installation. If redds or spawning activity are observed, installation will be delayed until the next NMFS-approved work window.
- Uncured concrete will not be in contact with water.

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 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 Columbia River interim recovery unit for the bull trout based on its 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 in litt. 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 2002, 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 2002, 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 2002, 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 the Columbia River unit is provided below. A comprehensive discussion of all of the population segments is found in the draft bull trout Recovery Plan (USFWS 2002, entire; 2004a, b; entire).

Central to the survival and recovery of the bull trout is the maintenance of viable core areas (USFWS 2002, 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. 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).

2.3.1.4.1 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 2002, 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.

<u>2.3.1.4.1.1 Columbia River Recovery/Management Units</u>

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 2002, p. 54).

The draft bull trout Recovery Plan (USFWS 2002, 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 all watersheds in Idaho which support anadromous salmonids and spans three management units: The Salmon River Basin, Imnaha-Snake River Basin, and the Clearwater River Basin. More information regarding the management units can be found in the Service's 2002 Bull Trout Draft Recovery Plan (USFWS 2002).

2.3.1.5 Conservation Needs

The recovery planning process for the bull trout (USFWS 2002, 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 2002, 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, such as the Jarbidge, 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)[5].

Rangewide, the Service designated reservoirs/lakes and stream/shoreline miles in 32 critical habitat units (CHU) as bull trout critical habitat (see Table 6). Designated bull trout critical habitat is of two primary use types: (1) Spawning and rearing; and (2) foraging, migrating, and overwintering (FMO).

Table 6. 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**

[5] 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.

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 unembedded substrates, to provide a variety of depths, gradients, velocities, and structure.

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

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

conditions. The size and amounts of fine sediment suitable to bull trout will likely vary from system to system.

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

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

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

2.3.2.3 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.

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 18 subbasins (4th field Hydrologic Units or HU) identified in Figure 1 and listed in Table 1. Major river basins in the action area include the mainstem Snake, Salmon, Lemhi, Selway, Lochsa, and Clearwater. 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. The Clearwater, Selway, Lochsa, and Salmon 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). 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. Populations in the Snake River basin are considered weak (less than 500 adults per basin), with the mainstem providing habitat between local populations. 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.

During program activities it is possible that resident and migratory (fluvial or adfluvial) life history forms, and adult and juvenile age classes of bull trout may be present in the area where individual actions are implemented. Migratory adult bull trout may be moving upstream or 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. However, we do not expect all projects will affect bull trout: Some projects under the Program may be implemented in areas where bull trout are not present but where critical habitat or other listed fish exists.

2.4.1.2 Factors Affecting the Bull Trout in the Action Area

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 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.

Watershed conditions vary substantially within each subbasin and between the subbbasins. 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 passage, sediment delivery, and riparian conditions. 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 2002, entire). The individual chapters in the Service's draft plan identified the categories of activities that have had the most significant adverse impacts on bull trout in recovery unit.

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. 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, habitat degradation as a result of wildfire, fish passage barriers, brook trout, and fish angling likely also affect bull trout in the action area.

Passage barriers and undersized culverts associated with roads are numerous and widespread throughout the action 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.

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.

In general, anthropogenic activities that have degraded aquatic habitats or affected native fish populations in the Snake River basin include stream channelization, elimination of wetlands, construction of flood-control dams and levees, construction of roads (many with impassable culverts), timber harvest, splash dams, mining, water withdrawals, unscreened water diversions, agriculture, livestock grazing, urbanization, outdoor recreation, fire exclusion/suppression, artificial fish propagation, fish harvest, and introduction of non-native. In many watersheds, land management and development activities have:

- Reduced connectivity (i.e., the flow of energy, organisms, and materials) between streams, riparian areas, floodplains, and uplands;
- Elevated fine sediment yields, degrading spawning and rearing habitat;
- Reduced large woody material that traps sediment, stabilizes stream banks, and helps form pools;
- Reduced vegetative canopy that minimizes solar heating of streams;
- Caused streams to become straighter, wider, and shallower, thereby reducing rearing habitat and increasing water temperature fluctuations;
- Altered peak flow volume and timing, leading to channel changes and potentially altering fish migration behavior; and,
- Altered floodplain function, water tables and base flows.

2.4.1.2.1 Basins in the Action Area

The action area covers 18 subbasins (4th -field HUCs, Table 1), encompassing all areas potentially affected directly or indirectly by this programmatic consultation. Because of the potential for downstream effects and additive effects within watersheds, the action area encompasses entire subbasins where ESA-listed anadromous fish species and designated critical habitat occur. A general review of the environmental baseline has been divided into the three major basins within the action area: (1) The Clearwater River Basin; (2) the Salmon River Basin; and (3) the Snake River Basin. Whereas the action area encompasses the entire Clearwater River and Salmon River basins, for the Snake River Basin the action area includes only the Snake River and its tributaries along the Idaho-Oregon border from Hells Canyon Dam down to the Clearwater River confluence.

2.4.1.2.1.1 Clearwater River Basin

The Clearwater River Basin is located in north-central Idaho between the 46th and 47th latitudes in the northwestern portion of the continental United States. It is a region of mountains, plateaus, and deep canyons within the Northern Rocky Mountain geographic province. The basin is bracketed by the Salmon River Basin to the south and St. Joe River subbasin to the north.

The Clearwater River drains approximately a 9,645 square mile area. The basin extends approximately 100 miles north to south and 120 miles east to west. There are four major tributaries that drain into the mainstem of the Clearwater River: The Lochsa, Selway, South Fork Clearwater, and North Fork Clearwater rivers. The Idaho-Montana border follows the upper watershed boundaries of the Lochsa and Selway rivers, and the eastern portion of the North Fork Clearwater River in the Bitterroot Mountains. The North Fork Clearwater River then drains the Clearwater Mountains to the north, while the South Fork Clearwater River drains the divide along the Selway and Salmon rivers. Dworshak Dam, located 2 miles above the mouth of the North Fork Clearwater River, is the only major water regulating facility in the basin. Dworshak Dam was constructed in 1972 and eliminated access to one of the most productive systems for anadromous fish in the basin. The mouth of the Clearwater is located on the

Washington-Idaho border at the town of Lewiston, Idaho, where it enters the Snake River 139 river miles upstream of the Columbia River.

More than two-thirds of the total acreage of the Clearwater River Basin is evergreen forests (over 4 million acres), largely in the mountainous eastern portion of the basin. The western third of the basin is part of the Columbia plateau and is composed almost entirely of crop and pastureland. Most of the forested land within the Clearwater Basin is owned by the federal government and managed by the Forest Service (over 3.5 million acres), but the State of Idaho and Potlatch Corporation also own extensive forested tracts. The western half of the basin is primarily in the private ownership of small forest landowners and timber companies, as well as farming and ranching families and companies. There are some small private in-holdings within the boundaries of Forest Service lands in the eastern portion of the basin. Nez Perce Tribe lands are located primarily within or adjacent to Lewis, Nez Perce, and Idaho counties within the current boundaries of the Nez Perce Indian Reservation. These properties consist of both fee lands owned and managed by the Nez Perce Tribe, and properties placed in trust status with the Bureau of Indian Affairs.

Water quality limited segments are streams or lakes which are listed under section 303(d) of the Clean Water Act (CWA) for either failing to meet their designated beneficial uses, or for exceeding state water quality criteria. The current list of 303(d) listed segments was compiled by the Idaho Department of Environmental Quality (IDEQ) in 2010, and includes many stream reaches within the Clearwater Basin (IDEQ 2011). Individual stream reaches are often listed for multiple parameters, making tabular summary difficult. However, please refer to the following website for reach-specific 303(d) listed stream segments: http://www.deq.idaho.gov/water-quality/surface-water/monitoring-assessment/integrated-report.aspx.

Small-scale irrigation, primarily using removable in-stream pumps, is relatively common for hay and pasture lands scattered throughout the lower elevation portions of the subbasin, but the amounts withdrawn have not been quantified. The only large-scale irrigation/diversion system within the Clearwater Basin is operated by the Lewiston Orchards Irrigation District within the Lower Clearwater subbasin. Seventy dams currently exist within the boundaries of the Clearwater Basin. The vast majority of existing dams are within the Lower Clearwater subbasin (56), although dams also currently exist in the Lower North Fork (3), Lolo/Middle Fork (5), and South Fork (6) watersheds (Ecovista 2004a).

Agriculture primarily affects the western third of the basin on lands below 2,500 feet elevation, primarily on the Camas Prairie both south and north of the mainstem Clearwater and the Palouse rivers. Additional agriculture is found on benches along the main Clearwater and its lower tributaries such as Lapwai, Potlatch, and Big Canyon creeks. Hay production in the meadow areas of the Red River and Big Elk Creek in the American River watershed accounts for most of the agriculture in the South Fork Clearwater. Total cropland and pasture in the subbasin exceeds 760,000 acres. Agriculture is a particularly large part of the economy in Nez Perce, Latah, Lewis, and Idaho Counties, which all have large areas of gentle terrain west of the Clearwater Mountains. Small grains are the major crop, primarily wheat and barley.

Subwatersheds with the highest proportion of grazeable area within the Clearwater basin are typically associated with Forest Service grazing allotments in lower-elevation portions of their ownership areas. However, the majority of lands managed by the USFS within the Clearwater basin are not subjected to grazing by cattle or sheep, including all or nearly all of the Upper

Selway, Lochsa, and Upper and Lower North Fork watersheds. Privately owned property within the basin typically contains a high percentage of agricultural use, with grazeable lands found only in uncultivated areas.

Mines are distributed throughout all eight subbasins in the Clearwater Basin, with the fewest being located in the Upper and Lower Selway. Ecological hazard ratings for mines (delineated by the Interior Columbia Basin Ecosystem Management Project) indicate that the vast majority of mines throughout the subbasin pose a low relative degree of environmental risk. However, clusters of mines with relatively high ecological hazard ratings are located in the South Fork Clearwater River and in the Orofino Creek drainage (Ecovista 2004a).

2.4.1.2.1.2 Salmon River Basin

The Salmon River flows 410 miles north and west through central Idaho to join the Snake River. The Salmon River is one of the largest basins in the Columbia River drainage, and has the most stream miles of habitat available to anadromous fish. The total basin is approximately 14,000 square miles in size. Public lands account for approximately 91 percent of the Salmon River basin, with most of this being in Federal ownership and managed by seven National Forests or the BLM. Public lands within the basin are managed to produce wood products, forage for domestic livestock, mineral commodities, and to provide recreation, wilderness, and terrestrial and aquatic habitats. Approximately 9 percent of the basin land area is privately owned.

Primary land use on private lands is agricultural cultivation, which is concentrated in valley bottom areas within the upper and lower portions of the basin. Other land management practices within the basin vary among landowners. The greatest proportion of National Forest lands are federally designated wilderness area or are areas with low resource commodity suitability. One-third of the National Forest lands in the basin are managed intensively for forest, mineral, or range resource commodity production. The BLM lands in the basin are managed to provide domestic livestock rangeland and habitats for native species. State of Idaho endowment lands within the basin are managed for forest, mineral, or range resource commodity production.

Water quality in many areas of the basin is affected to varying degrees by land uses that include livestock grazing, stream channel alteration, road construction, logging, and mining. The IDEQ has classified many water bodies in the Salmon River Basin as impaired under section 303(d) of the CWA (IDEQ 2011). The primary parameters of concern are sediments, nutrients, flow alteration, high stream temperatures, and habitat alteration. Please refer to the following website for reach-specific 303(d) listed stream segments within the basin: http://www.deq.idaho.gov/water-quality/surface-water/monitoring-assessment/integrated-report.aspx.

Agricultural diversions within the Salmon River basin have a major impact near developed areas, particularly the Lemhi River, Pahsimeroi River, the mainstem Salmon River, and several other tributaries of the Salmon River. Although the majority of diversions accessible to ESA-listed species are screened, several need repair and upgrading. A major problem is localized stream dewatering due to over allocation. In addition to water diversions, numerous small pumping operations for private use occur throughout the subbasin. Impacts of water withdrawal on fish production are greatest during the summer month when stream flows are critically low. Grazing on private lands continues to impact aquatic and riparian habitat.

Mining, though no longer as active as it was historically, is still prevalent in parts of the Salmon River Basin. Impacts from mining include severe alteration of substrate composition, channel displacement, bank and riparian destruction, and loss of in stream cover and pool forming structures. Natural stream channels within the Yankee Fork, East Fork South Fork, and Bear Valley Creek have all had documented spawning and rearing habitat destroyed by dredge mining (Assessment, p. 81).

2.4.1.2.1.3 Snake River Basin

The Snake River originates at 9,500 feet, along the continental divide in the Wyoming portion of Yellowstone National Park. The Snake River flows 1,038 miles westward to the Idaho-Oregon border, and then to Pasco, Washington, where it flows into the Columbia River as a major tributary. At the Idaho-Oregon border (in the action area), the Snake River passes through Hells Canyon and Idaho Power Company's Hells Canyon Dam complex, which blocks upstream access for anadromous fish. The Snake River basin includes rugged mountains, semi-arid desert, fertile agricultural land (primarily irrigated), and barren outcrops of lava flows. Rangeland, lava flows, and timber are the dominant land covers in the basin, with pine and spruce forests at the higher elevations.

Irrigated agriculture is one of the primary land uses in the Snake River basin. Upstream from the Hells Canyon Dam complex there are 31 dams and reservoirs with at least 20,000 acre-feet of storage each. The Bureau of Reclamation, Idaho Power Company, and a host of other organizations own and operate various water storage facilities, which have substantial influence on water resources and the movement of surface and groundwater through the region.

Development of the middle and upper Snake River for irrigation, and later for hydroelectricity, has severely altered aquatic conditions. Development for irrigation began in the late 1860s when the first major irrigation diversion was built. The first hydroelectric dam (Swan Falls) was built in 1901. Today, there are at least 44 hydroelectric projects and countless diversions, all of which have cumulatively affected the hydrology of the Snake River and its tributaries and the aquatic species present.

Within the Snake River portion of the action area, the IDEQ has listed several streams under section 303(d) of the CWA for either failing to meet their designated beneficial uses, or for exceeding state water quality criteria. IDEQ updated the 303(d) list in 2010, and it includes seven stream reaches within the Hells Canyon and Lower Snake River Asotin subbasins. These stream reaches are listed for parameters such as water temperature, sedimentation/siltation, *escherichia coli,* dissolved oxygen, pH, and nutrient/eutrophication biological indicators. Please refer to the following website for reach-specific 303(d)-listed stream segments: http://www.deq.idaho.gov/water-quality/surface-water/monitoring-assessment/integrated-report.aspx.

2.4.1.2.2 Climate Change

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

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 2, below, shows bull trout critical habitat within the action area. Within the action area, there are 6,240 stream miles and 20,770 acres of lake or reservoir critical habitat. In Idaho, total 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. 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.

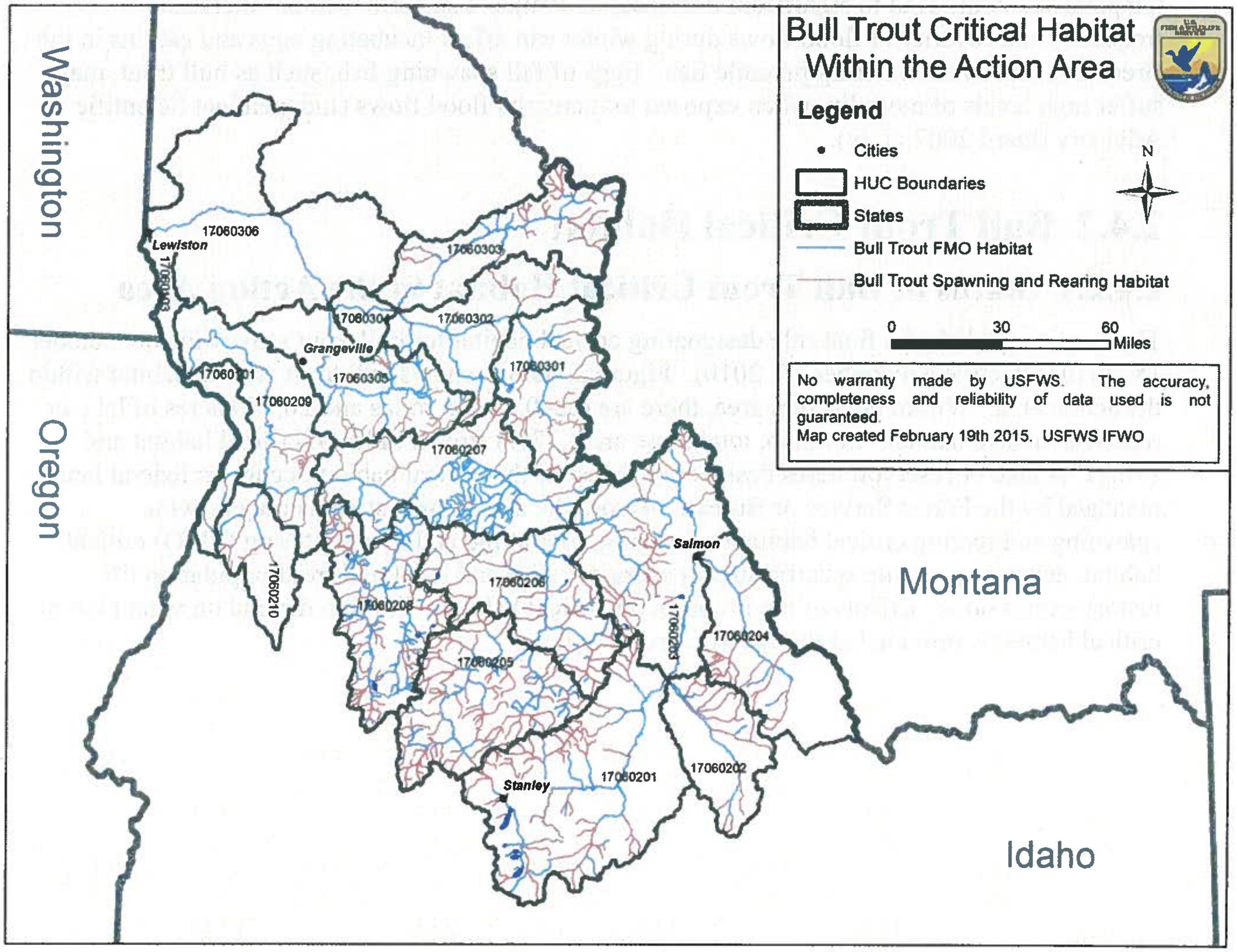

Figure 2. Bull Trout Critical Habitat within the Action Area

2.4.2.2 Factors Affecting Bull Trout Critical Habitat in the Action Area

Factors affecting critical habitat are similar to those described above for the species.

2.5 Effects of the Proposed Action

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

The actions covered by this consultation have predictable effects. The Service has conducted individual and programmatic consultations on activities similar to those in the proposed action throughout Idaho over the past 15 years, and the information gained from monitoring and feedback has been applied to refine project design criteria and conservation measures. Habitat improvement projects that are less predictable will be reviewed prior to approval or will require individual consultation.

2.5.1 Bull Trout

2.5.1.1 Direct and Indirect Effects of the Proposed Action

The habitat improvement actions completed under this Program will have long-term beneficial effects to salmonids and their habitats. Habitat improvement projects carried out in critical habitat will improve the condition of habitat at the site and within the watershed. The implementation of many activities will have some unavoidable short-term adverse effects such as increased stream turbidity and riparian disturbance, in order to gain more permanent habitat improvements. Short-term adverse effects are generally associated with near and in-stream construction (disturbance to fish and effects from increased turbidity), dewatering, chemical contamination (by construction equipment or application of chemical herbicides), and fish handling. The magnitude of these effects would vary as a result of the nature, extent, and duration of the individual project activities, as well as how successful the minimization measures are, though the major factors would be whether or not any work occurs in the stream and whether ESA-listed fish are present at the time of implementation.

The Service does not expect that every project carried out under the Program will have adverse effects to bull trout or bull trout critical habitat. Even for projects in occupied habitats there will be a range of effects depending on the size of the stream, the geology of the basin, soil types, condition of the riparian area, the type of project, the nature of bull trout use at the project site, the ability of fish to escape to unaffected areas, the type of habitat provided at the site, and other factors. In some cases the effects to bull trout will be insignificant because of their limited extent or discountable when fish are unlikely to be present or absent. The programmatic nature of this consultation limits our ability to consider the site specific factors. For the section 7(a)(2) analysis of this Program, it is prudent to anticipate that projects occurring in occupied habitat have equal potential to affect bull trout. Accordingly, we have analyzed what we consider to represent the most severe effects expected to occur throughout the action area. We expect temporary (during the project) and short-term (up to one year) adverse effects to bull trout from noise and disturbance, fish handling and stream dewatering, increased sediment and turbidity, and chemical contamination. We expect most projects to have immediate to long-term beneficial effects.

2.5.1.1.1 Beneficial Effects

The activities covered under this consultation are aimed at protecting or restoring aquatic habitat, with long-term benefits for ESA-listed fish species and their habitat. Projects that improve habitat conditions can lead to increases in population abundance, productivity, improved genetic integrity, and increased habitat and refugia.

- **Fish screening** projects will prevent fish from entering and becoming stranded in unscreened or inadequately-screened diversion ditches. This will decrease mortality caused by diversion ditches and could thus increase production and abundance.
- **Fish passage** projects will restore fish passage at human-made barriers, increasing access for all salmonid life stages to historical habitat, thereby potentially increasing population spatial structure. Restoring passage through culverts and other structures will provide access to historically important habitat and can result in immediate expansions in distribution of bull trout in some cases while in other cases this action will restore connectivity between existing bull trout subpopulations. Culvert replacement projects will also be designed to prevent stream bank and roadbed erosion and facilitate natural sediment and wood movement.
- **In-stream flow** projects will increase stream flows in some reaches, thereby improving spawning, rearing, and migration conditions for salmonids, as well as restoring riparian functions. Acquiring water from irrigators through purchase or lease has the potential to improve habitat quality in all stream reaches downstream from the original point of diversion. Moving points of diversion downstream from severely water limited reaches can improve habitat function for those reaches, and can dramatically improve habitat function of entire drainages if the water limited reach impaired upstream or downstream fish passage. Increasing efficiency of water transmission facilities can also reduce the amount of water diverted and, therefore, improve stream flow.
- **In-stream structures** will enhance spawning, rearing, and migration habitat for salmonids through a combination of mechanisms by: Increasing pockets of low-velocity holding habitat; increasing in-stream structural complexity and diversity including pool formation; providing high flow refugia; increasing interstitial spaces for benthic organisms; reducing embeddedness in spawning gravels and promoting spawning gravel deposition; reducing siltation in pools; reducing the width/depth ratio of the stream; mimicking natural input of LWD (e.g., whole conifer and hardwood trees, logs, root wads); deflecting flows into adjoining floodplain areas to increase channel and floodplain function; and increasing bank stability and riparian vegetation. These improvements in habitat can increase population productivity and abundance.
- **Side-channel, floodplain, and channel reconstruction** projects will restore and provide access to historic side-channel habitat and will increase floodplain function. Restoring side-channels will improve aquatic and riparian habitat diversity and complexity while reconnecting stream channels to floodplains. These types of restoration projects may reduce erosion, increase hyporheic exchange, provide long-term nutrient storage, increase retention of organic material, and provide refuge for fish and other aquatic species when flows or temperatures are unsuitable in the main stream channel. Levee modification or removal can improve fish habitat, reduce erosion, improve water quality, reduce high flow velocities, enhance groundwater recharge, and reduce flooding in other sections of

the river. These improvements in stream habitat can increase salmonid productivity and abundance.

- **Riparian vegetation** projects will reestablish native riparian vegetation in order to stabilize stream banks, provide shade and future sources of LWD, and encourage the development of protective cover and undercut banks for fish and other aquatic species.
- **Road and trail** projects will reduce fine sediment delivery to streams; prevent road failures, thereby reducing turbidity and embeddedness, and improving spawning and rearing habitat and future large woody debris recruitment.

2.5.1.1.2 Other Potential Effects

As stated above, many of the restoration activities included in this Program will have short-term insignificant or adverse effects to bull trout and bull trout critical habitat. The mechanisms of effect stem primarily from activities in and near streams and the associated conservation measures designed to minimize effects to listed fish, such as stream dewatering and fish salvage. The proposed activities have the potential to directly affect individual fish (temporarily) through noise and disturbance at construction sites, reduced water quality, and handling and stranding. The following table illustrates the potential mechanisms of effect we identify from the Program activities. Whether or not these effects are realized depends on the specific project.

Table 7. Program Activities and Associated Mechanisms of Effect

Action Category	Mechanisms of Effect					
	Noise, Disturbance	Sediment, Turbidity	Fish Handling	Dewatering, Stranding	Temp	Chemical Contamination
Fish Screening	X	X	X	X		X
Fish Passage	X	X	X	X	X	X
In-Stream Flow	X	X	X	X	X	X
In-Stream Structures	X	X	X	X		X
Side Channels and Floodplain Function	X	X			X	X
Channel Reconstruction	X	X	X	X	X	X
Riparian Habitat		X				X
Road and Trail Erosion Control, Maintenance, and Decommissioning	X	X				X
Surveying and Monitoring	X	X		X		

2.5.1.1.2.1 Noise and Disturbance

Heavy equipment operation for multiple categories of activities may create noise, vibration, and other disturbances. Besides temporary stream crossings, which are to be minimized, heavy equipment operation would only occur away from the stream channel, or in dewatered stream channels.

Popper et al. (2003) and Wysocki et al. (2007) discussed potential impacts to fish from long-term exposure to anthropogenic sounds, predominantly air blasts and aquaculture equipment, respectively. Popper et al. (2003) and Popper and Hastings (2009) reported possible effects to fish include temporary, and potentially permanent hearing loss (via sensory hair cell damage), reduced ability to communicate with conspecifics due to hearing loss, non-auditory tissue damage, and masking of potentially biologically important sounds. Studies referenced by Popper et al. (2003) evaluated peak noise levels ranging from 170 to 255 dB (re: 1µPa). Wysocki et al. (2007) did not identify any adverse impacts to rainbow trout from prolonged exposure to three sound treatments common in aquaculture environments (115, 130, and 150 dB RMS) (re: 1µPa). In the studies identified by Popper et al. (2003) that caused ear damage in fishes, all evaluated fish were caged and thus incapable of moving away from the disturbance. Popper and Hastings (2009) discuss how differences in how fish use sound (i.e., generalist versus specialists), fish size, development, and possibly genetics can lead to different effects from the same sounds. As a result, they caution that studies on the effects of sound, particularly if they are from different sources, are not readily extrapolated between species, fish sizes, or geographic location.

Machinery operation adjacent to the stream will be intermittent in all cases. The U.S. Federal Highway Administration (FHWA 2008) indicates that backhoe and truck noise production ranges between 80 and 89 dB. It is unknown if the expected dB levels will cause fish to temporarily move away from the disturbance or if fish will remain present. Visual stimulus from the nearby activities may also cause temporary behavior modifications. Even if fish move, juveniles are expected to migrate only short distances to an area where they feel more secure and only for a few hours in any given day. Migrating adult fish (for projects where passage is still available) would likely simply continue their upstream or downstream migration unharmed. We do not anticipate that short-term movements caused by construction equipment will result in effects substantially different than those typically experienced by fish in their natural environment. The expected levels of noise and disturbance caused by construction equipment will be minimal and are unlikely to result in injury or mortality. The Service does not consider these effects would cause a significant disruption to normal feeding, holding or sheltering behavior or other adverse effects.

There may be instances where equipment needs to cross a stream prior to dewatering. Given the conservation measures limiting the location and frequency of crossings and other conservation measures as described in **Section 2.1.3.3.1**, we do not expect bull trout to be harmed or displaced by equipment fording. Effects are not expected to be significant.

2.5.1.1.2.2 Effects from Increased Suspended Sediment and Turbidity

As shown in Table 7 many of the activities covered by this programmatic will increase suspended sediment or turbidity either by releasing sediment from the substrate or by disturbance along the stream bank or floodplain. Sediment is a very important stressor to salmonids and can affect them in both direct and indirect ways. Bull trout are highly susceptible to sediment inputs and of all salmonids require the lowest turbidity and suspended sediment levels for spawning, incubation, and juvenile rearing. The Service knows of no positive effects to salmonids from increased sediment; while the potential negative impacts of increased suspended sediment on bull trout and other salmonids have been well documented (e.g., Bakke et al. 2002, p.1; Newcombe and MacDonald 1991, pp. 72-73; Newcombe and Jensen 1996, p. 700-715; Bash et al. 2001, p. 24).

Increased sediment and suspended solids have the potential to affect primary production and benthic invertebrate abundance, due to reductions in photosynthesis within murky waters. Thus, food availability for fish may be reduced as sediment levels increase (Cordone and Kelley 1961, pp. 189-190; Lloyd et al. 1987, p. 18; Henley et al. 2000, pp. 129-133). Sediment can also reduce the health of in-stream plants, thereby reducing cover for fish making them more vulnerable to predation (Waters 1995, pp. 111-116). Pools, which are an essential habitat type, can be filled by sediment and degraded or lost (Megahan 1982, p. 114).

Increases in suspended sediment have been shown to affect salmonid behavior in several ways. Social (Berg and Northcote 1985, p. 1410) and feeding behavior can be disrupted by increased levels of suspended sediment. Fish may avoid high concentrations of suspended sediments altogether (Hicks et al. 1991, p. 483-485). Even small elevations in suspended sediment may reduce feeding efficiency and growth rates of some salmonids (Sigler et al. 1984, p. 142). Based on their experiments with juvenile rainbow trout (*Oncorhynchus mykiss)*, Suttle et al. (2004, p. 973) concluded that "fine sediment deposition, even at low concentrations, can decrease growth and survival of juvenile salmonids." They found "no threshold below which fine-sediment addition is harmless."

Activities carried out under the Program are likely to suspend in-channel sediments and cause turbidity plumes while work occurs in the stream channel or along the banks and when a stream is re-watered. In addition, overland sediment delivery could occur if the proposed containment measures prove ineffective. Turbidity can cause lethal, sublethal, and behavioral effects in juvenile and adult salmonids depending on the duration and intensity (Newcombe and Jensen 1996, p. 700-715). Increased turbidity levels in the action area may result in temporary displacement of fish from preferred habitat or potential sublethal effects such as gill flaring, coughing, avoidance, and increase in blood sugar levels.

Conservation measures are intended to prevent the majority of sediment from being delivered to stream habitat but cannot prevent all sediment due to the nature of the in-channel work. Bull trout may experience short-term adverse effects as a result. Substrate may inadvertently fall from excavation equipment buckets or accidentally be pushed over stream bank edges while working in close proximity to the stream channel during site preparation or during structure repair, replacement, or installation (e.g., culverts). Rain events during and following construction activities may also result in mobilization of disturbed soils resulting in stream delivery, even with sediment control measures in place. Re-watering of dewatered stream reaches may mobilize sediment in areas disturbed by project activity, such as channel reconstruction. However, conservation measures will minimize the risk of sediment entering streams (as described in sections **2.1.3.3. and 2.1.3.4** of this Opinion). The Project Sponsor will carry out erosion and pollution control measures commensurate with the scope of the action.

Sediment plumes may occur downstream of project sites immediately after reintroducing stream flow to a dewatered reach. Based on past projects that required stream dewatering, the Service expects that any resulting sediment plumes associated with the proposed action will be observable 600 to 1000 feet and will dissipate within a few minutes to hours at any given project site (Casselli et al. 2000; Jakober 2002; Foltz et al. 2012; Eisenbarth 2011, 2013; BPA 2013). Harmful effects are likely within up to 1000 feet while effects from increased sediment/turbidity will be insignificant beyond that.

Conservation measures included in the proposed action for re-watering stream channels will reduce the amount of sediment released. 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 minimize a sudden increase in turbidity. When re-watering begins, the Project Sponsor will monitor turbidity every hour 600 feet downstream from the point of discharge. If turbidity levels exceed 50 NTUs over background levels for two consecutive readings (2 hours), the Project Sponsor must cease work immediately and take measures to reduce turbidity before continuing to reintroduce streamflow. Sediment transport from any temporary bypass channels will be minimized due to the provision for lined channels or the use of plastic pipes to convey water around the construction site.

Affected streams are likely to quickly return to background suspended sediment levels considering the expected small volume of substrate likely to be introduced (Casselli et al. 2000; Jakober 2002). Bull trout will likely respond to a turbidity plume by avoiding the plume and temporarily seeking refuge nearby. Fish present downstream from program activities are thus expected to be able to avoid or reduce their exposure to turbidity by swimming to adjacent, less turbid habitat (i.e., behavioral response only). However, harm may still occur as a result of increased turbidity; likewise, exposure of juveniles to predators will likely increase as they seek alternate rearing habitat.

The potential effects of sediment deposition on fish habitat, and subsequently on individual fish, also include smothering of redds and spawning gravels, changes to primary and secondary productivity, and reduction of available cover for juveniles. Egg-to-emergence survival and size of alevins is negatively affected by fine sediment intrusion into spawning gravel (Young et al. 1991, p. 345). Fine sediment deposition in spawning gravel reduces the oxygen supply rate to redds (Wu 2000, p. 1595). However, given the in-stream work windows are specifically designed to avoid spawning periods, spawning adults, redds, eggs, and alevins will not be affected.

Fine sediment delivery to streams can reduce cover for juvenile salmonids (Bjornn and Reiser 1991, p. 83). Fine sediment can fill pools as well as interstitial spaces in rocks and gravels used by fish for thermal cover and for predator avoidance. The Service expects that juvenile cover will be adversely affected in the short-term within the affected stream reach and for 1000 feet downstream; but that habitat quality will then recover as fine sediments are flushed downstream during high flows after project completion. Downstream of 1000 feet, effects to cover will be insignificant. Because of the expected effectiveness of the proposed sediment control BMPs, we do not expect that enough sediment deposition will take place to alter salmonid use of the habitat. Furthermore, project-related sediments introduced into the stream channel will be a much smaller amount than the annual sediment budget of a watershed, such that sediment impacts from the program will be discountable at the watershed-scale.

Introduction of sediment due to equipment fording of streams at designated temporary crossings not within the dewatered work area will also result in increased suspended sediment/turbidity, with elevated turbidity expected to last less than one hour after each ford and for a short distance, less than 100 feet, downstream. The Service estimates that the levels of turbidity from stream fording are expected to be less than other Program activities because equipment will move through the channel very quickly and infrequently (up to two round trips per project), disturbance to the stream bed is not expected to significant, and plumes are not expected to exceed 50 NTU and dissipate very quickly with no significant effects to bull trout. Considering application of conservation measures (**2.1.3.3 General Conservation Measures**) the Service expects that fording the channel could result in suspended sediment levels triggering effects ranging from minor to moderate physiological stress and increased rates of coughing and respiration, and impaired homing. All these effects can be considered harmful to fish exposed to these conditions.

2.5.1.1.2.3 Effects from Fish Handling

Dewatering of stream channels and associated fish-handling procedures to remove fish from bull trout occupied stream reaches may adversely affect individual bull trout. In-stream work windows are generally early July to mid-August, during which time adult and juvenile bull trout may be present depending on the location. Any work area within a wetted stream channel will be isolated from the active stream whenever ESA-listed fish are reasonably certain to be present, or if the work area is 300 feet or less upstream from spawning habitats, except for large wood restoration actions.

Fish within the isolated work area may be herded out of the work area, and then potentially captured using a trap, seine, hand net, or other methods as prudent to minimize the risk of injury, and then released at a safe release site. Capture and release will be supervised by a fishery biologist experienced with work area isolation and competent to ensure the safe handling of all fish. Additionally, dewatering may result in stranding of some bull trout.

Electrofishing will be implemented only where other means of fish capture are not feasible or effective, and will follow the NMFS (2000b) electrofishing guidelines. Incorporating NMFS electrofishing guidelines and Idaho Department of Fish and Game (IDFG) collection permit requirements, will minimize stress, mortality, and competitive effects to bull trout, and will ensure that trained and capable personnel are performing the clearing operations.

Conservation measures provided in the proposed action are designed to reduce the potential for injury and mortality throughout the dewatering procedures. However, we expect dewatering and handling will disrupt normal behavior and cause short-term stress for all bull trout located within a dewatered stream channel, and limited injury and mortality of individuals. In the following sections, we attempt to numerate how many bull trout may be injured or killed through the various steps of dewatering a stream channel.

The following analysis of fish handling impacts relies on the assumption that approximately 40 projects per year will be implemented under this consultation, consistent with the Assessment (p. 86). At most, half (20) of these projects would involve in-stream construction and work area isolation—based on Bonneville Power Administration's Habitat Improvement Project (BPA HIP) programmatic consultation, a highly similar action, under which 20 of 53 habitat restoration projects in Idaho from 2008 to 2012 involved in-stream work and fish handling (NMFS 2014, p. 80). This does not mean this programmatic is limited to 20 in-water work projects a year – the estimate is used to provide context for effects to bull trout; as long as programmatic effects have been appropriately analyzed, additional individual projects involving dewatering may occur.

2.5.1.1.2.3.1 Block Nets

Prior to dewatering a stream section and before fish salvage occurs, block nets will be placed at the upstream and downstream ends of the in-stream work area to prevent fish migration into the work site. Depending on the type of project and passage upstream of the project, either the upstream or downstream block net will not be placed until after the seining (or herding) operations (discussed below) occur. The use of block nets poses a risk to bull trout due to impingement, even when monitored regularly. Although bull trout will have a general avoidance response to the work area, they may be startled and, in trying to move away from the disturbance, become entangled in the block nets causing injury or death. The Service assumes that personnel will be available while block nets are in place to remove bull trout promptly, thus minimizing effects of impingement.

For this Program, fish will be cleared out of the work area, the streamflow will be diverted around the project area, and then the block nets will be removed all in the same day to reduce the incidence of bull trout mortality. On rare occasions, block nets may remain in the stream overnight when the fish capture and diversion activities require additional time to complete.

The Service conservatively assumes that there is potential for bull trout to be impinged on block nets during each project that requires dewatering. Previously, for similar types of restoration projects (USFWS 2012, p. 57), the Service has assumed that a small percentage (3.5 percent) of bull trout would die due to impingement. Assuming that we may expect 17 bull trout to be handled for each project (see discussion below regarding estimates), we estimate that 1 bull trout may die due to impingement per site, or 20 per year.

2.5.1.1.2.3.2 Slow Dewatering and Herding

As described in the proposed action (section 2.1.3.3.2), a site will be slowly dewatered (up to 80 percent of flow) to encourage fish to volitionally move out of a work area. After that, a block net will be installed and fish may be hazed out of the proposed dewatered sections by walking seines or dip nets from the block net location to the end of the work site in an attempt to "herd" fish out of the worksite. The other block net would then be placed and efforts to capture remaining fish would follow. Fish captured by nets would be held in buckets filled with cold stream water for a period only long enough to transport fish to an appropriate release site. Buckets will likely be placed into the water and slowly inverted to allow captured fish to move into the selected release sites. After fish clearing operations are complete, the remaining flow will be diverted to allow work to occur within the dewatered reach.

Capturing and handling fish causes them stress, though they typically recover fairly rapidly from the process. Types of stress likely to occur during project implementation include increased plasma levels of cortisol and glucose (Frisch and Anderson 2000, p. 23; Hemre and Krogdahl 1996, p. 250). Even short-term, low intensity handling may cause reduced predatory avoidance for up to 24 hours (Olla et al. 1995, p. 393). The primary contributing factors to stress and death from handling with nets and buckets are differences in water temperatures (between the river and wherever the fish are held), dissolved oxygen conditions, the amount of time that fish are held out of the water, and physical trauma. Stress on salmonids increases rapidly from handling if the water temperature exceeds 64.4°F or dissolved oxygen is below saturation.

It is difficult to predict how many bull trout may be harassed or handled by slow dewatering and herding under this Programmatic. Depending on the site, dewatering and herding may be successful tools to minimize the effects of additional handling on bull trout by reducing the number of individuals exposed to electrofishing. Given the lack of data regarding the number of bull trout that may volitionally move during slow dewatering and captured during herding and netting activities, the Service assumes that all bull trout within a given reach will be harassed during this process and normal behavior will be disrupted. We do not attempt in this Opinion to provide an estimate on the number of fish that may leave an action area prior to fish handling efforts.

2.5.1.1.2.3.3 Electrofishing

After fish herding and prior to complete stream dewatering or diverting, electrofishing will occur to ensure the area is clear of fish. The effects of electrofishing on salmonids will consist of the direct and indirect effects of exposure to an electric field, capture by netting, and handling associated with transferring the fish back to the river. Most of the studies on the effects of electrofishing have been conducted on adult fish greater than 12 inches in length (Dalbey et al. 1996, p. 560). The few studies that have been conducted on juvenile salmonids indicate that spinal injury rates are substantially lower than they are for large fish. Smaller fish intercept a smaller head-to-tail potential than larger fish (Sharber and Carothers 1988, p. 117) and may therefore be subject to lower injury rates (Dalbey et al. 1996, p. 569; Thompson et al. 1997, p. 154). McMichael et al. (1998, p. 895) found a 5.1 percent injury rate for juvenile middle Columbia River steelhead captured by electrofishing in the Yakima River subbasin; while Ainslie et al. (1998, p. 915) reported injury rates of 15 percent for direct current applications on juvenile rainbow trout. Studies (Sharber and Carothers 1988; Dalbey et al. 1996; Dwyer and White 1997) show that the incidence and severity of electrofishing damage is partly related to the experience of the crews, type of equipment used, and the waveform produced. Only a few recent studies (Ainslie et al. 1998; Dalbey et al. 1996) have examined the long-term effects of electrofishing on salmonid survival and growth. These studies indicate that although some of the fish suffer spinal injury, few die as a result. However, severely injured fish grow at slower rates and sometimes show no growth at all (Dalbey et al. 1996, p. 569).

Electrofishing will be conducted by qualified personnel with appropriate training and experience, who will follow standard guidelines (NMFS 2000b) that will minimize the levels of stress and mortality related to electrofishing. For example, field crews will be trained in observing animals for signs of stress and know how to adjust electrofishing equipment to minimize that stress. Although McMichael et al. (1998, p. 898) indicated electrofishing injury rates for wild salmonids were only 5 percent, NMFS notes that as many as 25 percent (Nielson 1998, p. 8) of the total number of fish electrofished could be injured (including dying) to account for variable site conditions, experience levels, and not readily apparent or delayed injury. For this Opinion, we will follow Nielson (1998) and estimate that up to 25 percent of collected bull trout may be injured. Therefore, for each project that requires electrofishing, up to five bull trout may be injured due to electrofishing (25 percent of 17 rounded up) or up to 100 bull trout per year.

Bull trout that are collected during electroshocking efforts will be released away from the project site at suitable locations and where they will not likely be in danger of subsequent impingement on nets. If they are released downstream, they should be released far enough downstream to not experience sediment effects from the project. Fish that are forced to new habitat may be released into habitat already occupied by bull trout or other resident fish, and may have to compete for available habitat and niches. As a result of being moved, bull trout may suffer from increased competition, loss of cover, stress, and subsequent reduced feeding efficiencies. These behavioral effects may be resolved very quickly if habitat space is readily available, or fish may be forced to seek out appropriate habitat. Overall, the injurious effects of relocation are expected to be temporary (less than a day), sublethal, and bull trout are expected to adjust to their new habitat quickly.

2.5.1.1.2.3.4 Stranding During Stream Dewatering

During stream dewatering a small percentage (up to 5 percent) of bull trout may avoid being captured and relocated, and thus may die from being stranded in the dewatered work area. Assuming that we may expect 17 bull trout to be handled for each project (see discussion below regarding estimates), we estimate that 1 bull trout may die due to stranding per site, or 20 bull trout per year.

2.5.1.1.2.3.5 Bull Trout Estimates for Fish Handling

As stated above, estimating the number of bull trout handled is difficult given the scale of the Program, the wide range of habitat in Idaho, whether or not a stream is occupied, and the productivity of the habitat being dewatered. In order to make an attempt at estimating the number of bull trout that may be handled via electrofishing at any given project, the Service analyzed bull trout take reports submitted by IDFG from 2009 to 2013. The reports included the number of bull trout handled via electrofishing for both fish population studies and fish salvage for in-stream projects. While the records do not provide a reliable estimate of bull trout density for Idaho streams, they provide us with an approach to determine how many bull trout are likely to be salvaged during a project. Over the five year period, on average 17 bull trout were handled per project during electrofishing operations. In streams, most of the fish handled were juveniles (less than 300 mm in length), with adults making up a larger proportion in mainstem rivers or larger tributaries. Using the same average we estimate 340 bull trout may be captured during work area isolation, including juveniles and adults, per year for the Program (assuming 20 projects per year require dewatering).

Even though the Service understands that projects may be completed in unoccupied bull trout habitat, due to the absence of priority based criteria to govern the selection of restoration projects, it is possible that every in-stream project completed under this programmatic could occur within occupied habitat. Therefore, the Service assumes that each project may occur in an occupied stream reach and affect bull trout within the stream reach.

The estimated 340 bull trout captured during work area isolation would experience lethal and non-lethal effects. We make the following assumptions for calculating injury and death rates of bull trout for the Programmatic on a yearly basis.

- We estimate that 1 bull trout may die due to impingement on block nets per site, or 20 bull trout per year.
- A maximum of 20 project sites per year are likely to involve dewatering of stream reaches and handling and removal of bull trout from these stream reaches. An estimated 340 bull trout will be handled each year.
- Although IDFG reports indicate that few bull trout are harmed during electrofishing, the Service assumes that project electrofishing will injure or kill up to 25 percent (Nielson

1998) of bull trout captured – or up to 100 bull trout (4.25 bull trout per site rounded up to 5 multiplied by 20 sites), per year.

- During stream dewatering a small percentage (up to 5 percent) of bull trout may avoid being captured and relocated, and thus may die from being stranded in the dewatered work area. The Service estimates 1 bull trout may be stranded per project, or up to 20 bull trout per year.

Adequate monitoring of the number of fish handled will be necessary to validate assumptions and to adaptively manage the programmatic consultation to minimize effects to bull trout over time.

2.5.1.1.2.4 Temperature

The proposed action has the potential to reduce streamside shade through the removal of riparian vegetation. Reductions in shade can increase the amount of solar radiation reaching the stream surface and lead to increases in steam temperatures. As described in Spence et al (1996, entire) elevated water temperatures may adversely affect salmonid physiology, growth, and development, alter life history patterns, induce disease, and may exacerbate competitive predator-prey interactions (Spence et al. 1996). Individual projects will be designed to preserve existing vegetation and in instances where riparian shrubs are removed during construction, vegetation will be replanted. Many actions under this consultation will result in long-term increases in shade. Because actions completed under this programmatic consultation will occur at disturbed sites in need of habitat restoration and vegetation removal will be kept to the minimal amount necessary to complete the project, short-term riparian vegetation removal is expected to be insignificant and will have un-measureable effects on stream shade and stream temperature.

2.5.1.1.2.5 Chemical Contamination

2.5.1.1.2.5.1 Equipment

Petroleum-based contaminants such as fuel, oil, and some hydraulic fluids, contain poly-cyclic aromatic hydrocarbons, which can cause chronic sublethal effects to aquatic organisms (Neff 1985, p. 420). Fuels and petroleum products are moderately- to highly toxic to salmonids, depending on concentrations and exposure time. Free oil and emulsions can adhere to gills and interfere with respiration, and heavy concentrations of oil can suffocate fish. Evaporation, sedimentation, microbial degradation, and hydrology act to determine the fate of fuels entering fresh water (Saha and Konar 1986, p. 506). Ethylene glycol (the primary ingredient in antifreeze) has been shown to result in sublethal effects to rainbow trout at concentrations of 20,400 mg/L (Staples 2001, p.377). Brake fluid is also a mixture of glycols and glycol ethers, and has about the same toxicity as antifreeze.

Impacts to water quality through chemical contamination could affect bull trout. Heavy machinery use in or near stream channels raises concern for the potential of an accidental spill of fuel, lubricants, hydraulic fluid, and similar contaminants in the riparian conservation area, or directly into the water where they could adversely affect habitat, injure or kill aquatic food organisms, or directly impact bull trout. However, all equipment would be inspected for leaks and, if necessary, repaired prior to working in or near a stream and hydraulic fluids must be non-toxic to salmonids (i.e. vegetable based according to the conservation measures in section **2.1.3.3 General Conservation Measures**). The Program also provides avoidance and minimization measures related to fuel storage and refueling areas. Due to these and other project design features, the possibility of petroleum-based products reaching occupied waters is unlikely. If a spill occurs, amounts likely would be small because they would be associated with individual vehicles or equipment and not associated with larger fuel transport and related transfer operations. In addition, it is unlikely that any machinery or equipment fluids would be spilled in volumes or concentrations large enough to harm bull trout in or downstream of a project area. Given these project design features and best management practices, the effects to bull trout associated with accidental chemical contamination are expected to be discountable.

2.5.1.1.2.5.2 Herbicides

Herbicides may be applied to invasive plant species in or near riparian areas under this Program, in order to make space for native plant species that may provide greater riparian function to aquatic habitat, such as shade, large woody debris recruitment, or bank stability. The conservation measures in the proposed action are designed to minimize the risk of herbicides entering surface water and thereby impacting ESA-listed fish or their prey base. However, due to the possibility of surface water run-off, leaching through ground water, or wind drift, small amounts of herbicide could enter streams or other surface water, negatively impacting ESA-listed species. The analysis of the effects of herbicides on salmonids in this Opinion is based on: (1) Assessing the likelihood that listed fish and other aquatic organisms will be exposed to the herbicides, and estimating the concentrations of herbicides to which fish would be exposed; (2) reviewing the toxicological effects of the herbicides, inert ingredients, and adjuvants on listed fish and other aquatic organisms; and (3) comparing the estimated concentrations of herbicides in surface water from the proposed action to the concentrations known to cause lethal and sublethal effects to salmonids.

Under the proposed action, the risks to salmonids from herbicides are likely to stem primarily from direct toxicological effects of the herbicides and adjuvants on the fish, rather than through effects on aquatic vegetation or prey species. However, both types of effects may occur and are considered in this Opinion. Unfortunately, the toxicological effects and ecological risks to aquatic species, including ESA-listed fish, are not fully known for all herbicides, end-use products, and adjuvants in the proposed action.

Since herbicides could be applied throughout the plant growing season, all life stages of the ESA-listed salmonids in Idaho could potentially be exposed to herbicides, including incubating eggs, rearing juveniles, and adults. Herbicides can enter water through spray drift, surface water runoff, percolation, groundwater contamination, and direct application. The proposed action includes numerous conservation measures intended to minimize or avoid water contamination from herbicides. The conservation measures include stream and riparian buffers where chemical use is restricted or prohibited, limits on the amount of chemicals applied to a given area, and rules governing application methods and timing. The direct application of herbicides to surface water is not allowed. The likelihood of herbicides entering the water depends on the type of treatment and mode of transport.

Wind drift is a significant source of off-site herbicide transport with aerial applications (not allowed under the proposed action), but may also occur during boom or hand spraying. Wind drift is more likely to occur during aerial applications, and less likely to occur to a significant extent during ground-based spraying, unless sprays are directed into the air, or sprays are delivered in a fine mist. Wind drift is largely dependent on droplet size, elevation of the spray nozzle, and wind speed. The smaller a droplet, the longer it stays aloft in the atmosphere, allowing it to travel farther. In still air, a droplet of pesticide the size of 100 microns (mist-size) takes 11 seconds to fall 10 feet. The same size droplet at a height of 10 feet travels 13.4 feet horizontally in a 1 mile per hour wind, and 77 feet at 5 mph wind. Thus the proposed action includes wider stream buffers at wind speeds over 5 mph. During temperature inversions little vertical air mixing occurs and drift can transport long distance. This possibility is addressed through a conservation measure prohibiting spraying when wind speeds are less than 2 mph and there is a potential for temperature inversions. Since aerial application is not part of the proposed action, it is likely that spray drift will reach water only where chemicals are applied in riparian areas. Water contamination through wind drift from ground application of chemicals to riparian areas is likely to be small due to the short distance that a spray droplet is likely to travel as a result of the wind speed restrictions and no-spray buffers.

In the absence of aerial spraying, herbicide transport by surface runoff or percolation are the most likely mechanisms to cause water contamination with the proposed action, but the potential is minimized by timing spray activities to avoid precipitation and the use of no-spray buffers along stream courses. The no-spray buffers reduce the potential for chemicals to reach streams from overland flows by surface flows that might otherwise carry herbicides directly into a stream. The use of riparian buffers for interrupting overland flows is well-established as an effective mitigation technique for reducing sediment delivery to streams and the same mechanism would reduce delivery of herbicides from surface runoff. Overland flows occur when precipitation or snowmelt rates exceed the infiltration capacity of soils, which occurs infrequently throughout the action area. Overland flows are likely to occur briefly during intense thunder storms in summer, during the spring runoff period (at elevations where there is significant snow accumulation), or extended rainy periods. The proposed action includes provisions to suspend spraying when rain is likely to occur. However, summer thunderstorms are not entirely predictable and there is no practical way to ensure that rainfalls will not occur in herbicide treatment areas shortly after herbicides are applied.

Introduction of herbicides into a stream though percolation occurs when herbicides dissolve in water and through gravity and capillary action, are transported through the soils into an aquifer connected to the stream channel. Water contamination through groundwater is a highly variable process and is not readily predictable. In general, the distance from the point where herbicides reach an aquifer to a stream likely affects the concentration of the herbicides reaching the particular stream. Herbicide concentrations in the aquifer are reduced through dilution with increasing discharge as the aquifer approaches the stream and greater amount of contact with soil particles that may sorb herbicide molecules. The vertical distance to the water table and soil types also affect herbicide transport through ground water. Highly permeable soils with low organic content, such as alluvium and glacial till, provide little filtering or sorption and rapidly deliver pollutants. Soils with high amounts of clays can be virtually impermeable and large amounts of organic matter can bind herbicide molecules for long periods of time. Because the variables affecting transport of herbicides in groundwater are site-specific and highly variable, there is no particular buffer width that works equally well in all settings.

Pesticide movement ratings are derived from soil half-life, sorption in soil, and water solubility, and indicate the propensity for a pesticide to reach a stream through groundwater. As indicated by movement ratings, glyphosate is least likely to reach groundwater or move from the site, while chemicals such as picloram, dicamba, and triclopyr are highly mobile and are likely to be transported by runoff or percolation. All of the herbicides proposed for use are susceptible to transport in groundwater or surface runoff, especially if applications are followed immediately by high rainfall events or if the water table is relatively shallow.

Although no-spray buffers can reduce the likelihood of water contamination from herbicides, there is no general rule to determine appropriate buffer widths. The buffer distances in the proposed action are based on the presumption that herbicides applied near water can more readily reach water than herbicides that are not applied near water, but the specific distances for ground-based spraying are based on practical weed control considerations and are not derived from scientifically-based calculations. The effectiveness of no-spray buffers for preventing water contamination through runoff or percolation is generally unknown, but the buffers provide some increment of additional protection due to filtering and sorption of herbicides that could otherwise reach the stream.

Fish and their aquatic prey base are most likely to be exposed to herbicides in occasional circumstances where wind gusts or unexpected precipitation carries chemicals into the water. Chemical contamination of water from the proposed ground-based treatments is unlikely to occur beyond occasional and localized circumstances given the small amounts of chemicals used, precautionary measures that minimize or avoid water contamination, and limited riparian acreage treated within any given subbasin. Water contamination is most likely to occur in situations where spraying occurs in riparian areas with coarse alluvial soils and when a significant unexpected rainfall occurs shortly after weed treatment. Available water quality monitoring for past weed treatments are limited, but suggest that conservation measures similar to those in the proposed action are likely limiting the occurrence of water contamination and the concentrations of chemicals in the water when contamination occurs (Berg 2004).

Although the conservation measures in the proposed action would likely limit exposure of salmonids and their prey base to herbicides, some exposure is nonetheless possible. Site-specific estimates of fish exposure cannot be predicted since the exact treatment locations, the amount of chemicals that will be applied, and weather conditions are not known ahead of time. Instead, we rely on the analysis provided in the Assessment (pp. 87-94). NMFS developed estimated environmental concentrations (EECs) of herbicides in surface water based on modeled water contamination rates found in the most recent U.S. Forest Service Risk Assessments prepared by the Syracuse Environmental Research Associates, Inc. (SERA) (http://www.fs.fed.us/foresthealth/pesticide/risk.shtml) and described in the Assessment Appendix E. The SERA reports predict water contamination rates associated with the application of 1 pound of chemical per acre. To establish EECs for each herbicide in the proposed action, the SERA water contamination rate is multiplied by the maximum allowed application rate for a worse-case scenario. Table 8 shows EECs for each chemical, along with some general physical property information.

Table 8. Physical properties, application rates, and estimated environmental concentrations for herbicides proposed for use.

Active Ingredient	Persistence in Soil (days)[1]	Mobile in Soil	Max Label Application Rate (lb acid equivalent [a.e.]./Acre)	Water Contamination Rate (mg a.e./L)[2]	Estimated Environmental Concentration (EEC) (mg a.e./L)[3]
2,4-D amine	10 Low	Yes, degrades quickly	4.0	0.44	1.76
Aminopyralid	5 - 343 Low-High	No	0.11	0.056	0.0062
Clopyralid	40 Moderate	No	0.5	0.07	0.035
Chlorsulfuron	40 (28-42) Low-Mod	No	0.12	0.2	0.024
Dicamba	7-42 Low-Mod	Yes	2	0.01	0.02
Glyphosate	47 Moderate	No	8	0.083	0.66
Imazapic	7-150 Low-High	No	0.19	0.01	0.002
Metsulfuron-methyl	30 (7-28) Low	No	0.15	0.01	0.002
Picloram	90 (20-300) Mod-High	Yes	1.0	0.18	0.18
Sulfometuron-methyl	20-28 Low	No	0.378	0.02	0.008
Triclopyr (Garlon 3A)	30 Low	Yes	9.00	Acid: 0.24 TCP: 0.02	Acid: 2.16 TCP: 0.18

1 Soil half-life values for herbicides are from Herbicide Handbook (Ahrens 1994). Pesticides that are considered non-persistent are those with a half-life of less than 30 days; moderately persistent herbicides are those with a half-life of 30 to 100 days; pesticides with a half-life of more than 100 days are considered persistent.

2 Water contamination rates for direct spraying of ponds were obtained from the most recent SERA risk assessments (http://www.fs.fed.us/foresthealth/pesticide/risk.shtml). See Assessment Appendix E.

3 Estimated environmental concentrations (EECs) were derived by multiplying the maximum label application rate by the SERA water contamination rate for application of 1 pound of chemical per acre.

Herbicides (including the active ingredient, inert ingredients, and adjuvants) can potentially harm fish directly or indirectly. Herbicides can directly affect fish by killing them outright or causing sublethal changes in behavior or physiology. As described in Scholz et al. 2005 (entire) herbicides can indirectly affect fish by altering their environment, such as by changing the availability of prey species. Below we first discuss direct effects of herbicides, then indirect effects, and then conclude with a table showing concentrations of each herbicide known to cause lethal and sublethal impacts to salmonids and lethal impacts to salmonid prey species. See Assessment Appendix E for more detail on the specific toxicological effects of each herbicide proposed for use under this program.

Herbicide exposure may directly result in one or more of following impacts to the fitness of salmonids and other fish species.

- Direct mortality at any life history stage;

- An increase or decrease in growth;
- Changes in reproductive behavior;
- A reduction in the number of eggs produced, fertilized, or hatched;
- Developmental abnormalities, including behavioral deficits or physical deformities;
- Reduced ability to osmoregulate or adapt to salinity gradients;
- Reduced ability to tolerate shifts in other environmental variables (*e.g.*, temperature or increased stress);
- An increased susceptibility to disease;
- An increased susceptibility to predation; and
- Changes in migratory behavior.

In addition to effects of direct exposure on listed fish, indirect effects of pesticides can occur through their effects on the aquatic environment and non-target species. The likelihood of adverse indirect effects is dependent on environmental concentrations, bioavailability of the chemical, and persistence of the herbicide in salmonid habitat. For most herbicides, including those in the proposed action, there is little information available on environmental effects such as negative impacts on primary production, nutrient dynamics, or the trophic structure of macroinvertebrate communities. Most available information on potential environmental effects must be inferred from laboratory assays, although a few observations of environmental effects are reported in the literature.

Juvenile salmonids feed on a diverse array of aquatic invertebrates, with terrestrial insects, aquatic insects, and crustaceans comprising the large majority of the diets of fry and parr in all salmonid species (Higgs et al. 1995, p. 161). In general, insects and crustaceans are more acutely sensitive to the toxic effects of environmental contaminants than fish or other vertebrates. However, with a few exceptions (e.g., daphnids), the impacts of pesticides on salmonid prey taxa have not been widely investigated. Factors affecting prey species are likely to affect the growth of salmonids, which is largely determined by the availability of prey in freshwater systems (Mundie 1974, p. 1836). Food supplementation studies (e.g., Mason 1976) have shown a clear relationship between food abundance and the growth rate and biomass yield of juveniles in streams. Therefore, herbicide applications that kill or otherwise reduce the abundance of macroinvertebrates in streams can also reduce the energetic efficiency for growth in salmonids. Less food can also induce density-dependent effects, such as increased competition among foragers as prey resources are reduced (Ricker 1976, p. 1523).

It is possible that the action may also cause detrimental effects when non-target plants are killed by herbicides. Herbicide spraying in riparian areas can kill non-target plants that provide stream bank stability, shade, and cover for fish. Spraying can also increase surface runoff by creating areas of bare soil devoid of any vegetation. This is particularly true for non-selective herbicides that kill all plants, such as glyphosate. However, non-target species killed by herbicides tend to be mostly forbs, grasses, and legumes, which are capable of reestablishing themselves within a few growing seasons. Although shrubs and trees are also susceptible to herbicide effects, the quantity of herbicide applied during spot spraying is not likely to kill mature shrubs or trees that have matured beyond the pole stage.

Available information on the toxicological effects of each of the active ingredients and end-use products proposed for use is summarized in the Assessment Appendix E. Table 9 summarizes toxicity information for active ingredients and surfactants, using rainbow trout as a surrogate for

ESA-listed salmonids and daphnid as a surrogate for salmonid prey species. Lethal effects for rainbow trout are reported as the lethal concentration (LC) required to kill half of the test organisms within 96 hours ("96-hour LC50"). Lethal effects for daphnids are reported as the LC required to kill half of the test organisms within 48 hours ("48-hour LC50"). Table 10 reports toxicities separately for herbicide active ingredients and surfactants, but the toxicities of mixtures of the two are largely unknown. Mitchell et al. (1987) tested the toxicity of Rodeo with and without a surfactant. Without the surfactant, the 96-hour LC50 for rainbow trout was 429 mg a.e./L. With the surfactant X-77 (not proposed for use under this action), the 96-hour LC50 ranged from 96.4 mg a.e./L (rainbow trout) to 180.2 mg a.e./L (Chinook salmon). The addition of X-77 thus altered the toxicity of the formulation by up to four times. However, the surfactants proposed for use are not hazardous nor are they categorized by the Environmental Protection Agency as List 1 (inert ingredients of toxicological concern) or List 2 (potentially toxic other ingredients/high priority for testing inerts) compounds when used as intended and label directions are followed (CH2MHILL 2004).

Table 9. Toxicity of active ingredients and adjuvants proposed for use under this program.

Active Ingredient	Rainbow trout 96-hour LC_{50} (mg a.e./L)[1]	Lowest Sublethal Effect Threshold for Salmonids (mg a.e./L)[1]	Daphnid 48-hour LC_{50} (mg/L)
2,4-D amine	162	5	25
Aminopyralid	100	Unknown	98.6
Clopyralid	103.5	NOEC = 68	225
Chlorsulfuron	40	No Observed Effects Concentration (NOEC) = 32	>100
Dicamba[8]	28	Unknown	100
Glyphosate	96.4	NOEC = 25.7	128
Imazapic	100	Unknown	>100
Metsulfuron-methyl	150	4.7	>150
Picloram	8	NOEC = 0.55	48
Sulfometuron-methyl	148	NOEC = 1.17	>150
Triclopyr: Garlon 3A	Acid: 117 Trichloropyridinol (TCP): 1.5	32.2 TCP: 0.178	Acid: 132.9 TCP: 10.9
Adjuvant			
Activator 90	2.0[2]	NA	2.0[2]
LI 700	17 – 130[3,4]	NA	170 – 190[3,4]
Methylated Seed Oil (MSO)	48[5]	NA	>100[5]
R11	3.8 – 6[2,4]	NA	5.7 – 19[2,4]
Spreader 90	3.3[5]	NA	7.3 (96-hr)[5]
Syl-Tac	>5[5]	NA	>5[5]
Agridex	>1000[6]	NA	>1000
Valid	10[7]	NA	NA
41-A	1000[7]	NA	NA

[1]Lowest available LC_{50} values for salmonids, obtained from the most recent SERA risk assessments. See Assessment Appendix E for more detail. The values presented are for the formulated product and a metabolite.
[2] McLaren-Hart Environmental Engineering Corporation 1995; [3]LI 700 Safety Data Sheet;
[4] Smith *et al.* 2004; [5] Bakke 2003; [6]McLaren/Hart 1995, as cited in Diamond and Durkin (1997); [7] as reported in BPA (2012, p.B-25).

To predict the effects of the proposed action on ESA-listed salmonids, we compare estimated concentrations of herbicides in surface water after application to riparian plants to known toxic concentrations of these herbicides to salmonids and their prey species (Table 10). However, there are numerous uncertainties in this analysis:

- Table 9 presents toxicities for the active ingredients in herbicides, but end-use products (i.e. Rodeo) have other inert ingredients besides the active ingredients (i.e. glyphosate) listed above. End-use products containing the same active ingredient may have different toxicities to aquatic organisms. This is because they have different formulations (i.e., different proportion of active ingredient, different inert ingredient composition, or different proportions of each inert ingredient).
- Surfactants are toxic by themselves and have been documented to increase the toxicity of herbicide formulations. The increase in toxicity is not necessarily additive; it depends upon the type of surfactant used as well as the proportion of surfactant in the formulation or tank mixture. As stated above, Table 9 reports toxicities separately for herbicide active ingredients and surfactants, but the toxicities of mixtures of the two are largely unknown.
- Table 9 reports the known toxicities from the SERA reports, which synthesize available literature. In somė cases, available literature is limited. There is little information available on the sublethal effects (e.g., feeding, spawning, or migration) or ecological effects (e.g., effects on prey species) of the active ingredient, end-use products, and tank mixtures.
- To further complicate the evaluation, many sublethal toxicological effects may harm fish in ways that are not readily apparent. When small changes in the health or performance of individual fish are observed (e.g., a small percentage change in the activity of a certain enzyme, an increase in oxygen consumption, or the formation of pre-neoplastic hepatic lesions), it may not be possible to infer a significant loss of essential behavior patterns of fish in the wild, even in circumstances where a significant loss could occur. Where sublethal tests have been conducted, they are typically reported for individual test animals under laboratory conditions that lack predators, competitors, certain pathogens, and numerous other hazards found in the natural environment that affect the survival and reproductive potential of individual fish.

Table 10 compares estimated environmental concentrations of each active ingredient proposed for use to concentrations causing lethal and sublethal effects. These comparisons provide only a rough estimate of effects, given the caveats listed above. Table 10 suggests that the concentrations of most herbicides proposed for use would occur at concentrations well below (at least one to two orders of magnitude) concentrations where lethal effects are known to occur in salmonids. Estimated environmental concentrations of active ingredients would also be below the lowest threshold of sublethal effects, where known. Furthermore, the estimated EEC is for a worst-case scenario. To develop these "worst-case" scenarios, the EEC was derived from a direct application of the active ingredients to a 1-acre pond (1-foot deep) using the maximum rate specified on the label. The EEC is therefore an extreme level that is unlikely to occur during implementation of this programmatic action.

Table 10. Comparison of estimated environmental concentrations (EECs) of herbicide active ingredients to known toxicities to salmonids and their prey species.

Active Ingredient	Estimated Environmental Concentration (EEC) (mg a.e./L)	Toxicity 96-hour LC_{50} (mg a.e./L)[1]	Lowest Sublethal Effect Threshold (mg a.e./L)[1]	Daphnid 48-hour LC_{50} (mg/L)
2,4-D amine	1.76	162	5	25
Aminopyralid	0.0062	100	Unknown	98.6
Clopyralid	0.035	103.5	NOEC = 68	225
Chlorsulfuron	0.024	40	NOEC = 32	>100
Dicamba[8]	0.02	28	Unknown	100
Glyphosate	0.66	96.4	NOEC = 25.7	128
Imazapic	0.002	100	Unknown	>100
Metsulfuron-methyl	0.002	150	4.7	>150
Picloram	0.18	8	NOEC = 0.55	48
Sulfometuron-methyl	0.008	148	NOEC = 1.17	>150
Triclopyr: Garlon 3A	Acid: 2.16 TCP: 0.18	Acid: 117 TCP: 1.5	32.2 TCP: 0.178	Acid: 132.9 TCP: 10.9

1 Lowest available LC_{50} values for salmonids, obtained from the most recent SERA risk assessments. The values for triclopyr are the formulated product and a metabolite.

Estimated environmental concentrations are not available for all adjuvants, so NMFS was not able to compare such levels to known toxicities for salmonids and their prey species. Rather, NMFS characterized the ecological risk of each adjuvant using EPA's classification system for ecotoxicity. The ecological risk characterization ranges from very highly toxic (LC50 values <0.1 mg/L) to practically non-toxic (LC50 values > 100 mg/L). Table 11 summarizes the ecological risk characterization for each adjuvant proposed for use. Ecotoxicity ratings range from practically non-toxic to moderate. All of the surfactants with moderate ecotoxicity cannot be applied within a 50-foot buffer of open water, which should lessen the possibility of fish being exposed to these chemicals.

Table 11. Toxicity values for surfactants proposed for use under this program.

Active Ingredient	Rainbow Trout 96-hour LC_{50} (mg/L)	Ecotoxicity Category[1]	Daphnid 48-hour LC_{50} (mg/L)	Ecotoxicity Category[1]
Activator 90	2.0	Moderate	2.0	Moderate
LI 700	17 – 130	Moderate – Practically non-toxic	170 – 190	Practically non-toxic
Methylated Seed Oil (MSO)	48	Slight	>100	Practically non-toxic
R11	3.8 – 6	Moderate	5.7 – 19	Moderate – Slight
Spreader 90	3.3	Moderate	7.3 (96-hr)	Moderate
Syl-Tac	>5	Moderate	>5	Moderate
Agridex	>1000[6]	Practically non-toxic	>1000	Practically non-toxic
Valid	10	Moderate		
41-A	1000	Practically non-toxic		

[1]EPA Ecotoxicity categories for aquatic organisms.
http://www.epa.gov/oppefed1/ecorisk_ders/toera_analysis_eco.htm

Uncertainties Associated with Herbicide Use

There are numerous uncertainties that weigh into the effects analysis for herbicides in this Opinion. First, there are significant gaps in our knowledge about toxic effects from: (1) Unspecified inert ingredients contained in the end-use product formulations; and (2) tank mixtures containing multiple active ingredients and/or additives (i.e., surfactants). Second, estimates for lethality are measured for a surrogate species and are for 50 percent of the test organisms. Even in light of all this uncertainty, we believe that outright lethality from the use of herbicides under this program is unlikely to occur. This is because the estimated environmental concentrations for herbicides represent worse-case scenarios and environmental concentrations are expected to actually be much less than these estimates due to implementation of proposed best management practices (BMPs). Furthermore, a small proportion of the action area will be treated, thus any potential water contamination will be short in duration, small in magnitude, and infrequent. However, we cannot say with any certainty that ESA-listed fish would not be harmed through sublethal effects or indirectly through toxic effects on other aquatic organisms. Sublethal effects from water contamination by herbicides cannot be discounted based on the available information. Water contamination by herbicides is likely to occur in occasional circumstances, and sublethal effects of herbicides or their adjuvants can occur within the range of concentrations likely to occur under the proposed action. Of the particular herbicides and surfactants proposed for use, little is known about their sublethal effects on salmonids, their effects on aquatic ecosystems, or threshold concentrations where these effects might occur. Where sublethal assays have been reported for salmonids, harmful effects occur at concentrations as much as several orders of magnitude less than the lethal endpoints used by EPA to assess pesticide risk.

2.5.1.2 Effects of Interrelated or Interdependent Actions

Interrelated actions are those that are a part of a larger action and depend on the larger action for their justification. Interdependent actions are those actions that have no independent utility apart from the action under consideration. Because future maintenance activities are included in the proposed Program they are not considered interrelated or interdependent. The Service did not identify any other potentially interrelated or interdependent actions.

2.5.2 Bull Trout Critical Habitat

Construction projects have the greatest potential to affect critical habitat including fish screening and passage; in-stream flow projects; structures; side channels reconnects; and channel reconstruction. Most projects that provide fish passage or alter the stream channel will adversely affect critical habitat by contributing sediment to the system and potentially altering habitat features associated with stream channel complexity. Depending on the category and specific design of the project, these effects could last from a few hours or days to several months, while beneficial effects could last for years or decades. In many cases, effects to critical habitat will be insignificant, depending on the project. Project design features, such as diverting the stream, using erosion control, and limiting in channel work, will minimize effects. While some PCEs will be adversely affected for some period of time by these projects, all of the projects described in this Opinion will eventually contribute to the improvement of fish habitat with long-term benefits resulting from passage enhancement. Thus they will result in benefits over time to these PCEs of critical habitat, similar to what is described in **Section 2.5.1.1.1.**

2.5.2.1 Direct and Indirect Effects of the Proposed Action

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

The following activities have the potential to affect PCE 1.

- Fish Passage
- In-stream Flow Projects
- In-stream Structures
- Side Channels and Floodplain Function
- Channel Reconstruction or Relocation
- Riparian Habitat Projects

Short-term adverse effects (up to one year) to this PCE may occur from construction activities through disturbance and compaction of the stream banks, floodplain, riparian area, and stream channel, which may interrupt or alter subsurface connectivity, or affect springs/seeps in the floodplain. Dewatering and diverting the streams will adversely affect water quantity in short section of dewatered stream. Long-term, however, these activities would likely result in improvements to this PCE as water tables are elevated, channels restored, flows increased, stream banks improved, habitat is stabilized, and expanded. Restoration activities that improve conditions for streamside and upland vegetation will ultimately benefit the aquatic system through reduction of sediment delivery over time, improved infiltration rates, and rising of the water table.

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

The following activities have the potential to affect PCE 2.

- Fish Screening
- Fish Passage
- In-stream Flow Projects
- In-stream Structures
- Side Channels and Floodplain Function
- Channel Reconstruction or Relocation
- Surveying and Monitoring at Habitat Restoration Project Sites

In-stream construction activities require work area isolation which will pose a temporary (days to 2 or 3 weeks) migration barrier. Migration habitat will be blocked during dewatering, although for many projects correcting passage barriers, migration was likely already blocked. Construction projects will also cause noise, disturbance, suspended sediment, and turbidity plumes which may delay bull trout movement through project sites. Effects to PCE 2 will be limited to temporary adverse effects and will only occur while the project is being implemented. The in-water work windows are designed to minimize effects to bull trout and bull trout migration corridors and further minimize the extent of adverse effects to this PCE. Long term, these projects should improve migration habitat for bull trout by correcting barriers, improving habitat, providing off-channel habitat, decreasing velocities in some cases with berm removal, and increasing flows.

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

The following activities have the potential to affect PCE 3.

- Fish Screening
- Fish Passage
- In-stream Flow Projects
- In-stream Structures
- Side Channels and Floodplain Function
- Channel Reconstruction or Relocation
- Riparian Habitat Projects

Projects involving stream dewatering and removal of riparian vegetation will adversely affect this PCE by impacting macroinvertebrates within the isolated work area and terrestrial organisms where vegetation is treated near the stream. Construction projects which introduce or suspend sediment which lead to cobble embeddedness or impact substrate will also have adverse effects to this PCE. Prey availability may be limited seasonally or in the short-term (up to one year) following construction projects. Effects will be localized and limited to the project area and may be significant or insignificant depending on the location, duration, extent, and the amount of stream channel affected by the project.

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

The following activities have the potential to affect PCE 4.

- Fish Passage
- In-stream Flow Projects
- In-stream Structures
- Side Channels and Floodplain Function
- Channel Reconstruction or Relocation

The above activities are intended to improve complex habitat for salmonids. Affects to this PCE will be beneficial in most instances, although there may be some temporary adverse effects during construction and immediately following construction while stream channels stabilize. There could be instances where some features are altered or lost, as would be the case if there is a large pool at a culvert outlet or stream banks are disturbed at a project site, or embeddedness increased locally. Therefore, the Program may have adverse effects to this PCE.

PCE 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.

The following activities have the potential to affect PCE 5.

- Fish Passage
- In-stream Flow
- Side Channels and Floodplain Function
- Channel Reconstruction or Relocation

Large construction projects – such as channel relocation, channel reconnects, removal of berms – may affect water temperatures depending on the scale of the project and the length of stream channel within the project area. Removal of vegetation could allow increased solar radiation which could affect temperatures to some degree. These effects will be extremely localized and are not likely to cause a significant effect to this PCE.

PCE 6: In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo over-winter survival, fry emergence, and young-of-the-year and juvenile survival.

The following activities have the potential to affect PCE 6.

- Fish Screening
- Fish Passage
- In-stream Flow Projects
- In-stream Structures
- Side Channels and Floodplain Function
- Channel Reconstruction or Relocation
- Riparian Habitat Projects
- Road and Trail Erosion Control, Maintenance, and Decommissioning

These projects will contribute sediment to the system and increase cobble embeddedness in the short-term, thus adversely affecting this PCE. Depending on the category and specific design of the project these effects could last from a few days or weeks to several months. Project design features will limit the amount of sediment introduced to the stream, but the potential for increased sediment will not be completely removed.

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

The following activities have the potential to affect PCE 7.

- Fish Passage
- In-stream Flow Projects
- Side Channels and Floodplain Function
- Channel Reconstruction or Relocation

Although in-stream flows may be diverted during construction projects, projects will not result in adverse effects to the local natural hydrograph. Like PCE 1, in some cases base flows and hyporheic connectivity may be improved by projects that increase flows or improve floodplain and riparian habitat. Restoration activities that improve conditions for streamside and upland vegetation will ultimately benefit the aquatic system through reduction of sediment delivery over time, improved infiltration rates, and rising of the water table.

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

All nine activities have the potential to affect PCE 8. Water quantity and quality will be adversely affected by in-stream and near stream construction projects through introduced and increased suspended sediment and turbidity and stream dewatering. Projects will contribute sediment to the system and increase cobble embeddedness during the short-term. Depending on the category and specific design of the project these effects could last from a few days or weeks to several months. The presence of equipment adds some degree of risk of contamination from lubricants, antifreeze, and hydraulic fluids. These risks are greatly reduced by general and specific conservation measures proposed by the action agencies. Vegetation treatments may adversely affect water quality in the short-term, although project design features will limit the type and amount of chemicals that can be used near a stream. Even with the buffer distances, herbicides to treat invasive plants could add chemicals to the system that may affect aquatic flora and fauna. Any adverse effects to this PCE will be short-term. Restoration activities that improve conditions for streamside and upland vegetation will ultimately benefit the aquatic system through reduction of sediment delivery over time, improved infiltration rates, and flows.

PCE 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.

The following activities have the potential to affect PCE 9.

- Fish Screening
- Fish Passage

Subpopulation characteristics such as life history diversity and isolation, persistence and genetic integrity will be benefitted by construction projects that improve fish passage. Providing improved fish passage, or reconnecting isolated local populations where safe to do so, will improve genetic diversity. There will be no adverse effects to this PCE from projects implemented under this Program, although some passage projects may open up new habitat for other species, project design features state that if the project would facilitate the expansion of brook trout into occupied bull trout habitat, a Service biologist will consider whether or not the project is appropriate for coverage for bull trout under this Program.

2.5.2.2 Effects of Interrelated or Interdependent Actions

Interrelated actions are those that are a part of a larger action and depend on the larger action for their justification. Interdependent actions are those actions that have no independent utility apart from the action under consideration. Because future maintenance activities are included in the proposed Program they are not considered interrelated or interdependent. The Service did not identify any other potentially interrelated or interdependent actions.

2.6 Cumulative Effects to Bull Trout and Bull Trout Critical Habitat

The implementing regulations for section 7 define cumulative effects to include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

To a large extent bull trout in the action area are distributed on federally managed lands. However, private and State activities and management programs may affect bull trout or their habitat in some parts of the action area. These may be continuation of effects associated with ongoing activities that include timber harvest, grazing and management of domestic livestock, road construction, agriculture, water diversions, and residential development. Population growth and associated demands for agricultural, commercial, or residential development are expected to affect available habitat quality and quantity for bull trout in the future. Similarly, landowners may take steps to curtail or avoid land management practices that would harm or harass bull trout. However, there is no certainty that this will occur. Therefore, the Service assumes future non-federal actions in Idaho are likely to continue over the next 10 years at similar intensities as in recent years and these actions will cumulatively affect bull trout. The Service anticipates that the majority of cumulative effects related to State and private activities will occur within bull trout forage, migratory, and overwintering habitats where the greatest concentration of non-federal lands occur.

Illegal and inadvertent harvest of bull trout is considered a cumulative effect. Harvest can occur through both misidentification and deliberate catch. Schmetterling and Long (1999, p. 1) found that only 44 percent of the anglers they interviewed in Montana could successfully identify bull trout. Being aggressive piscivores, bull trout readily take lures or bait (Ratliff and Howell 1992, pp. 15-16). Spawning bull trout are particularly vulnerable to harvest because the fish are easily observed during autumn low flow conditions. Spawning bull trout are particularly vulnerable to harvest because the fish are easily observed during autumn low flow conditions. Hooking mortality rates range from 4 percent for non-anadromous salmonids with the use of artificial lures and flies (Schill and Scarpella 1997, p. 1) to a 60 percent worst-case scenario for bull trout taken with bait (Cochnauer et. al. 2001, p. 21). Thus, even in cases where bull trout are released after being caught, some mortality can be expected.

An additional cumulative effect to bull trout is global climate change. Warming of the global climate seems quite certain. Changes have already been observed in many species' ranges consistent with changes in climate (Independent Scientific Advisory Board 2007, p. iii; Hansen et al. 2001, p. 767). Global climate change threatens bull trout throughout its range in the coterminous United States. Downscaled regional climate models for the Columbia River basin predict a general air temperature warming of 1.0 to 2.5 °C (1.8 to 4.5 °F) or more by 2050 (Rieman et al. 2007, p. 1552). This predicted temperature trend may have important effects on the regional distribution and local extent of habitats available to salmonids (Rieman et al. 2007, p. 1552), although the relationship between changes in air temperature and water temperature are not well understood. Bull trout spawning and early rearing areas are currently largely constrained by low fall and winter water temperatures that define the spatial structuring of local populations or habitat patches across larger river basins; habitat patches represent networks of thermally suitable habitat that may lie in adjacent watersheds and are disconnected (or fragmented) by intervening stream segments of seasonally unsuitable habitat or by actual physical barriers (Rieman et al. 2007, p. 1553).

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

2.7 Conclusion

2.7.1 Bull Trout

The Service has reviewed the current status of bull trout, the environmental baseline in the action area, effects of the proposed action, and cumulative effects, and it is our conclusion that the Program is not likely to jeopardize the species continued existence. Our conclusion is based on the following rationales.

1) A maximum of 20 projects per year are anticipated to be distributed throughout the Clearwater and Salmon River basins and the Snake River and its tributaries along the Idaho-Oregon border from Hells Canyon dam down to the Clearwater River confluence (p10, p5). The variety of action agency participants (NMFS, USACE, BOR, NRCS, USFS, and BLM), their disparate authorities, and the scale of the landscapes in which they work informs this conclusion (p7, p10).
2) Not all projects are anticipated to affect bull trout; some projects under the Program may be implemented in areas where bull trout are not present but where critical habitat or other listed fish exists (p60).
3) Program activities are typically of a short-term negative impact with long-term positive species and habitat benefits (p12).
4) The types and forms of adverse effects anticipated, on a project basis as well as for the entire Program, is within the ability of the local bull trout populations to accommodate as a component of compensatory mortality.

While adverse effects to individuals are expected from projects, bull trout populations and distribution in the action area, core areas, management units, and population segments will not significantly change as a result of this Program nor will implementation reduce the likelihood of both the survival and recovery of bull trout. In addition, the Program is focused on restoration activities; implementation is intended to improve habitat conditions in a manner that may expand distribution and increase population numbers. Any short-term adverse effects are expected to be fully offset by the benefits accrued through project implementation.

2.7.2 Bull Trout Critical Habitat

The Service has reviewed the current status of bull trout critical habitat, the environmental baseline in the action area, effects of the proposed action, and cumulative effects, and it is our conclusion that the Program is not likely to destroy or adversely modify designated critical habitat for bull trout. Projects completed under the Program will have temporary and short-term adverse effects to some PCEs as described above, but should improve the conditions of critical habitat. We expect that project design features will reduce the magnitude of adverse effects, but not eliminate them. Projects implemented under the Program will not diminish the functional or conservation value of the critical habitat subunits or recovery units covered by this consultation.

2.8 Incidental Take Statement

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened fish and wildlife species, respectively, without specific exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm in the definition of take in the Act means an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to listed species by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering.

Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

2.8.1 Form and Amount or Extent of Take Anticipated

Implementation of the projects under the Program may result in short-term adverse effects to bull trout as a result of: (1) short-term increases in suspended sediment; (2) fish handling and stranding for work area isolation and dewatering; (3) short-term impacts to water quality due to application of herbicides. Depending on the type of the project, its location and timing, there is a varying likelihood of bull trout presence and thus exposure to effects.

Because it is difficult to anticipate the number of individual bull trout that will be taken as a result of implementing the Program, we will use both the amount of habitat affected and an estimate of the number of bull trout, as described below.

Take Due to Increased Suspended Sediment and Turbidity

Projects that require in-stream work are expected to result in increased levels of turbidity and suspended sediment within the work area and downstream; to address the adverse effects and associated take we use the amount of habitat affected as a surrogate. We anticipate that all adult, subadult, and juvenile bull trout present within an in-stream project work area and within 1000 feet downstream of the work area are subject to take in the form of harassment and harm from direct exposure to the increased levels of suspended sediment, turbidity, and deposited sediment. Increased levels beyond 1000 feet are not expected to be significant enough to cause adverse effects.

During stream re-watering (the activity that will cause the most increase) the project sponsor will monitor turbidity every hour 600 feet downstream from the point of discharge. If turbidity levels exceed 50 NTUs over background levels for two consecutive readings (2 hours), the project sponsor must cease work immediately and take measures to reduce turbidity before continuing to reintroduce streamflow. Sediment transport from any temporary bypass channels will be minimized due to the provision for lined channels or the use of plastic pipes to convey water around the construction site. We estimate no more than 20 projects per year will require in-water work that may affect bull trout.

Elevated suspended sediment may result in direct injury (gill irritation, physiological stress, reduced feeding efficiency) and harassment by causing bull trout to move out of areas of elevated suspended sediment. Moving out of the areas (harassment) may cause loss of territories, increase competition and stress, and reduce feeding efficiency. Effects are not expected to rise to the level of mortality. Incidental take associated with turbidity and suspended sediment will occur during the in-stream work window when spawning bull trout, redds, and alevins are not present, therefore take of eggs or alevins is not provided. Take associated with increased turbidity and suspended sediment is expected to occur during the construction phases, stream dewatering and re-watering, and may also occur following rain events or high flows as material is re-suspended. This take is limited to 20 projects per year.

Take Associated with Fish Handling

Prior to dewatering the stream, fish salvage will occur to remove fish from the work area. Block nets will be installed upstream and downstream of each site and fish will be removed from the construction site by dip netting and seining, by electrofishing, or by both. Slow dewatering in steep topography may serve to move some of the fish out of the area prior to fish clearing operations. We estimate no more than 20 project sites per year are likely to involve dewatering of stream reaches and handling and removal of bull trout. We expect all bull trout present in a stream reach to be dewatered will be harassed or harmed by the slow dewatering of the stream, herding or netting to passively move fish out of the area, and the remaining bull trout may be harmed by block net impingement, electrofishing, and stranding.

Take associated with fish handling provided per year (rounded up to the nearest whole bull trout):

- 20 bull trout may be killed due to block net impingement;
- 340 bull trout may be harassed from electrofishing;
- Of the 340 bull trout captured, 100 of those may harmed or killed from electrofishing;
- Additionally up to 20 bull trout may be killed by stranding.

Take Associated with Herbicide Applications

Application of chemical herbicides will result in short-term degradation of water quality which will cause injury to fish in the form of sublethal harm from adverse physiological effects. This is particularly true for herbicide applications in riparian areas or in ditches that may deliver herbicides to streams occupied by listed salmonids. These sublethal effects, described fully in the effects analysis for this Opinion, will include increased respiration, reduced feeding success, and subtle behavioral changes that can result in increased susceptibility to predation. Because we do not know exactly where herbicide application will occur in the action area, or the concentrations to which fish will be exposed, we cannot predict how many individual fish might experience sublethal effects from exposure to herbicides. For herbicide application, the extent of take is best identified by the total number of riparian acres treated each year, which is estimated to be approximately 200 acres. Take will be exceeded if more than 200 total riparian acres are treated in a calendar year under this programmatic consultation.

2.8.2 Effect of the Take

In the accompanying Opinion, the Service determined that this level of anticipated take is not likely to jeopardize the continued existence of the bull trout across its range. We have likely overestimated the number of bull trout that are subject to take under this Program during any given year because in many cases bull trout will not be present during implementation, particularly where projects occur in bull trout migratory habitat, which tends to overlap with chinook and steelhead habitat (where projects are more likely to occur). Because we cannot say where projects will occur, if bull trout will be present or at what density, how many projects will result in take, or how successful the minimizations measures will be, we provided take according to assumptions described above, which likely overestimated the number of projects.

2.8.3 Reasonable and Prudent Measures

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

1. Minimize incidental take associated with project activities.
2. Ensure completion of a monitoring and reporting program to confirm that the take exemption for the proposed action is not exceeded.

2.8.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Action Agencies must comply with the following terms and conditions, which implement the reasonable and prudent measure described above:

1. To implement reasonable and prudent measure #1 the action agencies will:
    a. Ensure that holding conditions for any transported fish provide the lowest level of stress to captured individuals by ensuring the availability of cold, well oxygenated water in holding vessels, minimizing holding time, and avoiding any predation in holding vessels. To avoid predation consider separate holding vessels for different age classes.

   b. While block nets are set, inspect them regularly for fish and remove them to an area far enough away from the project site to avoid additional impingement risk.
   c. In habitat occupied by bull trout, temporary stream crossings in the wet are limited to no more than two round trips per project, unless otherwise approved by a Service biologist.
   d. If an in-water work site is within 600 feet upstream of bull trout spawning habitat, the action agency shall dewatered the stream channel prior to project implementation unless the Service agrees in writing that effects will be less if the work area is not dewatered.
2. To implement reasonable and prudent measure #2, each action agency will provide an annual report to the Service by April 1 each year that will include an assessment of overall program activity and a list of any actions which the action agency funded, permitted, or carried out using this Opinion.
3. For projects completed under this Program on private lands, the private land owner must allow reasonable access to the site to Service representatives before, during, and/or after project completion as desired by the Service to observe or monitor site conditions, implementation, and effectiveness.
4. On the Project Completion Form summarize for each project whether it resulted in adverse or insignificant effects to bull trout and/or bull trout critical habitat.
5. For stabilization and revegetation efforts, if material is going to remain on the site indefinitely (will not be picked up and discarded at the end of implementation) use natural fiber (i.e. jute, not plastic fabrics or webbing) geotextile fabrics and materials.

2.8.5 Reporting and Monitoring Requirement

In order to monitor the impacts of incidental take, the Federal agency or any applicant must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [(50 CFR 402.14 (i)(3)] and on the Project Completion Form (Appendix B of this Opinion).

2.9 Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery programs, or to develop new information on listed species. No conservation measures were identified at this time.

2.10 Reinitiation Notice

This concludes formal consultation on Idaho Habitat Restoration Programmatic. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if:

1. The amount or extent of incidental take is exceeded.
2. New information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion.
3. The agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this Opinion.
4. A new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Because of the wide range of proposed activities and the natural variability within and between stream systems, the Service recognizes that the action agencies may need to make minor modifications to the project criteria and conservation measures described in the proposed action to address circumstances that arise during implementation. Where such modifications will not result in any effect on the listed species or critical habitat not considered in this Opinion, they may be made without reinitiation of consultation. To determine if this is the case, the relevant action agency(ies) should describe the modification in writing (by email or letter), and provide a written assessment of whether the modification will have effects not considered in this Opinion.

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4. APPENDICES

4.1 Appendix A

Programmatic Consultation for Habitat Restoration Projects in Idaho
Project Information Form

I. GENERAL INFORMATION

Date:

Project Sponsor:
Phone/email:
Address:

Lead Action Agency Contact:
Phone/email:
Address:

Other Participating Action Agency Contact:
Phone/email:
Address:

Other Participating Action Agency Contact:
Phone/email:
Address:

Describe any coordination with NMFS and USFWS (including any correspondence). Specify contact personnel and dates:

Location(s) of activity:

Coordinates (Lat/Long or UTM):

County:

Watershed and Stream Names:

ESA-listed species present at the project site:

Species	Present?	Species	Present?
Spring/Summer Chinook		Canada Lynx	
Fall Chinook		Northern Idaho Ground Squirrel	
Sockeye		Spalding's Catchfly	
Steelhead		Macfarlane's Four -O'clock	
Bull Trout		Water Howellia	
		Yellow-billed Cuckoo	

In the table below, identify the specific action(s).

Action Category	Specific actions included in this BA	Check all that apply
Fish Screening	Install, upgrade, or maintain fish screens *(NMFS must review engineering plans for installation or upgrading of screens)*	
Fish Passage	Install or improve fish passage facilities (i.e. fish ladders or other fishways) at diversion structures and other passage barriers *(NMFS must review engineering plans)* Remove or modify water control structures (i.e. irrigation diversion structures) Replace culverts and bridges to provide fish passage and/or to reduce risk of culvert failure and chronic sedimentation, using the stream simulation methods from NMFS (2011b).	
Instream Flow	Lease or purchase water rights to improve instream flows Change or consolidate points of diversion *(NMFS must review engineering plans)* Increase efficiency of irrigation practices (i.e. convert open ditches to pipes, or convert surface water diversion to ground water well)	

Action Category	Specific actions included in this BA	Check all that apply
Instream Structures	Install instream habitat structures including • Rootwads, large woody debris (LWD), and log jams • Boulders • Spawning gravels Provide grade control with boulder weirs or roughened channels *(NMFS must review engineering plans for installation of structures with greater than 3 feet height)*	
Side Channels and Floodplain Function	Reconnect and restore historic side channels Modify or remove levees, dikes, berms, and fill	
Channel Reconstruction	Reconstruction of existing stream channels into historic or newly constructed channels *(NMFS must review engineering plans).*	
Riparian Habitat	Plant riparian vegetation Reduce riparian impacts from livestock: • Install fencing • Develop livestock watering facilities away from streams • Install livestock stream crossings (culverts, bridges, or hardened fords) Control invasive weeds through physical removal or with herbicides Stabilize stream banks through bioengineering	

Action Category	Specific actions included in this BA	Check all that apply
Road and Trail Erosion Control, Maintenance, and Decommissioning	Decommission or obliterate unneeded roads Relocate portions of roads and trails away from riparian buffer areas When part of a larger restoration project, reduce sediment from existing roads: • Improve and maintain road drainage features • Reduce road access and usage through gates, fences, boulders, logs, tank traps, and signs • Remove or stabilize pre-existing cut and fill or slide material Reduce sediment delivery to streams from other man-made sources	
Surveying and Monitoring	Survey project sites: • Take physical measurements • Install recording devices • Determine fish presence (*electroshocking for research purposes is not included under this consultation*) Monitor project site and stream habitat after project completion Installation of PIT tag detection arrays	

II. Description of the proposed work

Describe your project by filling in the following list. You may expand the space below to provide this information or attach additional pages. Attach maps or drawings to clearly illustrate the location, nature, and extent of the proposed work. **Some categories of projects require additional information (e.g., Channel Reconstruction), as noted in the Opinion, *Section 1.3.5 Action Categories and Specific Conservation Measures*. Please attach additional required information to this form.**

1. **Project purpose and brief description:**

2. **Project Timing**

a. Start Date:

b. Start Date (inwater work):

c. End Date:

d. End date (inwater work):

3. **Number and type of structures to be installed or constructed (if rock structure, estimated amount of rock, including size; if wood, estimated number of pieces and size):**

4. **Proposed construction machinery to be used:**

5. **Anticipated construction techniques proposed (please include best management practices (BMPs):**

6. **Describe all temporary and permanent erosion and sediment control measures to be used during the project:**

7. **Anticipated streamflow at time of construction (cubic ft/sec):**

8. **How many temporary stream crossings do you propose? List all BMPs proposed to avoid and minimize impacts from stream crossings.**

9. ***Attach maps and design drawings.***

10. ***Send engineering plans to NMFS if required (see table above).***

4.2 Appendix B

Programmatic Consultation for Habitat Restoration Projects in Idaho
Project Completion Form

Project Sponsor: Date:

Name of Project:

Date Project Completed:

Location of Project:

Objective of Project:

Was project completed as designed (including reclamation of work areas)? (Yes/No):

If No, please explain:

Were the objectives of the project met? Explain:

What indicators were used to determine success of the project (e.g., visual inspection, photo points, amount of area rehabilitated, etc.). Attach photos which document compliance with project implementation measures:

How long will information on indicators be collected (e.g., if the objective of the project was to reestablish a riparian area, how long will plants be monitored for viability?):

Explain any "lessons learned" from implementing this project that could assist in similar projects:

Document all fish handling undertaken during the project (record here or attach a survey sheet):

Methods of fish collection during project implementation			Date
Electrofishing	ESA-listed species present	Number of fish by species	Life stages
Handled			
Injured			
Killed			
Seining/Netting	ESA-listed species present	Number of fish by species	Life stages
Handled			
Injured			
Killed			

List all herbicides used, including amount and acreage:

If project included turbidity monitoring, report results: